

Stabilized Earth Blocks in Northern Nigeria: An Architectural Inquiry into Culturally Responsive Housing and the Vernacular-Mainstream Gap

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Abstract - Nigeria has a serious housing shortfall, with government estimates ranging from 14.9 to 15.2 million units as of 2025/2026, and other stakeholders reporting amounts as high as 22 million. The building sector's large contribution to national CO₂ emissions, along with rising prices, makes the issue even more difficult. This research uses a qualitative discourse analysis of policy papers, professional literature, and architectural records to investigate how regulatory, perceptual, and capacity constraints contribute to the marginalisation of Compressed Stabilised Earth Blocks (CSEBs) in Northern Nigeria. The study introduces the concept of the "vernacular-mainstream gap" a systemic separation between indigenous building knowledge and formal construction practice. It proposes a recursive causal model: regulatory exclusion professional ignorance risk aversion symbolic devaluation of earth no policy demand code remains unchanged. The findings show that CSEBs are still excluded from precise specifications in the National Building Code (2006, the current version), are linked with backwardness in professional discourse, and are mainly absent from educational courses. The discussion of counter-evidence on CSEB durability constraints is open and transparent. The article reframes cultural responsiveness as a design process rather than a material quality, suggesting that CSEBs can only provide culturally suitable housing when paired with vernacular spatial conventions like the zaure and courtyard seclusion. The suggested framework integrates regulatory reform, educational transformation, demonstration projects, post-occupancy evaluation, and community-engaged design onto the recursive model. Future research should include a testable directed hypothesis. The article suggests that institutional transformation, not merely technical advocacy, is crucial to bridge the vernacular-mainstream gap.

Keywords: Compressed Stabilized Earth Blocks, Northern Nigeria, vernacular architecture, culturally responsive housing, discourse analysis, recursive causal model.

I. INTRODUCTION

Nigeria is facing a prolonged housing problem that has withstood decades of governmental initiatives. Official figures place the national housing deficit at 14.9-15.2 million units in 2025/2026, with some stakeholders estimating up to 22 million due to rapid population growth projected to reach 400 million by 2050 (Federal Ministry of Housing and Urban Development, 2023). This gap is more than just a numerical shortage; it reflects millions of Nigerian families that live in insufficient shelter, such as overcrowded rooms, informal settlements without essential amenities, or structurally hazardous homes. The disparity between housing supply and demand worsens each year, with formal sector delivery producing fewer than 100,000 units per year despite a roughly 5 million population rise.

Simultaneously, the building sector, which is largely reliant on imported cement and steel, contributes considerably to national carbon emissions, with cement manufacturing continuing a major industrial source (Labaran, *et al.*, 2024; Quintessence Environmental Consult, 2025). These data are based on several techniques and should be considered suggestive rather than accurate; yet, the crisis's trajectory is clear. Nigeria's building materials supply chain is nearly totally reliant on imported energy-intensive items, leaving the economy vulnerable to currency fluctuations and trade interruptions. This reliance imposes unsustainable social, economic, and environmental consequences.

These issues collide with Northern Nigeria's unique cultural and climatic setting. The region includes the Guinea Savannah and Sahelian zones, which are characterised by extreme temperature variations - often exceeding 35°C during the day and dropping below 20°C at night a prolonged dry season lasting six to eight months, and advancing desertification that claims an estimated 350,000 hectares of land each year. These conditions need the development of architectural solutions that give thermal comfort without the use of mechanical cooling, as air conditioning remains costly

for the majority of homes and puts extra load on an already weak energy system.

Furthermore, cultural traditions in Hausa, Fulani, Kanuri, Nupe, and other groups necessitate spatial configurations that support extended family structures, gender segregation, hospitality norms, and religious observances (Isah, 2016; Schwerdtfeger, 1982). In Hausa society, the 'gida' (compound) is organised around a series of graded spaces, including the 'zaure' (public reception area) at the entrance, semi-private spaces for male visitors ('soro' or 'dakuna'), and increasingly private domains for women and family activities in the inner courtyards ('shigifa' or 'tsakargida'). This spatial hierarchy encodes and reinforces social institutions, religious beliefs, and everyday behaviours. A house without spatial divisions is not only uncomfortable, but also culturally incorrect, requiring tenants to forgo customary activities or undergo costly and structurally damaging post-occupancy changes.

Vernacular architecture met these requirements through sophisticated earth-based construction systems such as 'tubali' (sun-dried bricks), 'jankasa' (lateritic soil) walling, and climate-responsive strategies such as thermal mass, natural ventilation, and spatial hierarchy (Moughtin, 1985; Dmochowski, 1990). Thick earth walls offer thermal lag, which reduces indoor temperature changes by 4-6°C as compared to sandcrete block walls. Carefully orientated apertures capture prevailing breezes, and stepped parapets ('harji') keep rain out while enabling hot air to escape. These are not primitive practices, but perfected technology evolved over centuries of testing and adaptation. Scholars of African vernacular architecture, such as Denyer (1978), Moughtin, (1985) Umar, *et al.*, (2019), and Prussin (1986), have extensively documented the richness of Hausa and Sudanese-style building practices, demonstrating sophisticated environmental and cultural logic.

