"Beyond the Mirage": A Review of Nigerian Sustainable Methods, Materials and Policy Propositions for Low-Cost and Affordable Housing

James Ogunbiyi[1] and Folake Adeleke[2]

[1]Department of Estate Management, University of Ibadan, Ibadan, Nigeria

Email: jamesogunbiyi10@gmail.com

[2]Department of Estate Management, University of Ibadan, Ibadan, Nigeria

Email: fgadeleke@gmail.com

Abstract

The challenges of affordable housing could be so elusive that some consider its attainment and adequate provision for low-income earners to be a mirage. As in many parts of the world, the Nigerian situation is not an exception in the challenges that bedevil government and private sector efforts in providing Low-Cost and Affordable Housing (LCAH). This study presents a systematic content analysis of extant studies considering current propositions toward efficient public-private initiatives to meet the demands of LCAH in Nigeria, which border on construction techniques, materials, and government policies. Six categorical challenges to LCAH in Nigeria were found and reported in the study, the two significant challenges being the unsustainable cost of conventional building materials and the inattentiveness to local and sustainable materials. The currently proffered solutions to the challenges of LCAH in Nigeria were also categorised along the building techniques, government policies, building materials, and a multi-dimensional approach. The overarching implication of the findings of this study is that the cost of financing the traditional delivery models of affordable housing in Nigeria is prohibitive; efforts should be geared towards cost-efficient alternative construction technologies/techniques as well as the use of local/sustainable building materials.

Keywords: Affordable Housing, Alternative Building Technologies, Innovative Housing Solutions, Public-Private Partnerships, Sustainable Building Materials

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1. Introduction

Many countries worldwide are experiencing a significant gap between housing demand and supply (Kusisto & Grant, 2019). By 2030, approximately 40% of the world's population, which equals about 3 billion people, is projected to need housing (UN-Habitat, 2014). In Africa, several nations have been struggling with housing shortages. For instance, Kenya, Madagascar, and Mozambique each faced a 2 million housing unit backlog, while South Africa had a deficit of 2.3 million housing units, Tanzania had a backlog of 3 million units, and Egypt had a deficit of 3.5 million units (El-hadj et al., 2018). Nigeria is included as the country had a deficit of about 17 million housing units in 2012 and needed to construct an average of 800,000 houses to make up the shortfall (Centre for Affordable Housing Finance in Africa - CAHF, 2016). On the contrary, the actual increase in stock was only around 100,000 units per year (CAHF, 2019). Available data indicates that the deficits in housing later grew to an estimated 22 million units in Nigeria (CAHF, 2019). Consequently, housing affordability challenges in Nigeria have become an intractable problem for low-income earners (Anthony et al., 2016). The provision of affordable housing is viewed as a human right and should be within the reach of every citizen of a country, irrespective of their income level (Adeleke & Olaleye, 2020). Due to their inability to afford housing, most low-income earners in the country are forced to live in poor-quality, substandard housing (Makinde, 2014; Adeleke, 2021). Despite the government's efforts to provide low-cost housing, the demand for affordable housing units significantly outweighs the supply, leading to a growing housing deficit (Moore, 2019).

Although low-cost and affordable housing may be synonymous in principle, the two concepts can also be circumstantially and contextually different. Low-cost housing refers to housing built considering lower construction costs without compromising functionality and durability (Olanrewaju *et al.*, 2021). Affordable housing refers to housing that is inexpensive to low-income earners and those earning moderate incomes (Puri *et al.*, 2015). Thus, while low-cost housing may be affordable, affordable housing may not necessarily be low-cost, and vice versa. The intended urban poor and low-income earners' inability to access low-cost housing due to socio-political barriers, bureaucratic costs, and other similar factors has given rise to the concept of unaffordable low-cost housing (Iwuagwu *et al.*, 2016). Low-cost housing is affordable

when it is within reach for people who make less than the typical household income in an area (Srivastava & Kumar, 2018).

