

Architecture Beyond Concrete: Realities and the Nigerian Case

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Abstract

In the face of rapid urbanization and resource constraints, developing countries are struggling with the need for affordable and sustainable housing solutions. This paper explores the potential of alternative architectural approaches that transcend conventional concrete structures, with a focus on the Nigerian context. Drawing from literature on vernacular architecture, sustainable building materials, and socio-economic factors influencing design, the paper investigates the viability of materials such as bamboo, earth, and recycled components in Nigeria. Through case studies and examples, it analyzes the sustainability, affordability, and cultural appropriateness of these approaches, while acknowledging the challenges faced in implementation, including resource scarcity, urbanization, and infrastructure constraints. The paper highlights the importance of community participation and local knowledge in design and construction processes. Ultimately, it provides recommendations for policymakers, architects, and stakeholders to foster a holistic and context-specific approach to architectural development in developing countries.

Keywords: Sustainable architecture, developing countries, alternative building materials, vernacular architecture, Nigeria, community participation.

Introduction

The global population is rapidly urbanizing, with over 68% of the world's population projected to live in urban areas by 2050 (UN, 2018). This trend is particularly pronounced in developing countries, where cities are experiencing unprecedented growth, often outpacing the capacity to provide adequate housing and infrastructure. In this context, the construction industry faces significant challenges in meeting the demand for affordable and sustainable housing solutions.

Traditional construction methods relying on concrete and steel have proven resource-intensive, environmentally damaging, and often ill-suited for the climatic and cultural contexts of many

developing nations. As a result, there is a growing recognition of the need to explore alternative architectural approaches that are adapted to local conditions, environmentally sustainable, and culturally responsive (Salama, 2012).

This paper examines the realities of architecture beyond conventional concrete structures, with a particular focus on the Nigerian context. Nigeria, a rapidly urbanizing country with a rich cultural heritage and diverse climatic conditions, presents a compelling case study for exploring alternative architectural solutions. By drawing from literature on vernacular architecture, sustainable building materials, and socio-economic factors influencing design, this paper investigates the potential and limitations of alternative approaches in the Nigerian context.

Literature Review

Vernacular architecture, which refers to traditional building practices and techniques that have evolved over time in response to local climatic, cultural, and environmental conditions, has long been recognized as a source of inspiration for sustainable and context-appropriate design (Oliver, 2003). In developing countries, where resources are often scarce and traditional knowledge systems remain deeply rooted, vernacular architecture offers valuable insights into the use of locally available materials and construction techniques (Zami & Lee, 2010).

Research has also highlighted the potential of alternative building materials, such as bamboo, earth, and recycled materials, in addressing the challenges of sustainable construction (Pacheco-Torgal & Jalali, 2012). These materials are often readily available, affordable, and have lower embodied energy and environmental impacts compared to conventional materials like concrete and steel (Pacheco-Torgal & Jalali, 2012; Zami & Lee, 2010).

However, the adoption of alternative architectural approaches is influenced by a complex interplay of socio-economic factors, including cultural preferences, economic constraints, and institutional frameworks (Salama, 2012; Zami & Lee, 2010). Understanding these factors is crucial in designing and implementing sustainable and culturally appropriate solutions.

The Nigerian Context

Nigeria, a country with a population of over 200 million, is experiencing rapid urbanization and a growing housing deficit (WBank, 2022). The country's diverse climatic conditions, ranging from the arid northern regions to the humid southern coastal areas, present unique challenges for architectural design and construction.

Traditional Nigerian architecture, heavily influenced by cultural and environmental factors, has historically relied on locally available materials such as mud, thatch, and timber (Dmochowski, 1990; Onyegiri & Ugochukwu, 2016). However, with urbanization and the increasing demand for modern housing, these traditional techniques have often been replaced by concrete and steel structures that are resource-intensive and poorly adapted to the local climate (Ademiluyi & Raji, 2008).

The Nigerian construction industry faces several challenges, including a shortage of skilled labor, inadequate infrastructure, and limited access to affordable building materials (Ogunmakinde, Sher, & Maund, 2019). Additionally, rapid urbanization and the influx of rural populations into cities have resulted in the proliferation of informal settlements and substandard housing conditions (Aduwo, Edewor, & Ibem, 2016).