However, current housing supply in Northern Nigeria often ignores traditional wisdom. Concrete block construction is commonly used in public housing, post-disaster reconstruction, and private real estate developments. However, this material is energy-intensive, thermally inappropriate, and culturally disconnected from residents' spatial needs (Isah, 2016; Adamu, 2024). The end consequence is a housing system that is both environmentally unsustainable and socially incongruent. Residents of government estates frequently construct unauthorised additions, block off areas, and put 'zaure' buildings in front of their units, resulting in changes that occasionally jeopardise structural safety and invariably signal design failure.

Despite rising global awareness of compressed stabilised earth blocks (CSEBs), which offer embodied energy savings of 40-60% compared to burnt bricks and sandcrete blocks (Morel *et al.*, 2001; Reddy & Jagadish, 2003), their usage in Nigeria remains low. A careful analysis of the literature finds three interconnected deficiencies that explain the ongoing marginalisation.

II. LITERATURE REVIEW

The Nigerian National Building Code (Federal Republic of Nigeria, 2006), which remains in effect since no comprehensive modification has been enacted, does not provide explicit standards for stabilised earth blocks. Section 6.4.2 mentions "sun-dried earth bricks" but does not provide recommendations on stabilisation, compression, testing, or quality assurance. Sandcrete blocks, on the other hand, are subject to several clauses that stipulate mix amounts, curing times, and minimum compressive strength. This is not a technical oversight. The Nigerian Building and Road Research Institute (NBRI) has released significant technical research on CSEBs, including soil compatibility maps, appropriate cement stabilisation ratios (6-8% by weight), and compressive strength data (2.67-4.42 N/mm², suitable for load-bearing walls). However, these conclusions have never been converted into code provisions. According to Adibe (2024), "since these materials are unregulated, they exist outside the official system." Without code recognition, structural engineers, building control authorities, and insurance providers cannot safely define or approve earth-based designs. The regulatory gap serves as a barrier, barring earth materials from the official building sector not due to technological insufficiency, but due to institutional inertia and a lack of defined norms. A decolonial interpretation (Santos, 2014) attributes this silence to colonial legal frameworks that recognised only "modern" (European) construction processes, thereby delegitimising indigenous knowledge.

According to Abubakar (2020) and Obaje *et al.* (2022), earth building is associated with poverty, rural backwardness, and devalued "traditional" activities in postcolonial Nigeria. In contrast, concrete is associated with modernism, development, and social position. This hierarchy is more than just a public prejudice; it is ingrained in professional discourse. The majority of architectural magazines and competition applications depict concrete, glass, and steel constructions. When earth structures are showcased, they are labelled as "sustainable," "vernacular," or "heritage," which implies that they are outside the mainstream of professional architectural practice. Adamu (2024) connects the perceptual hierarchy back to colonial modernity, when corrugated iron and concrete were introduced as emblems of civilisation. Santos (2014) refers to the devaluing of indigenous construction knowledge

as "epistemic violence," leaving a profound impact. The theoretical framework for this perceptual hierarchy is based not only on Bourdieu (1977) and de Sousa Santos (2014), but also on Rapoport (1969), who first articulated the cultural basis of architectural form, and Tzonis and Lefaivre (1981), whose concept of critical regionalism, while focusing on aesthetic resistance, provides a complementary lens for understanding how vernacular knowledge is marginalised. This symbolic load is so strong that even when inhabitants recognise the thermal comfort of earth building, they prioritise the social prestige provided by concrete.

In Nigeria, built environment education prioritises concrete, steel, and foreign technology above earth building (Labaran, *et al*, 2024; Akindele *et al.*, 2023; Adewole, 2024). An examination of architecture programs at four Nigerian universities revealed that earth building is often limited to a single module in architectural history, with no specific training in soil mechanics, CSEB manufacture, or structural design utilising earth materials. Professional accreditation criteria do not necessitate expertise in earth building, allowing registered architects and engineers to practise without understanding of the material. As a result, architects, engineers, and builders graduate without the ability to define, plan, or oversee earth building. The capacity gap extends to the informal sector, where traditional craftspeople have generational expertise of mud brick but lack training in stabilised earth technology, quality control, and contemporary building techniques. The NBRRI holds periodic workshops, although they reach less than 200 craftsmen each year, a drop in the ocean considering the magnitude of the housing shortfall.

