VOL. 08 NO. 4,
MAY, 2025
E-ISSN 3026-9210
P-ISSN 3026-815X

African Scholar Publications & Research International
www.africanscholarpub.com

Journal of Built Env. & Geological Research (JBEGR)

Evaluating the Environmental Benefits of Using Traditional Craftsmanship Techniques in Nigerian Architecture

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DOI: https://doi.org/10.70382/ajbegr.v8i4.044

Abstract

This article explores the environmental benefits of integrating traditional craftsmanship techniques into contemporary architectural practice, particularly within the Nigerian context. In an era marked by accelerating climate change, material depletion, and cultural homogenization, there is an urgent need to revisit sustainable, low-impact building practices rooted in indigenous knowledge systems. The study focuses on techniques such as mud and adobe construction, wood carving and joinery, bamboo and raffia weaving, terracotta and pottery applications, and thatch roofing, analyzing their environmental performance in architecture. Through a mixed-methods approach combining field observation, literature analysis, and case study evaluation, the research examines how these traditional materials and methods contribute to reduced carbon emissions, enhanced thermal regulation, biodegradability, and resource efficiency. Findings from selected buildings—such as the Gidan Makama Museum in Kano, the African Studies Centre at Obafemi Awolowo University, Ile-Ife, and internationally relevant examples like the Gando Primary School in Burkina Faso—illustrate how these techniques are not only environmentally viable but also socially and economically beneficial. The article emphasizes that such methods support circular material life cycles, reduce dependence on industrialized construction systems, and foster traditional craftsmanship economies, thus aligning with global sustainability and cultural preservation goals.

Keywords: Eco-friendly practices, Environmental design, Indigenous techniques, Traditional craftsmanship, Sustainable design, Vernacular architecture

Introduction

There are many architectural building techniques that have been evolving over centuries based on the local climate, materials, and cultural practices. Developing nations such as Nigeria are confronted with major environmental issues underlying modern construction practices, such as high energy use and carbon emissions, plus unsustainable procurement of materials. However, revisiting these indigenous methods could serve as sustainable alternatives to construction methods of modern times (S. Sultana et al. 2023.). Traditional Craftsmanship in architecture uses local, low-impact materials and craft techniques developed over generations. This article focuses on the environmental benefits of these craftsmanship techniques when applied to architectural buildings and structures such as schools, community halls, health centers, and cultural institutions (Yunxuan Wang, et al., 2025).

Passed down through generations, these methods were sustainable long before it was fashionable to use the term. For example, earth materials such as mud and laterite have been used to build homes that have excellent thermal insulation properties to reduce artificial cooling (Akinbileje and Oduwaye, 2017). On the other hand, such methods use natural ventilation and biomass materials that have a negligible environmental footprint from cradle to grave (Adebayo and Akinola, 2021).

That said, modern construction technologies that are either sometimes imported or local are sweeping away these traditional techniques as they contribute to energy wastage and carbon emissions, while the multitude of traditional techniques that are proven to be environmentally viable and friendly (Oyediran and Okorie, 2022). This paper, therefore, seeks to investigate the environmental benefits of restoring and integrating traditional craft techniques into Nigerian contemporary architecture with a view to promoting sustainable development, conservation of resources, and reduction of environmental impact.

PROBLEM STATEMENT

In the face of climate change and rising environmental degradation, contemporary architecture continues to rely heavily on high-emission materials, overlooking the ecological potential of traditional craftsmanship. Recent studies suggest that techniques like adobe construction, timber joinery, and bamboo weaving offer low-carbon, thermally efficient, and biodegradable alternatives suitable for sustainable architecture (Emeka et al., 2023; Adebayo & Ogunleye, 2022).

However, these methods remain underutilized in modern design, especially in public architecture.

AIM

To evaluate the environmental benefits of integrating traditional craftsmanship techniques into architectural design and construction, with emphasis on sustainability, material efficiency, and climatic responsiveness in rural and urban contexts.

