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Barriers To the Commercialization of Interlocking Stabilized Soil Block Technology in Nigeria's Construction Industry

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Abstract- ***The commercialization of Interlocking Stabilized Soil Block (ISSB) technology has been widely recognized as a viable approach to promoting sustainable construction, reducing housing costs, and minimizing the environmental impacts associated with conventional building materials. Despite its numerous technical, economic, and environmental advantages, the adoption and commercialization of ISSB technology in Nigeria remain relatively low. This study assessed the barriers to the commercialization of ISSB technology within Nigeria's construction industry by examining the perceptions of construction professionals and key stakeholders. A quantitative research approach was adopted using a structured questionnaire administered to 185 respondents comprising architects, builders, engineers, quantity surveyors, ISSB manufacturers, material suppliers, and government officials. Data were analyzed using descriptive statistics, the Relative Importance Index (RII), Cronbach's Alpha reliability test, Spearman's Rank Correlation, and Principal Component Analysis (PCA). The findings revealed that lack of awareness and inadequate knowledge of ISSB technology (RII = 0.92), high cost of ISSB block press equipment (RII = 0.88), limited technical skills and trained personnel (RII = 0.85), insufficient government support and policy frameworks (RII = 0.80), and negative public perception of earth-based construction materials (RII = 0.79) constitute the most significant barriers to ISSB commercialization in Nigeria. Factor analysis further classified these barriers into three principal dimensions: technical and economic constraints, institutional barriers, and market and social acceptance. The study concludes that the commercialization of ISSB technology requires coordinated interventions involving government agencies, professional institutions, manufacturers, financial organizations, and academia. It recommends the establishment of national standards for ISSB production, improved stakeholder awareness through continuous professional education, financial incentives for equipment acquisition, expanded technical training programmes, and the implementation of demonstration housing projects to accelerate the adoption of ISSB technology and promote sustainable housing development in Nigeria.***

Keywords: Interlocking Stabilized Soil Blocks (ISSB), commercialization, sustainable construction, affordable housing, construction industry, Relative Importance Index, Nigeria.

I. INTRODUCTION

Affordable housing and sustainable construction are critical challenges in Nigeria. Traditional masonry (fired clay bricks, Sandcrete blocks) is resource-intensive and costly, contributing to Nigeria's housing deficit. Interlocking Stabilized Soil Blocks (ISSBs) – compressed lateritic soil blocks stabilized with a small amount of cement or lime – have been promoted by the United Nations and experts as an economical, eco-friendly alternative.

Unlike fired bricks, ISSBs require no firing, reducing energy use, and offer improved insulation and finish. ISSBs also allow mortar-less walling, cutting cement and plaster costs. For these reasons, ISSBs "have gained increasing interest as an environmentally friendly alternative to conventional sandcrete blocks", with potential to reduce construction energy demand by ~30% and mitigate housing shortages.

However, on-the-ground adoption in Nigeria is stubbornly low. Ibitoye et al. (2022) note that despite

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UN endorsement, "the patronage of ISSBs is low-slung" compared to Sandcrete. Similarly, a 2023 demographic survey found only a few hundred ISSB-built homes in major estates. Researchers consistently report high barriers: lack of standardized practice, limited awareness, and technical obstacles. The result is a technology with clear benefits but slow commercialization.

Despite this demonstrated cost advantage, the commercial uptake of ISSB technology in Nigeria's building industry remains disproportionately low. Documented evidence from selected housing estates in Southwest Nigeria, including the Obasanjo Estate in Ekiti, Redemption City in Ogun State, and the Amen Estate in Lagos State, confirms that ISSB-based developments exist and are growing in number, yet the population's overall preference for ISSB as a primary building material remains relatively low when set against the continued dominance of sandcrete blocks (Ibitoye et al., 2023). This gap between technical viability and market adoption forms the central concern of the present study.

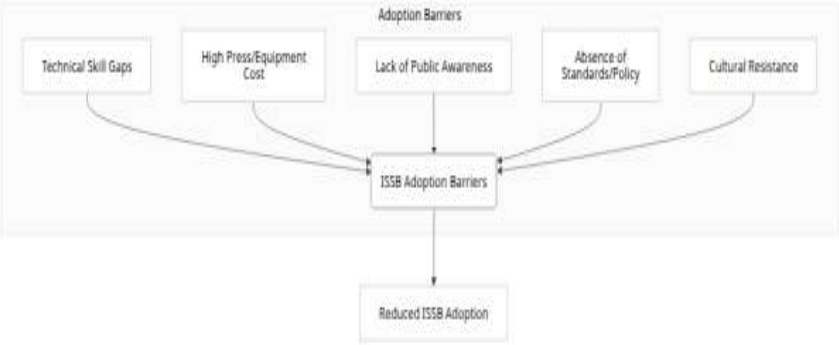

Figure 1: Conceptual framework of factors contributing to ISSB adoption barriers. Technical, economic, social, and regulatory factors all feed into a general barrier effect, leading to low ISSB uptake. (Arrows indicate influence.)

1.2 Statement of the Problem

Nigeria's construction sector is structurally dependent on cement-intensive sandcrete block production, a dependence that has persisted notwithstanding the comparative cost benefits, environmental advantages, and indigenous compatibility of alternatives such as ISSB.

While research has consistently demonstrated that ISSB construction can lower the direct cost of walling systems by reducing cement usage and rendering requirements (Ibitoye et al., 2022), this technical and economic evidence has not translated into widespread commercial adoption within the formal building industry.

The slow diffusion of ISSB technology suggests that the barriers constraining its commercialization extend beyond unit production cost alone. Evidence from estate-level documentation shows that even in locations where ISSB promoters are active and demonstrably successful housing stock already exists, the technology remains a secondary choice relative to sandcrete block construction (Ibitoye et al., 2023).

This points to the likely influence of factors such as limited public awareness, weak institutional and regulatory support, constrained access to financing for non-conventional building systems, scarcity of skilled ISSB artisans and production technicians, and persistent professional and consumer perceptions that associate earth-based construction with low social status.

However, the specific weighting and interaction of these barriers within Nigeria's construction industry has not been sufficiently interrogated in the existing literature, leaving a gap that this study seeks to address.