Against this backdrop, there is a growing interest in exploring alternative architectural approaches that address these challenges while promoting sustainability, affordability, and cultural relevance. Several initiatives and projects have emerged, demonstrating the potential of materials such as bamboo, earth, and recycled components in the Nigerian context.

Case Studies and Examples

A prominent example of an alternative architectural approach utilizing bamboo in Nigeria is the Nigerian Building and Road Research Institute's (NBRRI) bamboo-reinforced building project and marks a significant stride in sustainable construction within Nigeria. Supported by the Federal government, this initiative leverages the ecological and economic benefits of bamboo, promoting its use as a renewable, carbon-sequestering, and locally-sourced building material (Folarin, 2023). The project not only offers affordable housing solutions but also demonstrates resilience against

natural disasters, aligning with Nigeria's commitment to sustainable development. As a pioneering model, it sets a new standard for environmentally responsible construction, paving the way for future global endeavors in sustainable living environments. The project demonstrated the structural integrity and durability of bamboo as a building material, while also promoting community involvement and skills development within the local population.

Another innovation is the Earthbag Housing Initiative across Africa, earthbag construction is gaining traction as a sustainable and cost-effective building method. In South Africa, despite its low acceptance, studies highlight sandbag building technology's potential for affordability and resource efficiency. Meanwhile, in Kenya, builders are increasingly adopting earthbag technology due to its resilience against extreme weather conditions and its versatility in creating various structural forms (Austin, 2023). Further east, Rwanda's GA Collaborative has pioneered earthbag projects that offer durable housing solutions at a low cost. These initiatives collectively underscore the viability of earthbag construction in addressing housing challenges while promoting environmental sustainability across the continent. These projects not only provided affordable housing but also encouraged the use of locally available materials and labor, reducing the environmental impact and promoting community empowerment.



Figure 1: Builders constructing a house in Kenya using earth-bags (Austin, 2023)