While low-cost housing may not always be the same as affordable housing, it can still play a vital role in addressing the affordable housing crisis in Nigeria. Therefore, prioritising the construction of low-cost housing units is crucial to bridging the identified gap between the demand for affordable housing and its supply in the country. This is because the adverse effects of inadequate supply of low-cost and affordable housing include homelessness, overcrowding, the growth of slums, and urban degradation (Ojo et al., 2022). It is no gainsay that making housing affordable for low-income earners should be a primary concern for policymakers in Nigeria by providing inexpensive residential accommodations.

Considering the preceding characterisation of the need for Low-Cost and Affordable Housing (LCAH), this study adopted the systematic content analysis of extant literature in presenting current propositions that border on housing construction materials, methods, and policies to address the challenges of LCAH in Nigeria. The specific objectives are to examine the topical LCAH considerations in Nigeria, scrutinise the challenges that hinder the provision of LCAH in Nigeria, and analyse the currently suggested courses of action to make LCAH a consistent reality in Nigeria.

2. Methodology

The study adopted systematic content analysis to review extant studies that have examined the challenges to low-cost and affordable housing in Nigeria. Systematic content analysis combines systematic review and content analysis to offer a more scientific procedure for selecting and reviewing literature (Khirfan et al., 2020; Ogunbiyi et al., 2022; Ogunbiyi et al., 2024). Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) (Moher et al., 2009; Ogunbiyi, 2024) was the systematic review model adopted in this study, combined with content and thematic analyses.

Extant studies were sourced for the current study using Google Scholar. Using Boolean operators, an initial search prompt was designed that captured the critical

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terms of the study, including "cost-effective housing", "cost-saving housing", "low-cost housing", "affordable housing", "Nigeria", "building technologies", "building techniques", "building materials", "policies", "methodology", "empirical", and "primary data". The search string yielded 534 articles. Then, the search string was delimited to a five-year period (2022-2024), which resulted in 264 articles. To further reduce the articles to manageable but relevant ones, the search string was further delimited to a two-year period (2023-2024), which resulted in 93 articles. The 93 articles were subjected to individual reviews to ensure strict relevance to the current study. The effectiveness of the final search string is reflected in the fact that it captured all the key terms of the study; it ensured the recency of articles reviewed (2023-2024), and it attempted to capture only empirical research and 'primary data' collected for the previous studies.

The titles of the 93 selected articles were screened; irrelevant articles and studies found not to have been primarily conducted in or focused on Nigeria were excluded (n=61). Additionally, screening abstracts of the remaining 32 articles revealed the presence of unrelated studies, which were also excluded (n=10). Full-text screening of the remaining 22 articles showed that the studies in two other articles were unconnected to the current study and were excluded from further analysis. Hence, content and thematic analyses were undertaken on 20 extant studies to achieve the aim of this study.

3. Findings and Discussion:

3.1. Topical issues on low-cost and affordable housing in Nigeria

Results of content and thematic analyses of the topical items of consideration in the selected extant studies on LCAH in Nigeria are presented in Table 1.

Table 1: Thematic and content analyses of topical issues on LCAH in Nigeria

Theme	Sub-themes	Freq.	%	Sources
Topical low-cost and affordable housing considerations in Nigeria	1. Eco-friendly/Sustainable building materials	7	35%	Ekhaese & Ndimako (2023); Musa (2023); Lekjep et al. (2024); Nwaki et al. (2023); Micah (2023); Eze et al (2023); Elisha et al. (2023)
	2. Alternative Building technologies/techniques	6	30%	Ebekozien et al. (2024); Nwoko (2023); Farouq (2023); Okeoma (2023); Jan (2023); Sunday et al. (2023)
	3. Affordable housing challenges	3	15%	Modu et al (2024); Adedeji et al. (2023); Enwin & Ikiriko (2023)
	4. Housing design	2	10%	Emusa & Idakwoji (2023); Aliyu & Ismail (2023)
	5. Conventional building materials	1	5%	Akano (2023)
	6. Housing project finance	1	5%	Eze (2023)
	Total	**20**	**100%**	

Source: Authors' Review, 2024

1: Eco-friendly/sustainable building materials: This suggested that, in line with global trends, studies on LCAH in Nigeria have significantly shifted focus to seeking how sustainability can be maintained while tackling the challenges of LCAH. The studies examined the availability (Micah, 2023; Musa, 2023), benefits (Lekjep et al., 2024; Nwaki et al., 2023), and barriers (Eze et al., 2023; Nwaki et al., 2023) to the use of sustainable materials for LCAH and other building constructions in Nigeria.