This research defines the 'vernacular-mainstream gap', a structural divide between indigenous building knowledge and formal construction practices. The vernacular-mainstream gap differs from other concepts such as critical regionalism (Frampton, 1983) and vernacular modernity (Vellinga, 2014). It focuses on institutional mechanisms of exclusion, such as building codes, professional accreditation, and educational curricula that make indigenous knowledge invisible. The divide is not accidental; it is created and maintained via everyday actions such as legislation, education, and professional socialisation.

Based on a synthesis of the three gaps, this paper proposes a recursive causal model:

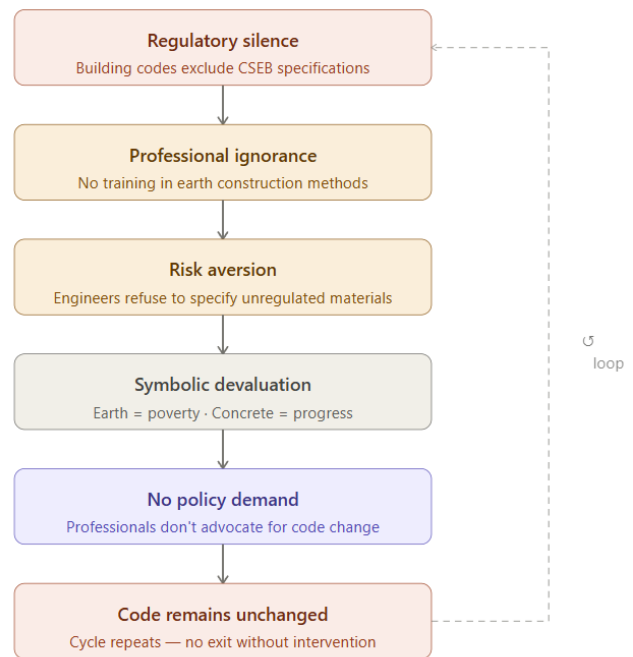


Figure 1: Recursive Causal Model of the Vernacular-Mainstream Gap

This model has two key features. The system is recursive, meaning that each element strengthens the previous one, resulting in a self-perpetuating loop. Regulatory quiet breeds professional ignorance; ignorance breeds risk aversion; risk aversion promotes symbolic devaluation; devaluation breeds no policy demand; and the lack of demand keeps the code intact, resulting in regulatory silence. Second, the model does not have a single root cause; action at any stage has the potential to disrupt the cycle, but individual efforts are unlikely to work without addressing the others. Improving training without code change prevents professionals from specifying CSEBs. Building demonstration projects without post-occupancy evaluation does not provide evidence for code changes. Advocating for code reform without changing professional views will face pushback. The concept suggests a coordinated, multi-pronged effort. To address methodological limits, this work focuses on professional and policy discourse. It does not make the claim of directly capturing lay perceptions.

III. METHODS

3.1 Research Design: Qualitative Discourse Analysis

This study uses a qualitative discourse analysis technique (Fairclough, 2003) rather than a generic document analysis. This research, like Bowen (2009) and Braun & Clarke (2006), provides basic recommendations on qualitative document analysis. Discourse analysis is suitable since the study concerns are about how texts form reality, specifically how construction rules, professional journals, and project

descriptions create and replicate the exclusion of earth elements. Unlike content analysis, which counts the frequency of keywords or topics, discourse analysis looks at absences, silences, implicit hierarchies, and assumptions that shape what may be said and thought about CSEBs in Northern Nigeria. This method is especially useful for identifying the "vernacular mainstream gap" since it is supported not only by what is clearly stated but also by what is omitted, such as the lack of CSEB standards in the National Building Code despite substantial technical study.

There were no main data gathering efforts (interviews, focus groups, or fieldwork). This is a purposeful scope limitation: the study focuses on representations of CSEBs in professional and policy discourse rather than laypeople's practical behaviours or views. The research topics influenced the decision to limit the study to documentary sources, which

focus on institutional and discursive systems rather than individual experiences or actions. Future study should supplement this discourse analysis with primary qualitative data.

3.2 Document Selection

Purposive sampling was utilised to choose texts from three different discursive domains: regulatory discourse, professional discourse, and architectural discourse. The sampling criteria were as follows: (a) relevance to earth construction or CSEBs in Nigeria; (b) authority or influence in the Nigerian built environment sector; and (c) public availability. Documents were omitted if they were unpublished, lacked obvious authorship, or were on earth building outside of Nigeria and had no comparative significance.

The final corpus included around 47 documents, distributed as follows:

Domain	Document Types	Key Sources
Regulatory discourse	Building codes, NBRI technical briefs, housing policy documents	National Building Code (2006), NBRI (2022), Federal Ministry of Housing (2023).
Professional discourse	Peer-reviewed journal articles, professional magazines, position papers	Obaje et al. (2022); Abubakar (2020); Ajayi, et al., (2023)
Architectural discourse	Project descriptions, award submissions, media coverage, competition entries	

The time period covered 1985-2025 to include both historical foundations (e.g., Moughtin, 1985; Dmochowski, 1990) and present advancements (e.g., Sabon Gida, 2024). This longitudinal coverage permits the examination of continuity and change in the discourse around earth building.