It is against this background that the present study investigates the barriers to the commercialization of Interlocking Stabilized Soil Block technology within Nigeria's construction industry, with a view to generating evidence that can inform policy, professional practice, and advocacy efforts aimed at mainstreaming sustainable, locally sourced building materials.

1.3 Aim and Objectives of the Study

The aim of this study is to examine the barriers militating against the commercialization of Interlocking Stabilized Soil Block (ISSB) technology in Nigeria's construction industry, with a view to proposing strategies for its wider adoption as a sustainable building material.

The specific objectives of the study are to:

i. examine the level of awareness and perception of stakeholders in the Nigerian construction industry toward ISSB technology;
ii. assess the economic, technical, regulatory, and socio-cultural barriers constraining the commercial uptake of ISSB as a mainstream building material;
iii. evaluate the comparative cost and performance profile of ISSB relative to conventional sandcrete block construction within the Nigerian context; and
iv. recommend strategies for overcoming the identified barriers to support the commercialization and advocacy of ISSB technology for sustainable design in Nigeria.

1.4 Research Questions

The study is guided by the following research questions: What is the current level of awareness and perception of ISSB technology among stakeholders in Nigeria's construction industry? What economic, technical, regulatory, and socio-cultural factors constrain the commercialization of ISSB technology?

How does the cost performance of ISSB compare with that of conventional sandcrete block construction? What strategies can be adopted to overcome the identified barriers and promote the commercial uptake of ISSB technology in Nigeria?

1.5 Significance of the Study

This study is significant to multiple stakeholders within the built environment sector. For policymakers and regulatory bodies, the findings provide an evidence base for the formulation of standards, incentives, and building codes that can accommodate and promote earth-based construction technologies.

For ISSB promoters, manufacturers, and artisans, the study offers insight into the specific obstacles limiting market penetration, thereby informing more targeted production, training, and marketing strategies.

For architects, engineers, and other built environment professionals, the study contributes to a growing body of Nigerian-context literature on alternative building materials, complementing existing work on the demographic spread of ISSB housing (Ibitoye et al., 2023) and its comparative cost advantages (Ibitoye et al., 2022).

Ultimately, the study is expected to support broader sustainable design advocacy efforts in Lagos State and Nigeria at large, by strengthening the case for indigenous, low-carbon building materials as credible alternatives within the formal construction industry.

1.6 Scope of Work

The study is delimited to the examination of barriers to the commercialization of ISSB technology within Nigeria's construction industry, with particular reference to Lagos State and comparable Southwestern Nigerian contexts where documented ISSB adoption already exists, including Ogun and Ekiti States.

The study focuses on commercial and market-related barriers, namely economic, regulatory, technical, and socio-cultural factors, rather than on the structural or geotechnical performance characteristics of ISSB units, which fall outside the scope of this research. The study draws on existing empirical literature on ISSB cost performance and adoption patterns in Southwest Nigeria (Ibitoye et al., 2022, 2023) as a foundation for its problem formulation.

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II. LITERATURE REVIEW

2.1 ISSB Technology and Benefits

Interlocking Stabilized Soil Blocks (ISSBs) are manufactured by compressing a soil–stabilizer mix (typically lateritic soil with a few percent cement or lime) in a mechanical press. This process yields uniform blocks that interlock, allowing mortar-less wall assembly.

ISSBs have high compressive strength (4–10 MPa) and moisture resistance once cured. Key advantages include: no firing (saving fuel/energy), minimal mortar use (saving cement), fast assembly (no plaster/rendering), and good thermal insulation. For example, UNHCR notes that ISSB shelters in Nigeria can be constructed quickly by displaced households using locally available laterite.

Recent studies quantify these benefits. In a case study of a semi-detached home in Ogun State, Ibitoye & Tolu-Alalade (2026) found that ISSB walls maintained indoor temperatures ~30% lower than equivalent Sandcrete walls, validating ISSB's superior thermal comfort.

A 30-year life-cycle cost analysis estimated that a 3-bedroom bungalow built with ISSB blocks costs 65% less (NPV-wise) than the same building with conventional blocks. Such findings demonstrate ISSB's potential to reduce housing costs and energy use. Moreover, Ibitoye (2025) reports that ISSB construction yielded easier finishes and better indoor comfort, highlighting environmental and social advantages.

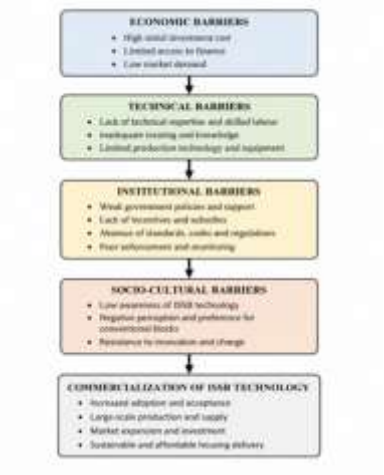

Figure 2: Conceptual framework illustrating the barriers influencing the commercialization of Interlocking Stabilized Soil Block (ISSB) technology in Nigeria's construction industry.

2.2 Barriers to ISSB Adoption

Despite proven advantages, barriers hinder ISSB's commercialization. Ibitoye et al. (2022) observe that Nigeria's uptake of ISSBs "is still apathy" despite endorsements. The literature categorizes barriers into several groups:

- Economic/Financial: High initial cost of equipment (press machines, often imported) is repeatedly cited. For example, a 2016 survey of Nigerian construction professionals found "high cost of machine" and "lack of trained operator" as top barriers. Even if raw materials (soil) are cheap, the capital for setting up production is substantial. Many firms cannot afford the ₦2–5 million (US$5–10k) presses or must import them at tariff and forex costs.
- Technical and Quality Issues: ISSB requires some skill in mixing and pressing. Lack of trained masons and technicians can lead to inconsistent block quality. Inconsistency in size, moisture resistance, or curing can undermine confidence. Ibitoye's studies note concerns about "material consistency, technical expertise [and] uniformity" across the blocks. Poor quality perception (e.g. blocks absorbing moisture) discourages engineers from specifying ISSB.
- Awareness and Perception: Studies show that low awareness is a critical barrier. Public and professional knowledge of ISSB's merits is

limited. For instance, in a recent survey only 18.8% of construction stakeholders reported "very good" knowledge of ISSBs. A thematic review highlights that ISSB's image is sometimes linked to poverty or low-quality housing. This negative perception can inhibit acceptance among consumers and developers.