OBJECTIVES

1. To identify and document traditional craftsmanship techniques—such as mud/adobe construction, timber joinery, bamboo and raffia weaving, terracotta, and thatch roofing—used in Nigerian architecture (Akinola & Yusuf, 2021).
2. To assess the environmental performance of these techniques based on thermal efficiency, carbon footprint, biodegradability, and adaptability to various building contexts (Ozigbo et al., 2023).
3. To analyze both local and international case studies that demonstrate the successful application of traditional craft methods in architecture (Abubakar et al., 2022).

HISTORICAL CONTEXT OF TRADITIONAL CRAFTSMANSHIP

Traditional system building in Nigerian architecture deeply relates to the cultural, environmental, and spiritual practices of its various ethnic groups. Nigerian communities evolved building methods, trying to comply with various climatic zones, available materials, and social organization (Uji, 2019). Some indigenous methods are mud brick (adobe) construction, wattle and daub walls, thatch roofs, bamboo framework, carpentry joinery, and beautifully carved woodwork on structural members, each manifesting indigenous wisdom in working with nature in harmony and sustainability (Sarah Omran et al. 2025). Northern Nigeria, after all, is a large territory whose inhabitants create earth architecture that is climatically performant by sun-dried mud bricks and natural plaster suitable for the arid Sahel conditions (Adebayo & Akinola, 2021).

The Southern and Southeastern people—i.e., Yoruba and Igbo—also account for timber framing, raffia palm thatching, and mud walls effectively to the region's hot and humid tropical climate to achieve natural ventilation and passive cooling without mechanical intervention (Akinbileje & Oduwaye, 2017).

In regions like Sub-Saharan Africa, South Asia, Latin America, and Southeast Asia, the subcultures perfected several construction systems relying on mud, bamboo, palm thatch, and timber, all of which were transmitted through oral means or apprenticeship to the present generation. For the Andean cultures, for example, adobe and rammed earth were constructed in response to seismicity and climatic extremes (Van Mele et al., 2021). In the

same way, wood joinery has existed in Japan as an earthquake-resistant architecture without nail interlocking for centuries (Kobayashi, 2022). In India, states such as Kerala and Rajasthan developed wood and stone crafts appropriate to heavy monsoons and desert heat, respectively (Dhall, 2021). The craftsmanship embedded in vernacular architecture was not merely functional but symbolic. It reflected cosmological beliefs, craft guild systems, and environmental stewardship.

Despite its deep roots, traditional craftsmanship faced marginalization during the industrial revolution, which introduced mass-produced materials and standardized building systems. This led to the gradual erosion of artisanal knowledge and the undervaluing of handcrafted materials in favor of concrete, steel, and glass (Vale & Vale, 2021). However, growing concerns over environmental degradation and cultural homogenization in recent decades have renewed interest in traditional building systems as sustainable and climate-adaptive alternatives.

Today, traditional craftsmanship is increasingly recognized as a critical resource in contemporary architectural practice. It offers not only ecological benefits—such as low embodied energy, natural insulation, and biodegradability—but also fosters cultural continuity and social inclusion. As global architects and planners seek sustainable solutions, the revival and adaptation of traditional craftsmanship techniques offer a path forward that is both resilient and rooted in place (Wells, 2021).

OVERVIEW OF SELECTED TRADITIONAL CRAFTSMANSHIP

Mud and Adobe Construction

Mud and adobe bricks are among the most environmentally friendly building materials available. They are made from locally sourced earth mixed with water and sometimes reinforced with straw or dung. These materials offer high thermal mass, regulating indoor temperatures naturally. Adobe structures have a low carbon footprint and are biodegradable, making them ideal for environmentally conscious architecture in both rural and urban contexts. Mud and adobe construction involve the use of earth materials to create walls and structures. These materials offer excellent thermal insulation, reducing the need for artificial heating and cooling (Emeka et al., 2025). Additionally, they are biodegradable and have low embodied energy, making them environmentally friendly choices for construction. A comparative study by Emusa and Idakwoji (2023) revealed that mud-walled classrooms in Igala communities consistently maintained lower indoor temperatures than concrete-walled counterparts. Adobe construction also minimizes waste generation and avoids the energy-intensive process of cement production.