2: Alternative building technologies/techniques (ABTs): The studies aimed at investigating alternative building techniques and technologies to determine their applicability in LCAH provision in Nigeria. The studies examined modular construction (Nwoko, 2023); Thermal Storage Material (TSM) (Farouq, 2023); shipping container housing (Okeoma, 2023); use of polystyrene material (Jan 2023); sandbag building technology (Sunday et al., 2023), and various ABTS (Ebekozien et al., 2024).

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3: Affordable housing challenges: The studies examined the challenges of affordable housing in the semi-arid climate (Modu et al., 2024) and other various challenges of affordable housing provision in Nigeria (Adedeji et al., 2023; Enwin & Ikiriko, 2023).

4: Housing design: The studies examined the imperatives of traditional housing pattern (Emusa & Idakwoji, 2023) and Afrocentric architecture (Aliyu & Ismail, 2023) and their applicability in LCAH in Nigeria.

5: Conventional building materials: Akano (2023) evaluated the effects of the cost of conventional building materials on quality and affordable housing supply.

6: Housing project finance: Eze (2023) examined how time-bound funding percentages affect the timeliness of housing and other construction project delivery and quality in Nigeria.

The observed research gaps in the selected studies concerned other innovative housing solutions that are being explored in other countries, including incremental housing, self-help models, cooperative housing, microfinance housing, viability appraisal of green building projects and materials, and multidisciplinary studies of issues affecting affordable housing delivery.

3.2. Challenges to methods, materials, and policies on LCAH in Nigeria

Concerning the challenges to methods, materials, and policies on LCAH in Nigeria as examined in the extant studies, the results of thematic and content analyses are presented in Table 2.

Table 2: Thematic and content analyses of the challenges to methods, materials, and policies on LCAH in Nigeria

Theme	Sub-themes	Freq.	%	Sources
Challenges to low-cost and affordable housing in Nigeria	1. Inattentiveness to local and sustainable materials	8	35%	Micah (2023); Eze et al (2023); Elisha et al. (2023); Musa (2023); Farouq (2023); Lekjep et al. (2024); Nwaki et al. (2023); Emusa & Idakwoji (2023)
	2. Unsustainable cost of conventional materials	4	10%	Ekhaese & Ndimako (2023); Jan (2023); Okeoma (2023); Nwoko (2023)
	3. Rapid urbanisation/population growth	3	15%	Aliyu & Ismail (2023); Sunday et al. (2023); Eze (2023)
	4. Cross-classified challenges	3	15%	Ebekozien et al. (2024); Adedeji et al. (2023); Enwin & Ikiriko (2023)
	5. Poor maintenance activities	1	5%	Modu et al. (2024)
	6. Housing developers' challenges	1	5%	Akano (2023)
	Total	**20**	**100%**	

Source: Authors' Review, 2024

1. Inattentiveness to local and sustainable materials: This was considered the current leading challenge to LCAH in Nigeria from the authors' perspectives of the selected studies. Micah (2023) and Nwaki et al. (2023) opined that sustainable building materials are available in Nigeria, but their cost-effective use is not being adequately explored. Eze et al. (2023) suggested that resistance to change, insufficient awareness, unhelpful preexisting regulations, lack of research funds, current cost of procurement, and other market barriers comprise the significant challenges to the adoption of sustainable materials in LCAH and other construction projects in Nigeria. Other identified challenges to LCAH in Nigeria were the high cost of cement (Musa, 2023), the cost of energy due to the tropical climate of Nigeria (Farouq, 2023), and inattentiveness to other indigenous environmental and socio-cultural considerations (Emusa & Idakwoji, 2023).

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2. Unsustainable cost of conventional materials: This has led to the high cost of housing development and maintenance (Okeoma, 2023), as well as costly construction wastes and other environmental challenges (Nwoko, 2023; Jan 2023).

3. Rapid urbanisation/population growth: This has led to insufficient affordable housing options (Aliyu & Ismail, 2023) and a general increase in housing deficit (Sunday et al., 2023; Eze, 2023).