- Institutional/Policy: There are few national standards or government policies supporting ISSB. Building codes may not include ISSB, and there is no widespread certification of machines or products. Ibitoye et al. (2026) and others emphasize the lack of supportive policy framework and incentives as major obstacles. Without official endorsement or subsidies, investors are hesitant to champion ISSB.
- Market/Infrastructure: The supply chain for ISSB materials and machines is underdeveloped. Only a handful of local promoters (e.g. Red Bricks International, Ipinle Earth Synergy) exist. Few businesses produce ISSB at scale, meaning availability of blocks for large projects is limited. This "limited market availability" (48.1% concern in [22]) hampers mainstream adoption.
- Socio-cultural: Traditional preferences for familiar materials (concrete blocks, bricks) can resist change. Some communities associate earthen construction with rural or "poor" buildings. Overcoming this requires effective community engagement.

These categories align with the Diffusion of Innovation framework: complexity (technical difficulty), relative advantage (cost, comfort), compatibility (with habits), observability (if people see examples), and so on. In Nigeria's context, both psychological barriers (risk aversion, skepticism) and systemic barriers are reported.

For instance, Ogunleye et al. (2026) found stakeholders valued ISSB's thermal and aesthetic benefits but were deterred by concerns over "low-cost claims, limited availability, and required training". Similarly, Ibitoye's (2024) homogeneity study identified lack of awareness (90.3% agreement) and high equipment cost (62.1%) as the most agreed-upon challenges.

2.2.2 The Concept of Commercialization in Building Material Technology

Commercialization, as applied to building material innovation, denotes the process by which a technically validated material or construction technique moves from demonstration or pilot use into sustained, market-driven production, distribution, and adoption by ordinary builders, developers, and clients.

Commercialization is therefore distinct from mere technical feasibility: a material may be structurally sound and cost-competitive, as ISSB has been shown to be (Ibitoye et al., 2022), without achieving market penetration, because commercialization additionally depends on awareness, skilled production capacity, supply chain maturity, regulatory recognition, financing access, and the perceptions held by professionals and end-users (Presswood et al., 2021).

This distinction is central to the present study, which is concerned not with whether ISSB performs adequately as a material, but with why its demonstrated technical and cost advantages have not translated into widespread commercial uptake.

2.3 Theoretical Framework

This study is anchored on the Diffusion of Innovations theory, which explains how, why, and at what rate new ideas and technologies spread through a social system. The theory identifies five attributes that influence the adoption of an innovation: relative advantage, compatibility, complexity, trialability, and observability.

Applied to ISSB, the technology demonstrates relative advantage in cost and sustainability terms (Ibitoye et al., 2022), yet its compatibility with entrenched professional norms, its perceived complexity in terms of skilled labour and machinery requirements, and the limited opportunities for stakeholders to trial or observe successful installations collectively constrain its diffusion.

The theory further distinguishes between categories of adopters, ranging from innovators and early adopters to laggards, a framework consistent with the documented pattern in Southwest Nigeria, where a small number of ISSB promoters and estates, such as

Obasanjo Estate in Ekiti, Redemption City in Ogun State, and Amen Estate in Lagos, represent early-adopter activity within a market still dominated by sandcrete block construction (Ibitoye et al., 2023).

The Theory of Planned Behaviour is also drawn upon to the extent that it explains how professional and client attitudes, subjective norms around material status, and perceived behavioural control over sourcing and constructing with ISSB jointly shape the intention to specify or use the material, complementing the diffusion perspective with an account of individual decision-making among architects, builders, and clients.

2.4 Empirical Review

2.4.1 Awareness and Perception of ISSB Technology

A recurring finding across the literature is that low public and professional awareness constitute one of the most significant constraints on ISSB commercialization. Olaleye and Ibitoye (2023), examining architects' responses to the utilisation of ISSB as an alternative building material for housing projects in Southwest Nigeria, found that while a segment of architects held favourable views of the material's sustainability credentials, actual specification of ISSB in practice remained limited, reflecting a gap between positive perception and behavioural uptake.

This finding is reinforced by demographic documentation showing that even in localities where ISSB estates have been established and are visibly successful, the population's overall preference for ISSB relative to sandcrete blocks remains comparatively low (Ibitoye et al., 2023), suggesting that visibility and demonstration alone have not been sufficient to shift market preference.

Similar awareness-related constraints have been documented outside Nigeria. In a study on the acceptability of interlocking soil block technology in Kenya's construction industry, Sanewu et al. (2022) reported that limited stakeholder familiarity with the technology, combined with skepticism rooted in earlier negative experiences with poor-quality earth construction, continued to depress market acceptance despite improvements in block stabilization methods.

Comparable patterns of cautious or selective acceptance have also been reported in studies of resident perception of laterite interlocking block housing in Ado-Ekiti, Nigeria, where occupant satisfaction with thermal performance coexisted with broader social ambivalence toward earth-based walling as a marker of housing status (Afolami & Oyebamiji, 2017).

2.4.2 Technical, Skills, and Production Capacity Barriers

Beyond awareness, the literature consistently identifies a shortage of technical skills, trained artisans, and appropriate machinery as a structural barrier to ISSB commercialization.

The production of quality ISSB units depends on correct soil selection, stabilizer proportioning, and consistent press operation, competencies that remain scarce relative to the long-established skill base for sandcrete block moulding (Omoregie et al., 2016).

Where production machinery, whether manual or hydraulic presses, is limited in number and geographically concentrated around a small number of promoters, the resulting supply bottleneck constrains the scale at which ISSB can be commercially offered, reinforcing its position as a niche rather than mainstream walling option (Sanewu, 2020).

This technical constraint interacts with the absence of standardized national specifications for soil selection and stabilization ratios, which leaves quality control inconsistent across producers and undermines confidence among contractors and clients who might otherwise consider the material.