3.3 Analytical Procedure

Thematic analysis (Braun & Clarke, 2006) was carried out using NVivo 14 qualitative data analysis software. Coding took three rounds. First, open coding detected all mentions of earth construction, CSEBs, regulation, perception, capability, and hurdles or enablers. Second, axial coding divided codes into three theme families (regulatory, perceptual, and capability), as well as a fourth family for navigation methods (recorded attempts to overcome hurdles). Third, selective coding revealed three discursive mechanisms: silence (a lack of specificity), symbolic antagonism (concrete vs. earth), and curricular absence (removal from instructional resources). Throughout the coding process, memos were created to track interpretative judgements and trace code linkages. An audit

trail was kept to guarantee openness and reproducibility. Fairclough (2003) used discourse analysis tools to investigate how language produces hierarchies. (a) vocabulary choices (e.g., "modern" concrete vs. "traditional" earth); (b) grammatical structures (e.g., passive voice that obscures agency in code omission); and (c) intertextuality (how documents relate to or disregard one another).

3.4 Limitations Acknowledged

The most significant limitations are: inability to capture lived experience or real-time professional decision making; reliance on secondary citations for perceptual claims; lack of post-occupancy data for the Sabon Gida project; and lack of primary data on the political economy of cement industry influence. The study makes no claims about its generalisability outside the discursive realm under consideration. Rather, it seeks to give a comprehensive diagnostic study of the institutional and discursive mechanisms that maintain the vernacular mainstream divide, resulting in viable hypotheses for future empirical research.

IV. RESULTS

4.1 Regulatory Silence: The First Link in the Cycle

The National Building Code effectively silences CSEBs by absence rather than outright ban - a discursive technique that triggers the looping cycle. The National Building Code (Federal Republic of Nigeria, 2006) makes a brief mention of "sun dried earth bricks" in Section 6.4.2, however there are no criteria for stabilisation, compression, testing, or quality assurance. Sandcrete blocks have specific specifications for mix proportions (Section 6.4.1), a minimum compressive strength of 2.5 N/mm², and curing. NBRRI (2022) released detailed technical study on CSEBs, including soil suitability maps for all 19 Northern Nigerian states, appropriate cement stabilisation ratios (6-8% by weight), and compressive strength data demonstrating CSEBs reach 2.67-4.42 N/mm², above the sandcrete minimum. Nonetheless, the Code has never implemented these conclusions. According to Adibe (2024), "since these materials are unregulated, they exist outside the official system."

The Code, which was last amended in 2006, remains in effect. Its drafting group, which comprised cement industry representatives and international experts, had no mandate to evaluate indigenous resources. A decolonial interpretation (Santos, 2014) attributes this silence to colonial legal frameworks that recognised only "modern" (European) construction methods. The lack of CSEB requirements is not a technological fault, but rather an institutional failure to transfer research into regulations. Regulatory silence serves as a barrier, making CSEBs inaccessible to structural engineers, insurers, and financiers. Without code recognition, experts cannot safely define CSEBs; building control authorities cannot accept earth-based designs; and insurance companies cannot insure earth construction. This silence represents the initial link in the recurrent loop.

4.2 Perceptual Hierarchies: The Symbolic Engine

Professional and media discourse creates a dichotomy between concrete (modern, progressive) and earth (traditional, impoverished) - the symbolic engine that drives the cycle. According to Abubakar (2020, p. 123), "Nigeria continues to face severe difficulties with views and attitudes toward earth construction." In professional publications, earth initiatives are labelled as "sustainable" or "vernacular," which implies that they are beyond the norm. An examination of project descriptions in architectural media (MOE+ Art Architecture, 2023) reveals that earth projects are typically accompanied by arguments for sustainability or cultural heritage, whereas concrete structures are portrayed as neutral, contemporary, and progressive. Isah (2016) recounts how inhabitants of Northern Nigeria's public housing complexes methodically remodel

concrete dwellings to integrate indigenous spatial features such as zaure and courtyard enclosures, although they rarely utilise earth as a building material, equating it with failure and poverty.

Adamu (2024) attributes this order to the colonial use of corrugated iron and concrete as emblems of "civilisation." In postcolonial Nigeria, concrete has become a symbol of achievement. To construct with dirt indicates poverty or an unwillingness to "modernise." This is epistemic aggression (Santos, 2014), the systematic devaluing of non-Western knowledge. The perceptual barrier concerns symbolic capital (Bourdieu, 1977), not thermal performance or endurance. Concrete provides status, whereas earth threatens status. This hierarchy establishes the "no policy demand" link in the cycle: experts who see the world as backward will not push for code reform.