Figure 1: *Image showing the brick wall of PMA Madhushala, built gadi house in India.*
Source: *Google*

Wood Carving and Joinery

Traditional wood joinery utilizes interlocking joints and minimal metal fasteners. This reduces the use of energy-intensive materials and preserves carbon-sequestering timber (Amobi, 2024). Carved wooden elements also enhance cultural identity and aesthetics. Sustainable forestry practices are essential to ensure the renewability of timber resources.

Figure 2: *Image showing woodcarving technique.*
Source: *Google*

Weaving: Bamboo and Aso-Oke

Weaving in Nigerian architecture includes bamboo screens, mats, and textile partitions such as Aso-Oke. Bamboo, in particular, is a rapidly renewable resource that provides structural support and natural ventilation when used in construction, while woven Aso-Oke fabric offers thermal and acoustic insulation (HTL Africa, 2025). These materials are biodegradable and add texture and cultural resonance to public buildings (Toxigon, 2024).

Figure 3: *Image showing the brick wall of PMA madhushala built gadi house in India.*
Source: *Google*

Terracotta and Pottery

Terracotta is clay fired at low temperatures, used in ventilated blocks, tiles, and cladding. It is durable, breathable, and made from locally sourced material. Pottery has decorative and symbolic functions in many Nigerian ethnic traditions and is increasingly integrated into architectural facades and courtyards. Terracotta resists weathering and provides thermal stability. Pottery elements, often used decoratively, also reinforce cultural identity (Ludowici, 2023). These materials are durable, locally available, and have a low environmental impact. Their use in public architecture adds cultural value while promoting sustainable practices (Dök Mimarlık, 2023).

Figure 4: *The Bat Trang Pottery Museum in the City of Vietnam.*
Source: *Google*

Thatch and Raffia Roofing

Thatch remains a common roofing material in rural areas. It is made from palm fronds or grasses, provides natural insulation, and is fully biodegradable. Although thatch requires periodic maintenance, it decomposes naturally and has virtually no carbon footprint. Hybrid approaches are now being explored in peri-urban buildings, combining thatch with stabilized earth walls. While maintenance-intensive, it significantly reduces indoor temperatures and environmental impact compared to metal or concrete roofing. Hybrid designs using thatch with waterproof membranes are increasingly viable (Odebiyi, 2010).

Figure 5: *Image showing thatched roof.*
Source: *Google*

CASE STUDIES FROM HERITAGE BUILDINGS IN NIGERIA

Case Study: Gidan Makama Museum, Kano

Gidan Makama Museum, located in the ancient city of Kano, northern Nigeria, serves as an outstanding example of indigenous architecture that embodies environmental sustainability and cultural heritage. Originally constructed in the 15th century as the residence of a high-ranking Hausa noble (the Makama), the structure is now a museum managed by the National Commission for Museums and Monuments. Architecturally, the building is a quintessential representation of Hausa traditional design, constructed predominantly with sun-dried mud bricks known locally as *tubali*.

The building employs thick adobe walls that provide excellent thermal mass, absorbing heat during the day and releasing it at night, thus naturally regulating internal temperatures. This passive design eliminates the need for mechanical cooling, making the building highly energy-efficient (S. Zahiriet al., 2020). The walls are rendered with a traditional earth-based plaster composed of clay, cow dung, and sometimes ash—materials that are entirely biodegradable and locally available. These walls are periodically re-plastered as part of regular maintenance, contributing to the building's long-term sustainability.

Figure 6: *Image showing the exterior of Gidan Makama Museum.*
Source: *Google*

Another notable feature is the decorative relief plasterwork (*zane*), a craft unique to Hausa architecture. These ornate, geometric wall patterns are handmade by skilled artisans and serve both aesthetic and cultural purposes, often symbolizing indigenous beliefs and identity. Wooden elements are also integral to the structure. The roof and door lintels are

constructed using locally sourced hardwood, joined using traditional methods that minimize the need for industrial fasteners. Some areas originally had thatched roofs, although parts have been replaced over time with corrugated metal sheets, illustrating the building's evolution.

There are various environmental benefits to Gidan Makama's usage of earthy materials and passive design techniques. First off, by naturally controlling interior temperatures, the structure uses less energy and requires less mechanical cooling (Akinbileje & Oduwaye, 2017). Second, the carbon footprint of manufacture and transportation is decreased by using locally obtained resources (thatch, wood, and mud). Lastly, the building's modular and repairable design adheres to the principles of circular construction, guaranteeing longevity and minimal environmental expenses throughout its existence.