2.4.3 Regulatory and Policy Barriers

The absence of supportive government policy, building codes, and standardization frameworks for earth-based construction materials is repeatedly cited as a constraint on commercialization. Without formal recognition of ISSB within national building codes, financiers, insurers, and approving authorities have limited basis for treating the material on equal footing with conventional sandcrete construction, regardless of its demonstrated cost and performance characteristics (Ibitoye et al., 2022).

Sonebi et al. (2022) similarly argue, in the context of locally sourced sustainable materials in the Middle East and North Africa, that policy and regulatory support, including incentives, demonstration mandates on public projects, and inclusion in national standards, is a precondition for moving such materials from niche to mainstream use, a position echoed in studies of affordable housing delivery more broadly, which identify regulatory uncertainty as a deterrent to both developers and financing institutions (Presswood et al., 2021).

2.4.4 Economic and Cost-Related Barriers

Although ISSB has been shown to offer a cost advantage over sandcrete block construction at the unit and walling-system level (Ibitoye et al., 2022), the literature distinguishes this from the higher upfront capital cost of establishing ISSB production capacity, which includes press acquisition, soil testing, and stabilizer sourcing.

This initial investment barrier disproportionately affects small-scale producers and new entrants, limiting the number of commercial ISSB suppliers able to compete with the well-established sandcrete block supply chain.

The economic literature on sustainable building material adoption in resource-constrained contexts similarly notes that life-cycle or system-level cost advantages are often insufficient to drive adoption where upfront production or financing costs present an immediate barrier to market entry (Bredenoord, 2017).

2.4.5 Socio-Cultural Perception Barriers

A further barrier identified across the literature is the socio-cultural perception that associates earth-based construction with low social status, in contrast to cement-based sandcrete construction, which has historically been associated with modernity and durability in Nigerian housing culture.

This perception persists notwithstanding documented improvements in the structural and thermal performance of stabilized soil block construction (Afolami & Oyebamiji, 2017), and notwithstanding growing professional acknowledgment of its sustainability credentials (Olaleye & Ibitoye, 2023). Such perceptions are reinforced by entrenched client and professional preference for familiar conventional materials, a pattern documented both within Nigeria and in comparable Sub-Saharan African contexts such as Kenya, where social acceptability rather than technical performance has been identified as the more persistent constraint on adoption (Sanewu et al., 2022).

2.4.6 Research-Industry Collaboration and Technology Transfer

Weak collaboration between research institutions, ISSB promoters, and industry practitioners is identified in the literature as a further constraint limiting the transfer of technical knowledge into commercial practice.

Where research on ISSB performance and cost advantages remains largely confined to academic publication, as with the comparative cost study by Ibitoye et al. (2022) and the demographic documentation of ISSB estates by Ibitoye et al. (2023), without structured pathways for translating findings into capacity-building programmes, demonstration projects, or contractor training, the diffusion of research findings into the wider construction industry remains slow.

This gap mirrors observations in the broader literature on sustainable building material adoption, which emphasizes that technology transfer from research to commercial practice requires deliberate institutional linkages rather than reliance on publication alone (Sonebi et al., 2022).

2.5 Comparative Studies on ISSB and Similar Earth-Based Technologies

Comparative evidence from other developing-country contexts broadly corroborates the pattern of constrained commercialization observed in Nigeria. In Uganda, Nambatya (2015) found that while developers recognized the cost and thermal performance advantages of interlocking stabilized soil blocks, adoption remained concentrated among a small number of donor-supported or self-build projects rather than achieving penetration into the mainstream formal housing market. In Kenya, Sanewu et al.

(2022) similarly reported that despite technical improvements in block stabilization and structural performance, market acceptability lagged behind technical readiness, a finding paralleled in structural studies of interlocking stabilized laterite soil block panels that demonstrated adequate performance for single-storey housing without a corresponding shift in market behaviour (Sanewu, 2020).

Taken together, these comparative studies suggest that the barriers facing ISSB commercialization in Nigeria are not unique to the Nigerian context but reflect a broader pattern in which earth-based building technologies achieve technical and cost validation well ahead of commercial market penetration.

2.6 Gap in Literature

The reviewed literature establishes, with reasonable consistency, that ISSB offers measurable cost and sustainability advantages over conventional sandcrete block construction in Nigeria (Ibitoye et al., 2022) and that its commercial uptake nonetheless remains low even in localities where successful ISSB estates already exist (Ibitoye et al., 2023).

Existing Nigerian studies, however, have tended to examine specific dimensions of this gap in isolation, whether architects' perceptions (Olaleye & Ibitoye, 2023), comparative cost performance (Ibitoye et al., 2022), or demographic patterns of existing ISSB housing stock (Ibitoye et al., 2023), without systematically weighting and ranking the relative significance of the economic, technical, regulatory, and socio-cultural barriers that jointly constrain commercialization across the broader stakeholder base of architects, builders, contractors, material producers, and policymakers.

This study addresses that gap by applying a structured survey and relative importance index ranking across these stakeholder groups in South-West Nigeria, thereby generating an evidence base that prioritizes barriers for policy and practical intervention rather than treating them as an undifferentiated list of constraints.

III. MATERIALS AND METHODS

3.1 Research Design

We adopt a cross-sectional quantitative survey to empirically assess ISSB adoption barriers. The target population comprises stakeholders in Nigeria's construction industry who influence material selection or use: architects, civil engineers, builders/contractors, quantity surveyors, ISSB manufacturers/promoters, building material suppliers, housing/agricultural agencies, and relevant government officials.

Table A1 (Appendix) lists the main categories. A structured questionnaire will be administered (online and face-to-face) to a sample frame of 150–250 respondents, chosen through stratified purposive sampling to ensure representation from Lagos, Ogun, Abuja, and other regions with ISSB activity.

3.2 Questionnaire and Variables

The survey instrument has sections for respondent demographics (age, profession, experience, organization type) and barrier assessment. Barrier items are drawn from the literature review. Each statement is rated on a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree). For example, sample barrier items include:

- "High cost of ISSB press equipment is a major barrier."
- "Lack of technical training on ISSB production hinders adoption."
- "There is insufficient government support or policy for ISSB technology."
- "General public associates ISSB with low-quality housing."
- "Quality/strength of ISSB blocks is inconsistent." These and ~10–15 similar items cover Economic, Technical, Awareness, Institutional, and Cultural factors. (Full item list in Appendix B.)