4.3 Capacity Constraints: Curricular Absence

Built environment curriculum routinely neglect earth construction, resulting in professional ignorance - a critical connection that maintains risk aversion. Labaran, *et al.*, (2024) studied curriculum from four Nigerian institutions and discovered that earth construction is often taught as a single module in architectural history, with no teaching in soil physics, CSEB manufacture, or structural design. Professional accreditation (Ajayi, *et al.*, 2023) does not need proficiency in earth construction. Akindele *et al.*, (2023) and Adewole, (2024), Akindele *et al.*, (2023) and Adewole, (2024), describe a pervasive lack of training among construction professionals, with 78% claiming no formal training in stabilised earth procedures. NBRRI workshops reach less than 200 artists each year (Quintessence Environmental Consult, 2025).

The capacity gap acts on two levels. At the professional level, ignorance promotes risk aversion: engineers cannot describe what they do not know. Traditional builders at the artisan level have generational expertise of mud brick but have not received instruction in CSEB quality control, stabiliser mixing, or compression machine operating. Curricular absence causes risk aversion; engineers refuse to define CSEBs because they are sceptical about the material. This completes the cycle: ignorance leads to risk aversion, no demand, and the code remains unmodified.

4.4 Counter Evidence: Acknowledging CSEB Limitations

To give a balanced perspective, CSEBs must disclose true technological constraints. According to NBRRI technical reports (Nigerian Building and Road Research Institute, 2019) and field observations, improperly cured CSEBs can suffer from erosion if stabiliser content is less than 6% or if blocks are not protected during curing; termite infestation in areas

with high termite activity (though this also affects timber framing); lower tensile strength compared to concrete, requiring reinforced ring beams for two-story construction; and labour intensity, CSEB production. Technical handbooks on earth construction (Houben & Guillaud, 1994; Rigassi, 1985) reveal that these limits are widely recognised and may be addressed with suitable stabiliser selection, compaction pressure, and curing methods, as discussed by Walker (2004) and Walker & Stace (1997).

These limits are not lethal. Proper training, stabiliser optimisation, and hybrid construction can all help to overcome these issues. Section 5's architecture clearly tackles these constraints through capacity building and quality control processes.

4.5 Navigating the Gap: Documented Initiatives as Proofs of Concept

The Sabon Gida project (Azure, 2024) and G.A.S. Farm House (MOE+ Art Architecture, 2023) show that bridging the gap is conceivable, although the evidence is confined to proofs of concept. Sabon Gida's CSEB L-shaped modules include a zaure, private courtyards, and gradual enlargement. The design strongly references Hausa spatial typologies and trains local communities in CSEB manufacture. G.A.S. Farm House uses 40,000 earth bricks from dug dirt, resulting in a contemporary aesthetic that challenges the notion of earth as "rustic."

Neither project has produced post-occupancy statistics. Sabon Gida is a competition entry, and its building status is uncertain. The report regards these as proof-of-concept rather than reviewed evidence of long-term efficacy. These efforts demonstrate that culturally responsive design using CSEBs is achievable. However, the absence of post-occupancy review is indicative of the vernacular mainstream divide.

4.6 Resolving the Contradiction: Cultural Responsiveness as Process

The study views cultural responsiveness as a design process rather than a material quality. Isah (2016) demonstrates that concrete dwellings may be culturally relevant by including zaure placement, courtyard seclusion, and proper visitor circulation. An earth home, on the other hand, may be culturally unsuitable if it imposes alien spatial order (for example, open plan Western design).

CSEBs allow for culturally responsive housing when paired with vernacular spatial rules, but they do not ensure it. The article switches its focus from material advocacy to process advocacy, which includes participatory design, community participation, and spatial grammar.

V. DISCUSSION

Discussion: Breaking the Recursive Cycle

5.1 How the Recursive Model Explains Persistent Marginalization

The data support each connection in the recursive model. Regulatory silence (3.1) precludes professional interaction by excluding CSEBs from the legal technical framework that controls construction. Without code recognition, structural engineers cannot verify CSEB designs, building control authorities cannot provide permissions, and insurers cannot insure earth buildings. This is not a mere nuisance; it is a structural exclusion that restricts all formal building to sandcrete and concrete.

Perceptual hierarchies (3.2) maintain symbolic devaluation. Every day, professional discourse, architectural media, and public discussion reinforce the binary conflict between "modern" concrete and "backward" earth. This hierarchy is so firmly ingrained that even specialists who recognise the thermal and environmental benefits of earth building continue to specify concrete because customers want the status symbol of a concrete house. The symbolic value of concrete transcends its technical performance.

Capacity gaps (3.3) result in ignorance and risk aversion. Architects and engineers graduate without ever having developed an earthen structure. They have never evaluated soil for CSEB compatibility, determined stabiliser ratios, or designed a reinforced ring beam for an earth wall. This ignorance is not due to personal failure, but rather to a lack of teaching these skills in the curriculum. As a result, when a customer asks about earth building, the professional responds with "it is not safe" or "it is not modern" - not because they have proof, but because they lack expertise.