4. Cross-classified challenges: The studies also reported the mix-match of challenges that affect LCAH in Nigeria. The challenges included inadequate long-term repayment funds, bureaucratic costs of housing development approvals, and expensive building materials (Adedeji *et al.*, 2023). Ebekozien *et al.* (2024) also reported the peculiar constraints of government, private sector developers, users, and materials manufacturers that may affect LCAH construction. Enwin & Ikiriko (2023) suggested the challenges as comprising shortcomings in urban planning, inaccessible finance, cost-prohibitive construction materials and labour, infrastructural inadequacies, bureaucratic bottlenecks, and corrupt practices.

5. Poor maintenance activities: Poor maintenance of building components may lead to faster deterioration of buildings, thereby limiting the effectiveness of existing LCAH stock in meeting housing demands (Modu et al., 2024).

6. Housing developers' challenges: Private developers face several daunting challenges that hinder their contributory participation in the provision of LCAH in Nigeria. These challenges include the high cost of building materials, unforeseen disruptions to the materials supply chain, overwhelming demand, unstable regulatory regimes, and labour costs (Akano, 2023).

These findings on the challenges of LCAH in Nigeria reflect the complexity of the current built environment. They represent diversified circumstances and a significant departure from the traditionally reported challenges to LCAH, which were majorly focused on governments as the major providers of LCAH in Nigeria (Ebekozien et al., 2021).

3.3. Proposed solutions to the challenges affecting LCAH in Nigeria

In addressing the challenges affecting LCAH provision in Nigeria, the extant studies proposed solutions that affect the housing processes, methods, building materials, and government policies. The results of the thematic and content analyses are presented in Table 3. This study classified the existing propositions under materials, methods, policies, and multi-dimensional solutions.

Table 3: Thematic and content analyses of the solutions to methods, materials, and policies on LCAH in Nigeria

Theme	Sub-themes	Freq.	%	Sources
Proposed solutions to low-cost and affordable housing challenges in Nigeria	1. Methods/Techniques: modular construction, stabilised earth mud bricks, polystyrene building technologies.	16	41%	Aliyu & Ismail (2023); Ebekozien *et al.* (2024); Eze *et al.* (2023); Modu et al. (2024); Elisha et al. (2023); Akano (2023); Musa (2023); Nwoko (2023); Farouq (2023); Okeoma (2023); Lekjep et al. (2024); Jan (2023); Sunday et al. (2023); Ekhaese & Ndimako (2023); Eze (2023); Emusa & Idakwoji (2023)
	2. Government Policies: PPPs with collaborative regulations bordering on financial incentives and support for developers.	13	33%	Eze et al. (2023); Elisha et al. (2023); Aliyu & Ismail (2023); Ebekozien et al. (2024); Akano (2023); Musa (2023); Nwoko (2023); Okeoma (2023); Lekjep et al. (2024); Nwaki et al. (2023); Sunday et al. (2023); Eze (2023); Enwin & Ikiriko (2023)
	3. Materials: - Composite materials - Recycled materials - Local materials - Innovative materials	9	23%	Akano (2023); Ekhaese & Ndimako (2023); Musa (2023); Farouq (2023); Lekjep et al. (2024); Sunday et al. (2023); Ekhaese & Ndimako (2023); Okeoma (2023); Jan (2023);
	4. Multi-dimensional solution: - Economic, environmental, etc. approaches.	1	3%	Adedeji *et al.* (2023)
	Total	**39**	**100%**	

Source: Authors' Review, 2024

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1. Methods: The selected studies proposed using innovative and sustainable building technologies/techniques (Ebekozien et al., 2024; Aliyu & Ismail, 2023) in providing LCAH to meet the existing demand for affordable housing in Nigeria. Such innovative building practices may include the use of stabilised earth mud bricks (Musa, 2023); modular construction techniques with associated housing designs (Nwoko, 2023); local building materials with passive cooling techniques (Farouq, 2023); polystyrene building technologies (Jan 2023), and the use of earthbag in buildings (Sunday et al., 2023) among others. Accordingly, practitioners need more awareness and hands-on training on the applications of innovative building materials and techniques (Eze et al., 2023; Elisha et al., 2023). Besides, social, cultural, and other Indigenous considerations may afford local sustainable and affordable building practices to aid LCAH in Nigeria (Emusa & Idakwoji, 2023). Moreover, competently executed planned, predictive, and preventive maintenance would also forestall the failure of the existing housing stock in reasonably catering to the current level of demand for LCAH (Modu et al., 2024).