Variables (for SPSS/Excel) will include: age, gender, professional role, ISSB awareness (yes/no), self-rated knowledge (1–5), and each barrier statement (B1…Bn). Additional variables may capture usage (e.g. "Have you ever specified or used ISSB?").

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3.3 Data Analysis

Descriptive statistics (means, frequencies) will summarize respondent characteristics and average agreement with each barrier. To rank barriers, we will compute the Relative Importance Index (RII) for each item:

$$RII = \frac{\sum_{i=1}^{n} w_i}{A \times N}$$

where "w" _"i" is the weight (1–5) given by respondent "i", "A" is the highest weight (5), and "N" is the total respondents. RII yields a score [0,1] indicating overall importance; items with higher RII rank as more significant barriers.

We will check scale reliability using Cronbach's α for the barrier items. A commonly accepted $\alpha > 0.7$ indicates acceptable internal consistency. If some items reduce α, they may be reviewed or dropped.

Exploratory factor analysis (EFA) will be used to identify underlying constructs (e.g. grouping correlated barriers into "Economic", "Technical", "Social" factors). Factor loadings ≥0.4 will indicate items belonging to a factor. This helps simplify interpretation.

Finally, we may use correlation analysis (Spearman's rho) to explore relationships between factors (e.g. between awareness level and agreement on certain barriers).

All data processing can be done in SPSS, R, or Excel as needed. Summarized results will be reported in tables and narrative form.

3.4 Validity, Pilot Test and Ethics

Content validity is ensured by deriving items from existing literature and prior surveys (e.g. Aghimien et al. 2016, Ibitoye 2026). A pilot test with ~10 professionals can refine clarity. Respondents' consent will be obtained, and data treated confidentially.

3.5 Sample and Stakeholders

Based on construction industry demographics, a total sample of ~200 is anticipated. Stakeholders to target include:

- Architects and planners (key decision-makers in material specification).
- Civil/Structural engineers (concerned with material performance).
- Contractors and builders (end-users of blocks).
- Quantity Surveyors (cost experts, can speak to economics).
- ISSB equipment manufacturers and promoters (product insiders).
- Government/NGO housing officials (policy perspective).
- Academics (for professional awareness).

IV. RESULTS

4.1 Socio-Demographic Characteristics of Respondents

A total of 200 questionnaires were administered to professionals involved in the Nigerian construction industry. Out of these, 185 valid questionnaires were retrieved and analyzed, representing a response rate of 92.5%. The high response rate indicates a satisfactory level of participation and provides confidence in the reliability of the findings.

The respondents comprised architects, builders, engineers, quantity surveyors, ISSB manufacturers, material suppliers, government officials, and other built environment professionals. Architects constituted the largest proportion of respondents (20.5%), closely followed by builders (19.5%).

More than sixty percent (63.8%) possessed over ten years of professional experience, while approximately seventy percent had previously heard about Interlocking Stabilized Soil Block (ISSB) technology. However, only about one-quarter (24.9%) considered their knowledge of ISSB to be good or very good, indicating that awareness does not necessarily translate into technical competence.

Table 1 presents the demographic characteristics of the respondents.

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Table 1: Socio-Demographic Characteristics of Respondents (n = 185)

Variable	Category	Frequency	Percentage (%)
Profession	Architect	38	20.5
	Builder	36	19.5
	Civil Engineer	28	15.1
	ISSB Manufacturer	28	15.1
	Material Supplier	18	9.7
	Quantity Surveyor	16	8.6
	Government/NGO	11	5.9
	Others	10	5.4
Years of Experience	Less than 5 Years	27	14.6
	5–10 Years	40	21.6
	Above 10 Years	118	63.8
Knowledge of ISSB	Very Good	12	6.5
	Good	34	18.4
	Fair	84	45.4
	Poor	55	29.7

The results indicate that although awareness of ISSB technology is relatively widespread among construction professionals, practical knowledge and experience remain limited. This finding suggests that insufficient technical capacity may significantly impede the commercialization of ISSB technology within the Nigerian construction industry.

4.2 Relative Importance Index (RII) Analysis of Commercialization Barriers

The Relative Importance Index (RII) was employed to determine the severity of the identified barriers to ISSB commercialization. The respondents evaluated each barrier using a five-point Likert scale, and the mean score, standard deviation, RII, and ranking were computed.

The findings presented in Table 2 reveal that lack of awareness and inadequate training on ISSB technology emerged as the most significant barrier with a mean score of 4.60 and an RII of 0.92. This indicates that inadequate dissemination of knowledge remains the primary obstacle to market acceptance.

The high cost of ISSB press equipment ranked second (Mean = 4.40; RII = 0.88), highlighting the substantial capital investment required to establish production facilities. Similarly, limited technical skills and shortage of trained operators ranked third (Mean = 4.25; RII = 0.85), demonstrating that the lack of competent personnel continues to constrain commercial production.

Institutional factors also featured prominently. Respondents ranked insufficient government support and policy frameworks fourth (RII = 0.80), emphasizing the absence of standards, incentives, and regulatory backing for ISSB technology. Likewise, negative public perception, where ISSB is often viewed as a low-income housing material, ranked fifth with an RII of 0.79.

Operational issues such as quality inconsistency, market availability, and competition from conventional sandcrete blocks recorded moderate rankings, while labour intensity and regulatory bottlenecks were perceived as comparatively less significant barriers.