Counter-evidence (3.4) demonstrates that CSEB restrictions, although genuine, are controllable. Erosion, termites, tensile weakness, and labour intensity may all be mitigated using appropriate stabiliser ratios (6-8% cement), termite treatment, reinforced ring beams, and training programs. These are technical challenges that require engineering solutions. The fact that they continue to be hurdles is not a technological failing, but rather an institutional one: without code recognition, no one invests in fixing them on a large scale.

The model describes why standalone treatments fail. The NBRRI has conducted good technical research, but without code change, such research sits on shelves. Donors have supported experimental programs, but without POE and policy advocacy, they will remain isolated displays. Individual

architects have created wonderful earth structures, but without professional instruction and perceptual shifts, they will remain outliers. The cycle necessitates simultaneous intervention at numerous links.

5.2 Mapping Interventions onto the Model

To disrupt the loop, interventions must focus on particular relationships. The suggested structure (section 5) assigns each component to a link in the model, as seen in Table 1.

Table 1: Mapping Interventions to Model Links

<i>Model Link</i>	<i>Intervention</i>	<i>Framework Component</i>
<i>Regulatory silence</i>	Explicit code specifications for CSEBs + spatial requirements	Regulatory reform (5.1)
<i>Professional ignorance</i>	Curriculum revision, mandatory CPD	Educational reform (5.2)
<i>Risk aversion</i>	Published POE data from demonstration projects	Demonstration projects with POE (5.3)
<i>Symbolic devaluation</i>	High-visibility projects + community ownership	Community-engaged design (5.4)
<i>No policy demand</i>	Professional advocacy enabled by code proposals	(Cross-cutting)

Crucially, the mapping demonstrates that no single solution can stop the loop alone. Regulatory reform without educational change prevents professionals from implementing new code requirements. Demonstration projects without a POE fail to generate the evidence required for code change. Community participation without high-visibility initiatives does not change symbolic linkages. The framework is specifically meant to be an integrated bundle.

5.3 Learning from International Comparisons

India, Zimbabwe, and Australia have effectively incorporated CSEB principles into their building regulations, providing useful lessons for Nigeria. A robust government research organization, the Central Building Research organization (CBRI), which had both research capability and a legislative responsibility to update the national building code, aided India's achievement. CBRI carried out comprehensive soil testing throughout Indian states, created standard mix designs, and subsequently pushed the Bureau of Indian Standards for code inclusion. Nigeria's NBRRI has comparable research capabilities, but lacks the authority to impose code modifications. The takeaway: research alone is insufficient; institutional power to transform knowledge into policy is required.

Zimbabwe's requirements stem from a donor-funded housing initiative that required post-occupancy review. The

initiative constructed hundreds of CSEB dwellings, tracked their performance for five years, and utilised the data to lobby for code inclusion. Nigeria has several donor-funded CSEB pilots, but none have included a mandated long-term POE. The lesson: demonstration projects must produce publishable performance statistics.

Earth construction Standards Australia, a professional body that brought together architects, engineers and builders to design standards and push the government, was instrumental in driving Australia's earth construction standards. The Australian Earth Building Handbook (Walker, P. and Standards Australia 2002) demonstrates how professional groups may codify best practices for CSEB, such as soil testing, stabiliser ratios, and structural design guidelines. There is no analogous professional association in Nigeria focusing on earth building. The takeaway: Professional lobbying is an essential complement to government research.

These international comparisons indicate that Nigeria's path to mainstreaming CSEBs necessitates three parallel actions: strengthening NBRRI's mandate to update the Code, requiring POE for all donor-funded earth construction pilots, and establishing a professional earth building association to support advocacy.

5.4 Limitations of the Study

This study has serious limitations, which must be openly recognised. First, discourse analysis does not represent lived experiences, real-time professional decision making, or the political economy of cement industry lobbying. Building rules are not developed in a vacuum; they are influenced by major economic interests. The cement sector in Nigeria has a significant effect on policy, which this study has not explicitly examined. To further understand these dynamics, future study should include interviews with politicians, industry representatives, and officials from professional organisations.

Second, the perceptual assertions are based on secondary citations (Abubakar, 2020; Isah, 2016), not original data collecting. While these sources are reliable, they do not replace original survey or interview research on professional and public attitudes in Northern Nigeria today.

Third, the Sabon Gida project lacks post-occupancy statistics. It is a competition submission, not an assessed completed project. The study refers to it as a proof of concept, but the lack of POE implies that assertions regarding its performance are theoretical.

Fourth, the recursive model, while based on discourse analysis, is still a theoretical claim that requires empirical validation. Longitudinal studies monitoring changes in professional attitudes, code status, and building practices over time would be required to test the model's causal assertions.

These limitations do not undermine the study's conclusions; rather, they limit its breadth. The report provides a diagnostic framework and a set of hypotheses for further research, but no firm conclusions about what would work in practice.