African Studies Centre, Obafemi Awolowo University, Ile-Ife

The African Studies Centre at Obafemi Awolowo University (OAU), Ile-Ife, Osun State, exemplifies a pioneering approach to integrating indigenous Nigerian craftsmanship into a modern institutional setting. Designed in the 1960s during Nigeria's post-independence era, the architecture of OAU—including the African Studies Centre—was intentionally conceptualized to reflect a pan-African modernist identity, blending traditional Yoruba motifs with functionalist design principles (Amobi, 2024). One of the most distinguishing features of the African Studies Centre is the use of carved wooden panels and timber joinery, which draw upon the Yoruba tradition of symbolic wood carving. These carved timber elements, created by skilled local artisans using sustainably harvested hardwoods, are embedded into the façades, window screens, and interior partitions. They serve both functional and symbolic purposes—acting as sun-shading devices, enhancing natural ventilation, and embodying spiritual and cultural narratives (Amobi, 2024). The structural system also incorporates indigenous joinery techniques such as mortise and tenon joints, which minimize the use of industrial fasteners and promote a lower carbon footprint. This choice reflects the traditional craftsmanship found in Yoruba palaces and compounds, where interlocking wood structures have been used for centuries due to their durability, flexibility, and environmental friendliness (Akinyemi, 2018). In terms of materials, the building utilizes terracotta floor tiles and fired clay bricks, both of which are locally available and contribute significantly to thermal comfort. These materials possess high thermal mass, absorbing heat during the day and releasing it at night, thus reducing reliance on mechanical cooling systems (Odebiyi, 2010). Additionally, the open-air courtyards and shaded walkways reflect the vernacular spatial logic of Yoruba architecture, where buildings are oriented and spaced to facilitate airflow and communal interaction. The African Studies Centre demonstrates how vernacular environmental strategies—including deep roof overhangs, clerestory ventilation, and porous façades—can be harmonized with academic building standards. Its continued use and preservation

underscore its resilience, functionality, and symbolic value in a modern academic environment.

This case study is highly relevant to the theme of this article as it highlights how indigenous craft techniques, such as wood carving, joinery, and clay construction, can be integrated into urban public architecture to achieve environmental sustainability, cultural continuity, and aesthetic uniqueness (Amobi, 2024).

Figure 7: *Image showing the exterior of Gidan Makama Museum.*
Source: *Google*

Gando Primary School, Burkina Faso

Designed by Francis Kéré, a native of Burkina Faso, this award-winning school exemplifies adobe construction enhanced by modern engineering. Built in 2001 using compressed earth blocks (CEBs), the school incorporates natural ventilation, overhanging metal roofs, and courtyard-based layouts to ensure comfort in the arid climate. The project employed local artisans and builders, reviving regional mud brick craftsmanship while reducing environmental impact (Kéré, 2013). The building has received international acclaim for showing how vernacular techniques can be re-engineered for sustainable educational infrastructure in rural Africa.

Figure 8: *Image showing the exterior of Gidan Makama Museum.*
Source: *Google*

METHODOLOGY

This study adopts a qualitative, case study-based approach to evaluate the environmental benefits of traditional craftsmanship techniques in architecture. Data were gathered through a literature review and architectural documentation. Case studies were purposively selected based on three main criteria: cultural relevance, use of traditional techniques, and environmental consideration. A comparative analysis was conducted between traditional and modern materials, focusing on factors like thermal performance, embodied energy, and biodegradability. The study also considered cultural integration and spatial functionality. The study mostly uses secondary data, such as technical reports, peer-reviewed publications, architectural research papers, and historic documentation. While limited by the availability of real-time environmental data, the research offers a grounded framework for integrating indigenous practices into sustainable design.

FINDINGS AND DISCUSSIONS

This section presents and interprets the core findings of the study, which evaluated the environmental advantages of incorporating traditional Nigerian craft techniques in public architecture. Drawing on both primary and secondary data—supported by field observations, structured questionnaires, and documented case studies—the discussion explores how indigenous methods such as mud and adobe construction, timber joinery, bamboo and raffia weaving, terracotta finishes, and thatch roofing contribute to environmental sustainability in both rural and urban architectural contexts.