Table 2: Relative Importance Index (RII) of Barriers to ISSB Commercialization

S/N	Barrier	Mean	SD	RII	Rank
1	Lack of awareness and training on ISSB technology	4.60	0.56	0.92	1
2	High cost of ISSB press equipment	4.40	0.63	0.88	2
3	Limited technical skills and trained operators	4.25	0.70	0.85	3
4	Insufficient government support and policy	4.00	0.75	0.80	4

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S/N	Barrier	Mean	SD	RII	Rank
5	Negative public perception	3.95	0.77	0.79	5
6	Quality inconsistency of ISSB blocks	3.70	0.80	0.74	6
7	Limited availability of ISSB in the market	3.60	0.82	0.72	7
8	Competition from conventional sandcrete blocks	3.55	0.84	0.71	8
9	Labour intensity and learning curve	3.30	0.89	0.66	9
10	Regulatory bottlenecks	3.10	0.93	0.62	10

Overall, the results suggest that the commercialization of ISSB technology is primarily constrained by inadequate awareness, financial limitations, technical capacity, and weak institutional support rather than by the technical performance of the material itself.

4.3 Reliability Analysis

The internal consistency of the questionnaire was assessed using Cronbach's Alpha. As presented in Table 3, the computed alpha coefficient was 0.860, indicating excellent reliability and confirming that the questionnaire items consistently measured the perceived barriers to ISSB commercialization.

Table 3: Reliability Statistics

Reliability Test	Value
Cronbach's Alpha	0.860
Number of Items	10

Since the reliability coefficient exceeded the recommended threshold of 0.70, the instrument was considered suitable for further statistical analysis.

4.4 Factor Analysis

Factor analysis was conducted to identify the underlying dimensions influencing ISSB commercialization. Prior to extraction, the suitability of the dataset was examined using the Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy and Bartlett's Test of Sphericity.

The KMO value of 0.821 exceeded the recommended minimum value of 0.60, while Bartlett's Test was statistically significant ($p < 0.001$), confirming that the variables possessed sufficient correlations for factor analysis.

Table 4: KMO and Bartlett's Test

Test	Value
Kaiser-Meyer-Olkin (KMO)	0.821
Bartlett's Test χ^2	694.37
Degrees of Freedom	45
Significance (p-value)	0.000

Principal Component Analysis extracted three components with eigenvalues greater than one, accounting for approximately 73.40% of the total variance.

Table 5: Total Variance Explained

Component	Eigenvalue	% Variance	Cumulative %
1	3.48	34.80	34.80
2	2.35	23.50	58.30
3	1.51	15.10	73.40

The rotated component matrix identified three major dimensions of commercialization barriers.

Table 6: Rotated Component Matrix

Barrier	Technical & Economic	Institutional	Social & Market
High equipment cost	0.86		
Technical skills	0.82		
Quality inconsistency	0.75		
Government support		0.84	
Standards and policy		0.81	
Awareness		0.77	
Public			0.84

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Barrier	Technical & Economic	Institutional	Social & Market
perception			
Market availability			0.78
Competition from sandcrete			0.72

The first component was interpreted as Technical and Economic Constraints, the second as Institutional Constraints, and the third as Market and Social Acceptance. These findings demonstrate that ISSB commercialization is a multidimensional issue requiring integrated policy, technical, and market interventions.

4.5 Correlation Analysis

A Spearman's Rank Correlation analysis was conducted to examine the relationship between respondents' knowledge of ISSB technology and their perception of commercialization barriers.

Table 7 indicates a statistically significant negative correlation ($\rho = -0.43$, $p < 0.01$), suggesting that respondents with greater knowledge of ISSB perceived fewer barriers to its commercialization.

Table 7: Spearman's Correlation Analysis

Variables	Spearman's rho	p-value
Knowledge of ISSB vs. Barrier Perception	-0.430	0.001

This finding implies that increasing awareness, technical education, and practical exposure to ISSB technology could substantially reduce perceived barriers and accelerate its commercialization in Nigeria.

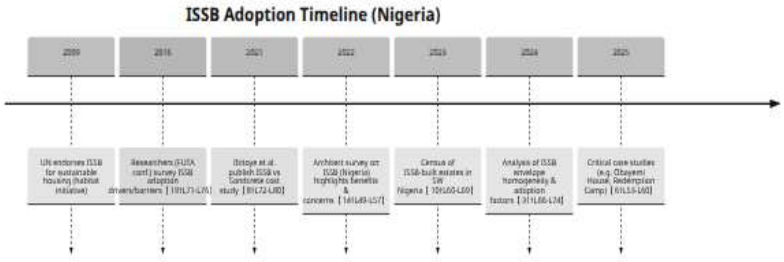

Figure 3: Timeline of key research and events in Nigerian ISSB development. The trend shows rising scholarly focus on ISSB's benefits and barriers (cited where available).

V. DISCUSSION

The findings of this study demonstrate that the commercialization of Interlocking Stabilized Soil Block (ISSB) technology in Nigeria is constrained by a combination of technical, economic, institutional, and socio-cultural barriers.

Although respondents generally acknowledged the environmental and economic advantages of ISSB, the technology has not achieved widespread commercial acceptance within the Nigerian construction industry. This suggests that the slow adoption of ISSB is influenced not only by material performance but also by factors affecting technology diffusion, stakeholder confidence, and market readiness.

The Relative Importance Index (RII) analysis identified lack of awareness and inadequate knowledge of ISSB technology as the most significant barrier to commercialization. This finding indicates that many construction professionals and potential clients remain unfamiliar with the production processes, structural performance,

environmental benefits, and economic advantages of ISSB.

Similar observations were reported by Ibitoye (2025), who found that although ISSB possesses significant sustainability advantages, limited awareness among professionals and end users continues to restrict its practical application in residential construction.

Likewise, Ibitoye, Oyewole and Babamboni (2023) observed that awareness of ISSB housing estates in Southwestern Nigeria remains relatively low despite the growing number of completed projects, emphasizing that improved public education is essential for wider acceptance.

These findings further support the observations of Olaleye et al. (2023), who concluded that architects recognize the technical advantages of ISSB but require greater empirical evidence and exposure before routinely specifying the material for housing projects.

The high cost of ISSB block press equipment emerged as the second most significant commercialization barrier.

Although ISSB construction generally reduces mortar consumption and overall material costs, respondents emphasized that the capital required to acquire block-making equipment discourages entrepreneurs and small-scale developers from investing in the technology.

This finding agrees with Ibitoye and Dare-Abel (2022), who reported that while ISSB provides significant cost advantages over conventional masonry systems, the initial investment required for production equipment remains a major obstacle to widespread commercialization.