VI. INTEGRATED FRAMEWORK FOR BRIDGING THE GAP

This research offers four interrelated treatments based on the recursive model and mapping described previously (section 4.2, Table 1). Unlike generic frameworks, this one is based on Northern Nigerian characteristics such as the zaure spatial typology, Hausa construction techniques, Islamic gender regulations, and the institutional realities of Nigeria's building industry.

6.1 Regulatory Reform

The National Building Code must be updated to reflect specific technical requirements for CSEBs. Based on NBRRI (2022) research and international precedents (India IS 1725:2013; Zimbabwe SAZS 724:2001), these standards should specify: soil grading requirements (clay content 15-

30%, sand 40-60%), stabiliser content (cement 6-8% by weight for load bearing walls, 4-6% for non-load bearing), compression pressure (minimum 4 MPa for manual presses, 10 MPa for hydraulic), block dimensions (typically 290×140×90 mm or 290×140×100 mm), curing protocols (28 days covered, kept moist), Minimum compressive strength (2.5 N/mm² for single storey, 3.5 N/mm² for two story) and testing frequency (one block every 500 units manufactured). International technical recommendations (Houben &Guillaud, 1994; Rigassi, 1985) include thorough criteria for soil selection, block pressing, and curing that may be tailored to the Nigerian setting.

Importantly, regulatory change needs to incorporate geographical criteria for cultural responsiveness. Based on Isah (2016), this ought to consist of: Visitor-family circulation separation (separate entrances or screened passages), minimum zaure dimensions (3x4 meters to accommodate male visitors), courtyard privacy provisions (solid walls at least 1.8 meters high with no direct sightlines from public spaces), and incremental expansion allowances (structural provision for future room additions). It is necessary to codify mandatory community involvement in public housing design, requiring documented participatory design procedures prior to approval.

Implementation path: NBRRI should be granted a statutory mandate to propose code amendments, with an 18-month deadline for draft standards, followed by a 6-month public consultation period, and finally parliamentary acceptance.

6.2 Educational Reform

All Nigerian universities that provide architecture, civil engineering, or construction management programs must modify their built environment curricula. Core modules should include soil mechanics for construction (identification, classification, and stabiliser selection); CSEB production (press operation, curing, and quality control); structural design with earth (wall thickness, ring beam detailing, foundation design); and thermal performance simulation for earth buildings. Studio projects should encourage students to apply Hausa spatial typologies (zaure, shigifa, and dakuna) to modern house designs, with site visits to vernacular buildings in Kano, Zaria, and Bauchi.

Field training at NBRRI demonstration sites should be required, with at least one week of hands-on CSEB manufacturing and construction for each architecture and civil engineering graduate. Professional accrediting organisations (NIA, NSE, NIOB) should require at least 5 CPD credits per year in earth building, with credits provided exclusively for recognised courses that incorporate both theory and practical components.

Implementation Pathway: Within the next 12 months, the National Universities Commission (NUC) will establish a new Benchmark Minimum Academic Standard (BMAS) for architecture and engineering programs. Professional organisations should update their CPD regulations concurrently.

6.3 Demonstration Projects with Post Occupancy Evaluation

A planned program of demonstration projects is required to establish evidence for code change and challenge perceptual hierarchy. These projects must be placed in high-visibility areas, such as a government ministry building in Kano's city center, a public housing complex on a main route in Kaduna, or a primary health care facility in Bauchi. High exposure means that experts and the general public see earth structures in prominent settings, directly disputing the link between earth and poverty.

Mandatory post-occupancy evaluation (POE) is required one, three, and five years after completion. POE should assess indoor thermal comfort (temperature and humidity logging across seasons), resident satisfaction (structured surveys with Likert scales and open-ended questions), durability (cracking, erosion, termite damage), maintenance costs (compared to adjacent sandcrete buildings), and embodied energy. All POE data must be openly available, with summary reports given to NBRRI for code change advocacy.

Implementation strategy: The Federal Ministry of Works and Housing should issue a directive mandating that all government-funded housing and infrastructure projects in Northern Nigeria examine CSEBs, with a goal of at least three demonstration projects per state within five years. Donor organisations (World Bank, AfDB, and UN agencies) should mandate POE as a condition for supporting earth building pilot projects. Ghisleni (2024) emphasises the significance of post-occupancy evaluation in influencing professional attitudes, citing successful social housing projects in the global south that utilised modular systems and vernacular approaches.

6.4 Community Engaged Design

Top-down delivery of culturally sensitive housing is not possible. Before any design work begins, participatory design workshops must be undertaken, including separate sessions for men and women to ensure that all opinions are heard (as per gender protocols). Workshops should employ visual methods (spatial mapping, card sorting of room choices, scale models) to elicit residents' spatial requirements without requiring technical knowledge. Specific topics to cover include preferred zaure location (usually on the perimeter and accessible from the street), courtyard privacy (orientation

away from public view, screening of cooking areas), visitor circulation (separate from family living spaces), and incremental expansion.