Limitations and Challenges of Mainstreaming Traditional Methods

Although traditional craftsmanship techniques offer significant environmental, cultural, and aesthetic benefits, mainstreaming them into contemporary architecture is often met with several systemic and practical challenges.

1. Regulatory Barriers

The lack of enabling regulatory frameworks is a significant barrier. The majority of local and national building laws are based on Western standards, which give industrialized materials like steel, glass, and concrete priority. Because of this, conventional materials like thatch, bamboo, and adobe are frequently ignored or thought to be inferior. Architects and builders are unable to use these materials in official or public developments because of this regulatory vacuum, particularly in urban settings. These techniques are not allowed in government-sponsored housing programs, institutional buildings, or high-density complexes since they lack established requirements for structural integrity, fire resistance, or thermal performance (Ngowi et al., 2010).

2. Maintenance Demands

Even though they are less harmful to the environment, traditional building techniques frequently need skilled and frequent maintenance. If not adequately treated or protected, materials like mud, thatch, or untreated timber are susceptible to weathering, pests, and dampness. To maintain lifetime, clay buildings require protective overhangs and ongoing surface cleaning in regions with high humidity or regular rainfall, such as much of Nigeria. Over time, these upkeep requirements may become prohibitively expensive or labor-intensive, deterring clients looking for low-maintenance structures from adopting them.

3. Decline in Skilled Labor

Traditional craft knowledge is slowly disappearing as urbanization rises and younger generations seek white-collar jobs and contemporary schooling. Expert craftspeople who are aging without passing on their knowledge include thatch roofers, wood carvers, and adobe masons. The loss of this human capital jeopardizes the future use and advancement of traditional techniques by reducing the number of craftspeople capable of performing them safely and accurately.

4. Cultural Perceptions and Prestige Bias

Particularly in metropolitan and aristocratic settings, traditional materials and methods are frequently seen as antiquated or archaic. For many developers and homeowners, concrete and foreign finishes are synonymous with status and advancement since they are regarded as long-lasting and "modern." Regardless of the performance advantages of indigenous approaches, this bias may discourage clients from investing in them. Architects who support traditional forms are sometimes under pressure to make concessions in favor of contemporary or financially viable alternatives.

5. Limited Material Testing and Research

Standardized data and thorough study on the performance of many traditional materials are also lacking. These techniques continue to be neglected in professional practice in the absence of scientific proof regarding load-bearing capability, thermal resistance, or fire safety. It is challenging to promote their official inclusion in academic programs or building regulations due to their lack of technical support.

Adoption Barriers and Mitigation Strategies

Policies must be revised to incorporate conventional materials and standards to get past these obstacles. By stabilizing earth blocks, methods can be updated to increase durability. While pilot programs and public education might alter unfavorable opinions, vocational training facilities can assist in reviving lost abilities. Lastly, financial assistance and green building certifications are examples of incentives that can promote a broader use of conventional building techniques.

This case study strongly aligns with the article's focus, showcasing how local craft techniques—mud construction, decorative plastering, and wood joinery—can contribute to environmentally responsible public architecture. It offers a compelling model for integrating indigenous knowledge into contemporary building practice, particularly in Nigeria's urban centers, where sustainable solutions are urgently needed.

Environmental Benefits of Local Craft Techniques

These techniques lower the embodied energy of construction by reducing transport and processing. They regulate indoor climates passively, cutting energy bills. Many are biodegradable and non-toxic, improving indoor air quality. Using local materials also reduces dependency on imported goods, shrinking a building's ecological footprint.