Similarly, Aghimien et al. (2016) identified equipment cost, limited access to finance, and inadequate production facilities as critical barriers to the adoption of compressed earth technologies in Nigeria.

These findings suggest that commercialization policies should extend beyond promoting ISSB as an affordable material to include financial support mechanisms such as equipment subsidies, low-interest credit facilities, cooperative production centres, and incentives for local fabrication of block presses.

Another major challenge identified by respondents was the limited availability of skilled personnel and technical expertise required for ISSB production and construction.

The successful production of ISSB depends on proper soil selection, stabilization ratios, compaction techniques, curing procedures, and quality control practices. Deficiencies in these processes frequently result in inconsistent block quality, reinforcing negative perceptions regarding the structural reliability of earth-based construction materials.

This finding corroborates Ibitoye (2025), whose evaluation of the Obayemi House project emphasized that the performance of ISSB structures depends largely on adherence to proper production procedures and skilled workmanship.

Similarly, the study on the thermal performance of ISSB by Ibitoye and Tolu-Alalade (2026) highlighted that the technical advantages of ISSB can only be fully realized when production standards and construction practices are properly implemented.

These findings underscore the need for structured vocational training, curriculum integration within tertiary institutions, and continuous professional development programmes for architects, builders, engineers, and contractors.

Institutional barriers also featured prominently among the identified commercialization constraints. Respondents ranked insufficient government support, weak policy implementation, and the absence of national standards among the most significant obstacles affecting ISSB adoption.

The absence of regulatory incentives, certification frameworks, and inclusion of ISSB within public housing programmes discourages private investment and limits confidence among developers.

Similar conclusions were reached by Ibitoye et al. (2026), who demonstrated that psychological and institutional barriers—including inadequate policy support, weak stakeholder confidence, and poor institutional awareness—significantly impede ISSB adoption in Nigeria.

Furthermore, Ibitoye and Tolu-Alalade (2026) emphasized that sustainable construction technologies require coordinated institutional support if they are to move beyond isolated demonstration projects into mainstream construction practice.

These findings indicate that government agencies, professional regulatory bodies, and standards organizations have critical roles to play in promoting ISSB commercialization through policy reforms, financial incentives, certification systems, and procurement guidelines.

The study further identified negative public perception as an important socio-cultural barrier to commercialization. Despite increasing evidence supporting the structural integrity, thermal performance, environmental sustainability, and cost-effectiveness of ISSB, many prospective homeowners continue to associate earth-based construction with poverty, temporary housing, and inferior building quality.

This perception remains one of the greatest challenges confronting sustainable indigenous building materials in Nigeria. Ibitoye (2025) similarly observed that although occupants appreciated the thermal comfort, affordability, and environmental benefits of ISSB buildings, concerns regarding aesthetics, moisture resistance, and public acceptance continued to influence adoption decisions.

Interestingly, studies investigating ISSB performance have consistently demonstrated positive outcomes relating to occupant comfort, indoor environmental quality, and construction efficiency, suggesting that the persistence of negative perceptions is largely psychological rather than technical.

The factor analysis conducted in this study further demonstrated that commercialization barriers are multidimensional, comprising technical and economic constraints, institutional limitations, and market and social acceptance issues.

These dimensions are consistent with the principles of the Diffusion of Innovation Theory, which argues that the adoption of new technologies depends on perceived relative advantage, compatibility, complexity, trialability, and observability.

Although ISSB clearly demonstrates relative advantages in affordability, sustainability, thermal performance, and environmental conservation, deficiencies in awareness, institutional support, technical capacity, and market confidence reduce its rate of diffusion throughout the Nigerian construction industry.

Similar conclusions were reached by Ibitoye et al. (2026), who argued that improving stakeholder confidence and strengthening institutional support are fundamental requirements for accelerating ISSB commercialization.

Overall, the findings indicate that the commercialization of ISSB technology requires a coordinated and multi-sectoral strategy involving government institutions, professional bodies, academic institutions, manufacturers, and private investors.

Improving stakeholder awareness through continuous professional education, strengthening technical training programmes, reducing equipment acquisition costs through financial incentives, establishing comprehensive national standards, and implementing demonstration housing projects would significantly enhance market confidence and encourage wider adoption.

Such interventions would not only facilitate the commercialization of ISSB technology but also contribute to sustainable construction practices, affordable housing delivery, environmental conservation, and the achievement of Nigeria's sustainable development objectives.

VI. CONCLUSION

This study examined the barriers to the commercialization of Interlocking Stabilized Soil Block (ISSB) technology within Nigeria's construction industry by evaluating the perceptions of construction professionals and other key stakeholders.

The findings reveal that despite the well-documented environmental, economic, and thermal performance benefits of ISSB technology, its commercialization remains constrained by a combination of technical, economic, institutional, and socio-cultural factors.

The Relative Importance Index (RII) analysis identified inadequate awareness and limited knowledge of ISSB technology as the most significant barrier, followed by the high cost of block press equipment, shortage of skilled personnel, inadequate government support, and negative public perception of earth-based construction materials.

These findings suggest that the slow diffusion of ISSB technology is influenced less by its technical performance and more by deficiencies in information dissemination, institutional support, financing mechanisms, and market confidence.

The reliability and factor analyse further demonstrated that the identified barriers are multidimensional and interrelated. Three major constructs—technical and economic constraints, institutional barriers, and market and social acceptance—were found to collectively influence the commercialization process.

Consequently, addressing only one category of barriers is unlikely to achieve widespread adoption. Instead, a coordinated approach involving government agencies, professional institutions, private investors, educational institutions, and construction practitioners is required to create an enabling environment for ISSB commercialization.

The findings also reinforce previous studies by Obafemi A. Ibitoye and other scholars, which consistently identify inadequate awareness, weak policy implementation, limited technical capacity, and insufficient market support as the principal constraints limiting ISSB adoption in Nigeria.

This study extends existing knowledge by integrating these barriers into a comprehensive commercialization framework and demonstrating how they collectively influence stakeholders' willingness to adopt sustainable construction technologies.

From a practical perspective, the study provides evidence that can assist policymakers, construction professionals, investors, and housing developers in designing strategies that promote wider utilization of ISSB technology.