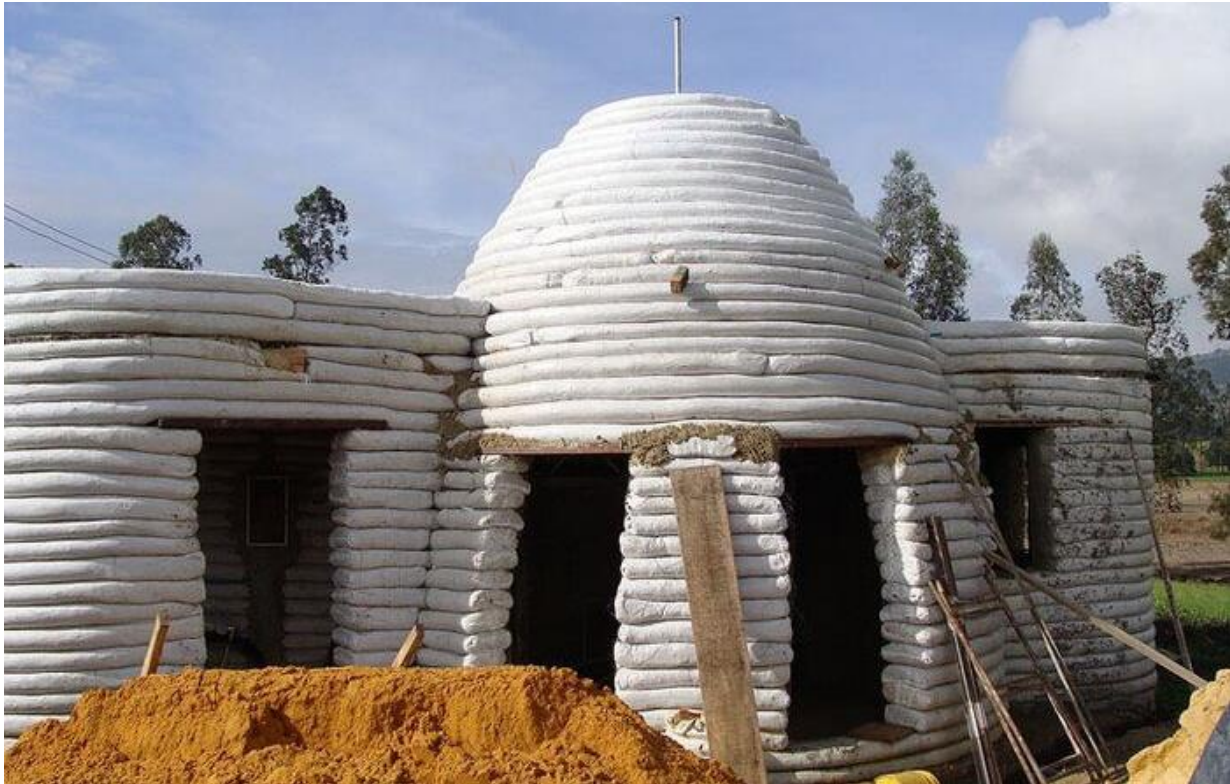


Figure 2: A house under construction using earth-bag technology (Austin, 2023)

In Lagos, the Recycled Plastic Bottle House project showcased the potential of recycled plastic bottles as a building material, addressing both the housing shortage and the issue of plastic waste management (Opoko & Oluwatayo, 2014). The project involved local communities in the construction process, fostering a sense of ownership and pride.

Another example of an alternative architectural approach in Nigeria is the use of thatch as insulation for ceilings. Traditional Nigerian architecture has long incorporated thatched roofing, made from locally available materials such as palm fronds or grass (Dmochowski, 1990). While modern construction methods have largely abandoned thatch in favor of corrugated metal or concrete roofs, there has been a renewed interest in exploring the insulating properties of thatch for ceiling applications.

In addition to its insulating properties, the use of thatch for ceilings also aligns with the cultural traditions and vernacular architecture of the region, promoting a sense of cultural identity and pride

among the local community (Onyegiri & Ugochukwu, 2016). This innovation is believed to also provide economic opportunities through the revival of traditional thatching skills and the establishment of local supply chains for thatching materials.

However, like other alternative approaches, the use of thatch for ceilings faces challenges related to durability, maintenance requirements, and potential fire hazards (Udoudoh & Bassey, 2021). Addressing these concerns through research, training, and the development of appropriate building codes and standards is crucial for the successful implementation of this approach.

While these examples demonstrate the viability of alternative architectural approaches, they also highlight the challenges faced in implementation, such as limited access to materials, lack of skilled labor, and the need for community acceptance and participation (Dmochowski, 1990; Onyegiri & Ugochukwu, 2016; Opoko & Oluwatayo, 2014).

Discussion and Analysis

The case studies and examples presented in this paper illustrate the potential of alternative architectural approaches in addressing the housing challenges faced by developing countries like Nigeria. The use of materials such as bamboo, earth, and recycled components not only promotes sustainability and affordability but also aligns with the cultural and environmental contexts of these regions.

However, the successful implementation of these approaches requires a holistic and context-specific approach that considers the socio-economic factors influencing architectural design and construction. Community participation and the integration of local knowledge are crucial in ensuring the cultural appropriateness and acceptance of these solutions (Salama, 2012).

Furthermore, institutional and policy frameworks play a significant role in supporting and promoting alternative architectural approaches. Governments and relevant stakeholders need to invest in research, skills development, and infrastructure to facilitate the adoption of these approaches on a larger scale (Ademiluyi & Raji, 2008; Ogunmakinde et al., 2019).

The case studies highlight the potential of reviving traditional techniques and materials, such as bamboo and thatch, in contemporary architectural solutions. By leveraging the structural properties of bamboo to insulating properties of thatch for ceiling applications, this approach not only

promotes sustainability and affordability but also fosters cultural continuity and community engagement.

However, the long-term viability of using these materials require further investigation into issues such as durability, maintenance requirements, and fire safety considerations. Collaborations between architects, engineers, and material scientists could help address these challenges through research, testing, and the development of appropriate building codes and standards.

Additionally, the successful implementation of these approaches necessitate the preservation and transmission of traditional building skills like thatching skills, as well as the establishment of sustainable supply chains for these materials. Community-based initiatives and knowledge-sharing platforms could play a vital role in this regard, ensuring that these traditional techniques are not lost and can be integrated into modern architectural solutions.

While the case studies highlighted in this paper demonstrate promising results, it is important to acknowledge the potential limitations and challenges associated with alternative approaches. Issues such as durability, maintenance requirements, and scalability need to be thoroughly evaluated and addressed (Onyegiri & Ugochukwu, 2016; Opoko & Oluwatayo, 2014).