Incremental building models should be available, allowing households to grow as resources permit. The Sabon Gida concept, which allows for the first enclosure of a shaded veranda using fewer durable materials (zanna - dried grass and mud, cardboard, or plywood) before being replaced with CSEB walls, should be standardised and formalised in procurement standards.

Each project shall teach at least 20 local residents in CSEB manufacturing, quality control, and maintenance, with certified trainees given precedence for employment on future projects. This fosters local ownership and increases artisan capability, something the industry currently lacks.

Implementation strategy: State housing companies should require community involvement processes as a condition for project approval. Training programs should be conducted through existing vocational training centers (VTCs), with NBRRI technical assistance.

6.5 Testable Directional Hypothesis

Based on the framework, this study provides a directed hypothesis for further research:

H1: In Northern Nigeria, the introduction of high visibility CSEB demonstration projects with published post occupancy evaluations, combined with mandatory continuing professional development on earth construction for architects and engineers, will reduce negative professional perceptions of earth materials (measured by Likert scale surveys) and generate documented professional demand for National Building Code revision within a measurable timeframe.

This hypothesis is falsifiable and may be investigated using a pre-test/post-test design: survey a sample of professionals prior to interventions, implement the framework in one state (e.g., Kano), use a nearby state (e.g., Kaduna) as a control, and re-survey after 36 months. Document professional advocacy by analysing NIA, NSE, and NIOB meeting minutes, position papers, and NBRRI submissions. The hypothesis is purposely directed rather than quantitative, reflecting the exploratory character of the study.

VII. CONCLUSION

7.1 Summary of Findings and Theoretical Contribution

This discourse analysis examines how regulatory, professional, and instructional texts generate and sustain the vernacular-mainstream gap in Northern Nigeria housing. The

research presented a recursive causal model for the gap: regulatory silence, professional ignorance, risk aversion, symbolic devaluation, no policy demand, code unmodified. Empirical data from policy papers, professional literature, and architectural records supported each connection. The research acknowledges the limits of CSEB, such as erosion, termite sensitivity, tensile weakness, and labour intensity. However, it calls for a responsible and educated use of earth building. This research also incorporates Mignolo's (2011) articulation of decolonial thinking, which views the exclusion of indigenous knowledge as a long-term impact of colonialism rather than a technological gap.

The theoretical contribution is threefold. The vernacular-mainstream divide differs from critical regionalism (Frampton, 1983) in that it focuses on institutional processes including codes, curriculum, and certification, rather than aesthetic opposition. Critical regionalism examines how architecture may resist modernity via form and materiality, while the vernacular-mainstream divide highlights how construction codes and professional education exclude local knowledge. Second, it builds on vernacular modernity (Vellinga, 2014) by demonstrating how "tradition" is purposefully eliminated through regulatory silence and curricular absence. Third, it applies de Sousa Santos' (2014) idea of epistemic violence to a specific factual domain: construction codes that obscure indigenous knowledge are active agents of epistemicide rather than neutral tools.

7.2 Framework and Hypothesis

The research offered an integrated framework that maps four interventions (regulatory reform, educational transformation, demonstration projects using POE, and community-engaged design) onto the recursive model. Unlike general frameworks, this one is based on Northern Nigerian specifics, including 'zaure' dimensions, Hausa spatial grammar, Islamic privacy rules, and the institutional realities of NBRRRI, NUC, and professional bodies. A directional hypothesis suggests that high-visibility demonstration projects incorporating POE, along with required CPD, might minimise unfavourable professional impressions and increase support for code reform. The paradigm prioritises post-occupancy assessment above competition aesthetics, filling a significant gap in current earth-building advocacy.

7.3 Limitations and Future Research

The study has considerable limitations. It studied discourse rather than behaviours. It did not gather primary data on professional decision-making or lay impressions. The Sabon Gida project lacks POE data. The recursive model remains a theoretical notion that needs empirical support. Future study should include semi-structured interviews with

NBRRRI officials, architects, and builders, post-occupancy assessments of existing CSEB homes, longitudinal surveys of professional attitudes, and an analysis of the cement industry's political impact.

Nigerian vernacular traditions provide the resources and expertise needed to produce culturally acceptable, ecologically sustainable dwellings. The goal is to establish institutional conditions, such as codes, curriculum, demonstration projects, and community engagement methods, to reintegrate earth knowledge into mainstream practice. This study presents a recursive model, a framework, and a hypothesis. The following phase is empirical testing. It is impossible to exaggerate the importance of this objective. Ogunsote & Prucnal-Ogunsote (2002) advocated for climate-responsive design in Nigeria, while Oliver (2006) argued for the global importance of vernacular architecture. However, neither has been converted into policy, which this article aims to remedy.

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