2. Policies: - While acknowledging that the best way forward remains efficient public-private partnerships (PPPs), the selected studies suggested the relevant regulations and policies that could aid the actualisation of LCAH for the target Nigerian populace. The policies were suggested to support the use and affordability of sustainable construction materials and practices (Eze et al., 2023; Musa, 2023). This would also involve government regulations and initiatives geared towards awareness creation and encourage the willingness of stakeholders to adopt innovative and eco-friendly construction techniques (Nwoko, 2023; Sunday et al., 2023). The studies also recommended that government policies foster financial incentives for developers and support research and development, training, retraining, and interdisciplinary collaboration among practitioners (Aliyu & Ismail, 2023; Eze, 2023). Such policies must also make provisions for subsidy support on the procurement of building materials and tax exemptions to encourage the adoption of local and sustainable building materials for LCAH developments (Akano, 2023).

3. Materials: Extant studies on LCAH in Nigeria are increasingly advising the adoption of a range of building materials that are considered less expensive when compared to conventional building materials. The studies suggest the adoption of:

Composite materials are combined through mixing and heat treatment, e.g., hemp-based composites (hempcrete) (Akano, 2023).

- Recycled materials - reclaimed wood, recycled concrete aggregates (Akano, 2023), and recycled steel (Ekhaese & Ndimako, 2023).

- Local materials – bamboo (Akano, 2023); earth mud bricks with palm tree derivatives (Musa, 2023); local earthen materials (Farouq, 2023); wood, bamboo, straw bales, earth, clay brick, stone, timber, and laterite (Lekjep et al., 2024;); earth-based materials such as adobe (laterite) blocks, rammed earth, compressed earth bricks, natural clay and mud bricks and tiles (Nwaki et al., 2023); clay soil for plastering, granites for footing/wall base (Sunday et al., 2023).

- Innovative materials - the innovative application of existing materials such as Phase-change material (PCM) and other thermal energy storage (TES) materials (Farouq, 2023); shipping containers (Okeoma, 2023); advanced plastic materials like the expanded polystyrene (Jan 2023); solid-weave polypropylene bags, flat-weave tubes, HDPE mesh tubes/bags (Sunday et al., 2023); insulated concrete, green concrete, geo-polymer brick, stabilised earth brick, flyash concrete (ashcrete) (Ekhaese & Ndimako, 2023).

4. Multi-dimensional solution: Adedeji et al. (2023) proposed that the challenges to LCAH in Nigeria would require a multi-dimensional solution. The author suggested aggregating economic, environmental, social, technological, and institutional considerations in addressing the challenges.

The findings of this study underscored the need for a multi-pronged approach to address the challenges of LCAH provision in Nigeria. This requires very effective public-private partnerships that adequately utilise cost-effective and sustainable building materials, building techniques/technologies, and cutting-edge government policies efficiently implemented to aid the actualisation of LCAH. An evident gap in the available studies is the lack of sufficient detailed and practical demonstrations of successful applications of sustainable materials for LCAH constructions.

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4. Areas for Further Studies

Arising from the review of the literature, the following gaps and areas for further studies were identified:

1. Studies need to be more articulate and practical on how government regulations may guide sustainable, affordable housing in Nigeria.
2. More research is needed on other innovative affordable housing solutions, such as incremental housing, self-help models, shipping container housing, sandbag construction, cooperative housing, and microfinance housing.
3. Viability appraisal of the applicability of local and sustainable (green) building materials for LCAH delivery in Nigeria.
4. More laboratory research and dissemination of knowledge about the structural strength and durability of local and sustainable building materials in Nigeria.

5. Conclusion

This study shows that building affordable housing in Nigeria using traditional methods is too expensive over time. Instead, efforts should be focused on alternative, inexpensive construction techniques and materials that are readily available and environmentally friendly. The study also emphasises the central position of government regulations and policies in effectively implementing and realising LCAH for the urban poor and low-income earners.

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