Recommendations

In conclusion, this paper has explored the realities of architecture beyond concrete in developing countries, with a particular focus on the Nigerian context. By examining literature on vernacular architecture, sustainable building materials, and socio-economic factors influencing design, the paper has highlighted the potential and limitations of alternative architectural approaches.

Through case studies and examples, the paper has demonstrated the viability of materials such as bamboo, earth, and recycled components in addressing the housing challenges faced by developing countries like Nigeria. These approaches not only promote sustainability and affordability but also align with the cultural and environmental contexts of these regions.

However, the successful implementation of alternative architectural approaches requires a holistic and context-specific approach that considers community participation, local knowledge, and

institutional and policy frameworks. Governments and relevant stakeholders need to invest in research, skills development, and infrastructure to facilitate the adoption of these approaches on a larger scale.

Recommendations for policymakers, architects, and stakeholders include:

1. Promoting research and knowledge-sharing on alternative architectural approaches and sustainable building materials.
2. Investing in skills development and capacity-building programs for architects, builders, and local communities.
3. Developing policy frameworks and incentives to encourage the adoption of sustainable and culturally appropriate architectural solutions.
4. Fostering community participation and integrating local knowledge in the design and construction processes.
5. Addressing infrastructure and resource constraints to support the implementation of alternative approaches.

This could involve investing in infrastructure such as transportation networks, material supply chains, and waste management systems to ensure the availability and efficient distribution of alternative building materials. Additionally, exploring local sources of materials and encouraging the establishment of small-scale production facilities can help address resource constraints and promote self-sufficiency.

6. Promoting interdisciplinary collaboration and knowledge exchange among architects, engineers, material scientists, and local communities.

The successful implementation of alternative architectural approaches require a multidisciplinary approach that brings together diverse expertise and perspectives. Architects can collaborate with engineers to ensure the structural integrity and durability of alternative materials, while material scientists can contribute to the development and testing of new sustainable building solutions. Equally important is the integration of local knowledge and traditional construction techniques, which can be facilitated through community engagement and participatory design processes.

7. Conducting long-term studies and monitoring to evaluate the performance and sustainability of alternative architectural approaches.

While the case studies presented in this paper demonstrate promising results, it is crucial to conduct longitudinal studies and monitoring to assess the long-term performance, durability, and environmental impact of alternative building materials and techniques. This will help identify potential challenges, refine and optimize the approaches, and inform future decision-making and policy development.

8. Raising awareness and promoting education on sustainable and culturally appropriate architecture.

Promoting public awareness and education is essential for gaining acceptance and promoting the adoption of alternative architectural approaches. This can be achieved through public campaigns, educational programs in schools and universities, and the dissemination of successful case studies and best practices. By increasing understanding and appreciation of the benefits and cultural significance of these approaches, communities and stakeholders are more likely to embrace and support their implementation.

9. Encouraging international collaboration and knowledge-sharing among developing countries facing similar challenges.

The issues and challenges faced by developing countries in terms of housing, urbanization, and sustainable development often share commonalities. By facilitating international collaboration and knowledge-sharing among these countries, valuable insights, best practices, and successful models can be exchanged and adapted to local contexts. This can accelerate the adoption and refinement of alternative architectural approaches, fostering a global movement towards sustainable and culturally responsive solutions.

Conclusion

The imperative of addressing housing deficits and promoting sustainable development in the face of rapid urbanization in developing countries cannot be overstated. This analysis has underscored the viability and potential of alternative architectural approaches transcending conventional

concrete structures within the Nigerian context. By integrating empirical evidence, theoretical frameworks, and case studies, a comprehensive assessment has been conducted.

While acknowledging the implementation challenges, including resource constraints, infrastructural inadequacies, and socio-economic factors, the pivotal role of community engagement, indigenous knowledge preservation, and institutional support has been highlighted. Through a holistic, context-specific approach encompassing policy reforms, interdisciplinary collaborations, and continuous research, the adoption of sustainable and culturally appropriate architectural solutions can be facilitated.

Ultimately, this discourse emphasizes the urgency of embracing innovative, evidence-based strategies to address the housing needs of developing nations while promoting environmental stewardship and cultural identity. By fostering an enabling environment for alternative architectural approaches, developing countries can pave the way towards a more sustainable, equitable, and resilient future for their urban landscapes.

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