Establishing national quality standards, strengthening professional training programmes, providing financial incentives for ISSB manufacturers, supporting local equipment production, and implementing nationwide awareness campaigns are likely to improve industry confidence and increase commercial investment in ISSB production.

Although this study contributes significantly to the understanding of ISSB commercialization in Nigeria, it is limited by its reliance on questionnaire-based responses obtained from selected construction professionals and stakeholders.

Future studies should incorporate larger nationwide samples, longitudinal analyses, economic feasibility assessments, and real-life case studies of completed ISSB projects to provide stronger empirical evidence on the long-term commercial viability and performance of the technology.

In conclusion, the commercialization of Interlocking Stabilized Soil Block technology represents a viable pathway towards achieving sustainable construction, affordable housing delivery, and environmental conservation in Nigeria.

However, realizing this potential requires deliberate efforts to improve stakeholder awareness, strengthen institutional support, enhance technical capacity, and create favourable economic and regulatory conditions that encourage investment and widespread adoption across the construction industry.

REFERENCES

[1] Aghimien, D. O., Makanjuola, S., & Fadeke, T. (2016). Drivers and barriers of compressed stabilized interlocking earth blocks for building construction in Nigeria. In Proceedings of the Joint International Conference on Human Habitat (FUTA, Nigeria).

[2] Akur, J., et al. (2012). Issues and challenges in the use of compressed stabilized earth blocks in Uganda. Building Research & Information, 40(4), 442–458.

[3] Aliyu, A., & Bello, J. (2020). Sustainable building materials: A review of ISSB and alternatives. Journal of Architectural Engineering & Technology, 9(3), 1–8.

[4] Allwood, J. M., et al. (2019). Sustainable construction materials. Cambridge University Press.

[5] Bala, K. A., & Patanakar, B. (2022). Green construction materials for low-income housing in Nigeria: Prospects and challenges. In ACASH Conference Proceedings.

[6] Ibitoye, O. A. (2025). A critical analysis of interlocking stabilized soil blocks (ISSB) in residential architecture: A case study of Obayemi House, Redemption Camp, Ogun State. International Journal of Multidisciplinary Research and Growth Evaluation, 6(3), 562–569.

[7] Ibitoye, O. A., Abiola, O. A., & Babamboni, A. S. (2023). Demographic characteristics of housing estates developed with ISSB technology in selected Southwestern Nigerian (SWN) cities. FUDMA Journal of Sciences, 7(2), 275–283. https://doi.org/10.33003/fjs-2023-0702-2038

[8] Ibitoye, O. A., Alagbe, O., & Dare-Abel, O. (2022). Comparative cost advantages of interlocking stabilized soil block and sandcrete block for building construction in South-West Nigeria. International Journal of Scientific Research and Engineering Development, 5(5), 549–558.

[9] Ibitoye, O. A., & Dare-Abel, O. (2022). Assessment of interlocking stabilized soil blocks (ISSBs) as panacea for sustainable housing projects in Nigeria. In Proceedings of the Caleb University Disruptive Innovation Conference.

[10] Ibitoye, O. A., Ogunleye, G. O., Owolabi, T. O. S., Babamboni, A. S., & Afolabi, T. (2026). Beyond affordability: A statistical analysis of psychological and institutional barriers to ISSB adoption in Nigeria's construction industry. International Journal of Spectrum Research, 2(1), 50–59.

[11] Ibitoye, O. A., & Tolu-Alalade, J. O. (2026). Thermal performance of interlocking stabilised soil blocks (ISSB) for passive and sustainable building design. Asian Journal of Geographical Research, 9(2), 54–63.

[12] Ibitoye, O. A., Alagbe, O., Olatunde, A., et al. (2024). The homogeneity of ISSB building envelopes towards promoting widespread adoption for sustainable housing projects in sub-Saharan African cities. In Proceedings of the Caleb University Conference on Disruptive Innovation and Creativity.

[13] Obeta, I. C., & Olatunji, O. (2016). Promoting alternative building technology for sustainable housing in Nigeria. Engineering, Construction and Architectural Management, 23(4), 456–472.

[14] Olaleye, A. A., & Ibitoye, O. A. (2023). Architect's response on utilisation of interlocking stabilised soil blocks as an alternative building material for housing projects in Southwest Nigeria. FUDMA Journal of Sciences, 6(5), 198–202. https://doi.org/10.33003/fjs-2022-0605-1191

[15] Omoregie, A. D., Alabi, A. O., & Imuetinyan, A. E. (2016). Providing sustainability in educational buildings through the use of compressed stabilized interlocking earth blocks. Journal of Construction Engineering, Technology and Management, 6(2), 130–140.

[16] Oyebamiji, I. O., & Afolami, A. J. (2017). Thermal comfort in housing with laterite interlocking blocks in Nigeria. FUTY Journal of the Environment, 11(1), 120–135.

[17] Rogers, E. M. (2003). Diffusion of innovations (5th ed.). Free Press.

[18] Sanewu, I. F. (2020). Structural response of interlocking stabilized laterite soil block panels

for single-storey housing [Doctoral dissertation, JKUAT-COETEC].

[19] Sanewu, I. F., Kaluli, J. W., Ngunjiri, L. M., & Kinuthia, J. (2022). Acceptability of interlocking soil block technology in Kenya's construction industry. In Proceedings of the Sustainable Research and Innovation Conference, 257–261.

[20] Sonebi, M., Abdalqader, A., Amziane, S., Dvorkin, L., Ghorbel, E., Kenai, S., Khatib, J., Lushnikova, N., & Perrot, A. (2022). Trends and opportunities of using local sustainable building materials in the Middle East and North Africa region. RILEM Technical Letters, 7, 127–138.

[21] Uduma, O., et al. (2022). Comparative life-cycle cost analysis of ISSB vs. sandcrete in Southwest Nigeria. International Journal of Research and Project Publications, 7(3).

[22] United Nations High Commissioner for Refugees. (2023). Sustainable construction techniques: Use of interlocking stabilized soil blocks.

[23] UN-Habitat. (2009). Interlocking stabilized soil blocks: Appropriate earth technologies in Uganda.