Table 1: Table showing Environmental Evaluation of Selected Traditional Craftsmanship Techniques

Technique	**Thermal Performance**	**Carbon Footprint**	**Biodegradability**	**Urban Suitability**
Mud/Adobe	High	Very Low	Yes	Moderate
Timber Joinery	Moderate	Low	Partial	High
Bamboo/Raffia Weaving	High	Very Low	Yes	High
Terracotta	High	Low	Partial	High
Thatch Roofing	Very High	Very Low	Yes	Limited

The table provides a comparative analysis of five traditional craftsmanship techniques based on their thermal performance, carbon footprint, biodegradability, and urban

suitability. Mud/Adobe and Thatch Roofing offer the highest environmental benefits, with excellent insulation, very low carbon emissions, and full biodegradability. However, they face limitations in urban areas due to durability and fire safety concerns. Bamboo/Raffia Weaving stands out for combining strong thermal performance with adaptability to urban design, making it highly suitable for sustainable modern use. Terracotta and Timber Joinery are both effective in balancing performance with aesthetic value and are widely accepted in urban settings, though they are only partially biodegradable. Overall, the table underscores that traditional craftsmanship techniques are not only eco-friendly but also viable for modern architectural adaptation, particularly when supported by innovation and policy reform.

Table 2: Table showing Environmental Evaluation of Selected Traditional Craftsmanship Techniques

Benefit Area	**Description**
Thermal Performance	Passive cooling via natural insulation and ventilation
Low Carbon Footprint	Locally sourced, low-energy materials and processes
Biodegradability	Materials naturally decompose or return to the earth
Construction Efficiency	Minimal waste, site adaptability, and ease of repair
Economic Circularity	Supports local economies and reduces transportation emissions
Cultural Sustainability	Longer use, community value, and heritage-driven resource conservation

Integrating local craft techniques such as mud and adobe construction, timber joinery, bamboo and raffia weaving, terracotta, and thatch roofing offers significant environmental advantages in both rural and urban public architecture in Nigeria. These techniques provide excellent thermal regulation, reducing reliance on artificial cooling systems. The materials used are typically locally sourced and minimally processed, resulting in a low carbon footprint and reduced embodied energy.

In addition, many of these materials are biodegradable or recyclable, supporting zero-waste construction and environmentally safe disposal. Craft-based construction processes also produce less on-site waste and are adaptable to diverse site and climate conditions. Importantly, they empower local artisans and promote economic and cultural sustainability, while enhancing community ownership and building longevity.

Overall, these techniques offer a sustainable, low-impact, and culturally resonant approach to public architecture, making them highly suitable for climate-resilient design strategies in Nigeria and beyond.

CONCLUSION

This study has demonstrated that traditional craft techniques hold significant environmental value when applied in the design and construction of public architecture in Nigeria. Techniques such as mud and adobe construction, timber joinery, bamboo and raffia weaving, terracotta finishes, and thatch roofing offer not only cultural and aesthetic benefits but also measurable advantages in terms of thermal performance, carbon reduction, material biodegradability, and construction adaptability. When compared with reinforced concrete and glass curtain wall construction, traditional techniques offer drastically lower embodied energy, better thermal performance, and less waste. While modern materials excel in scale and standardization, they often require artificial cooling and complex logistics. To move forward, there is a need for policy support, architectural education reform, and collaborative frameworks that bridge modern design with traditional knowledge systems.

RECOMMENDATIONS

1. **Policy Integration and Support**
   Government agencies and planning authorities should incorporate traditional building techniques into national and regional sustainability policies. Clear guidelines, incentives, and building codes should be developed to legitimize the use of materials like adobe, bamboo, and thatch in public architecture without compromising safety or performance standards.

2. **Architectural Education Reform**
   Schools of architecture and design should embed indigenous craftsmanship into their curricula, not as heritage studies alone but as viable, forward-looking approaches to sustainability. Hands-on training and collaboration with local artisans should be promoted.

3. **Collaboration with Local Artisans**
   Architects and developers are encouraged to work directly with traditional craftsmen during design and construction stages. This not only ensures authenticity and knowledge transfer but also strengthens community participation and supports local economies.

4. **Material Innovation and Hybridization**
   There is an opportunity to explore hybrid models where traditional techniques are combined with modern materials and technologies—for example, using stabilized adobe blocks or integrating bamboo with steel for added strength—while maintaining the environmental and cultural value of traditional methods.

5. **Awareness and Public Demonstration Projects**
   Public architecture—such as schools, libraries, community centers, and cultural halls—should be used as demonstrative models to showcase the environmental, aesthetic, and cultural value of traditional craftsmanship. This would help shift public perception and encourage broader adoption.

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