Assessment of the Impact of Climatic and Security Challenges on Sustainable Building Practices in Geidam, Yobe State

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Abstract

This study investigates the impact of climatic and security challenges on sustainable building practices in Geidam, Yobe State, Nigeria. Using a mixed-methods approach that includes structured questionnaires, key informant interviews, and systematic on-site observations, the research explores key factors influencing construction activities, assesses the application of sustainable practices, evaluates adaptation strategies using local materials, and provides actionable policy recommendations. Findings reveal that climate factors such as excessive heat, seasonal flooding, and sandstorms, as well as persistent security issues including insurgency, vandalism, and migration displacement, significantly affect building construction in the region. While awareness of sustainable practices is moderately high among professionals and community stakeholders, the actual implementation of such practices is hindered by economic, technical, and institutional constraints. The study advocates for policy enforcement, technical training, and increased community engagement to enhance sustainability in building practices.

Keywords: Sustainable building, climate change, insecurity, Geidam, local materials, construction, resilience, northern Nigeria

1. INTRODUCTION

The need for sustainable building practices has become increasingly important in regions affected by environmental and socio-political stressors. In the northeastern part of Nigeria, particularly in Geidam, Yobe State, the construction industry faces significant challenges posed by harsh climatic conditions and recurring security threats. These challenges not only affect the quality and resilience of buildings but also influence long-term urban planning, housing development, and sustainability efforts.

Geidam lies within the Sahelian zone, characterized by high temperatures, low rainfall, and strong seasonal winds. These climatic conditions necessitate the use of energy-efficient and climate-responsive building strategies to ensure thermal comfort and reduce reliance on mechanical cooling systems (Otegbulu, 2011). However, limited technical capacity and the use of non-climate-responsive construction techniques have contributed to energy inefficiency and poor indoor environmental quality.

Compounding this issue is the persistent security threat from insurgent groups like Boko Haram and the Islamic State West Africa Province (ISWAP), which has led to the destruction of infrastructure, displacement of people, and disruption of socio-economic activities. Notably, in October 2023, Boko Haram militants attacked Gurokayeya village in Geidam, resulting in the deaths of 17 villagers, followed by a landmine explosion that killed 20 mourners the next day (Umar, 2023). Further attacks in 2024 and early 2025 have continued to destabilize the region, with incidents including the killing of residents, destruction of properties, and mass displacements (Sahara Reporters, 2024a; 2024b; 2025).

As a result, there is an urgent need to re-evaluate current building practices and propose sustainable solutions that are resilient to both environmental and security-related challenges. This study seeks to assess how climatic and security challenges influence sustainable building practices in Geidam and to propose practical strategies that can enhance resilience and adaptability in the built environment

Statement of the Problem

Despite growing awareness of sustainable construction in Nigeria, regions like Geidam still face major barriers to implementing these practices due to their unique climate and conflict situations. Traditional building methods are often ill-suited to the harsh climate, while insecurity deters long-term planning and investment in durable infrastructure. Many buildings are constructed with minimal adherence to sustainability standards, which compromises safety, comfort, and energy efficiency.

Insecurity has also led to the destruction of residential and public buildings, forcing reconstruction efforts that often ignore sustainability in favor of speed and cost-effectiveness. There is a lack of empirical data on how builders and residents in Geidam adapt to these challenges and what opportunities exist for promoting sustainable construction in such a fragile context. This study aims to bridge this gap.

Objectives

1. To identify the major climatic and security challenges affecting the building industry in Geidam.
2. To evaluate current building practices and their alignment with sustainability principles.

3. To examine the materials and technologies employed in local construction in response to climate and security conditions.
4. To recommend strategies for promoting sustainable and resilient building practices in conflict-prone, semi-arid environments.

Significance of the Study

This study provides valuable insights for construction professionals and policymakers in semi-arid and insecure regions, helping to inform sustainable and resilient building practices. It supports the development of context-specific building codes, enhances academic curricula particularly in institutions like Mai Idris Alooma Polytechnic and contributes to the broader discourse on sustainable development in fragile, climate-vulnerable communities.

Scope and Delimitation

The scope of this study is limited to selected residential and public buildings within Geidam town, focusing on structures built or reconstructed in the last 10 years. The research will explore construction methods, materials, and stakeholder perceptions. It will not cover industrial buildings or purely theoretical models, but will instead focus on practical, field-based assessments.

2. REVIEW OF RELATED LITERATURE

Concept of Sustainable Building Practices: Sustainable building refers to structures and processes that are environmentally responsible and resource-efficient throughout a building's life cycle from siting to design, construction, operation, maintenance, renovation, and deconstruction (Kibert, 2016). Key elements include energy efficiency, water conservation, use of renewable materials, and indoor environmental quality.

Climatic Challenges in the Built Environment: Climate significantly influences building design and material selection. In arid and semi-arid regions like Yobe State, extreme temperatures, low humidity, and sandstorms affect the durability and performance of buildings. Studies such as Oladokun et al. (2020) emphasize the need for climate-responsive architecture in Northern Nigeria to mitigate heat stress and material degradation.

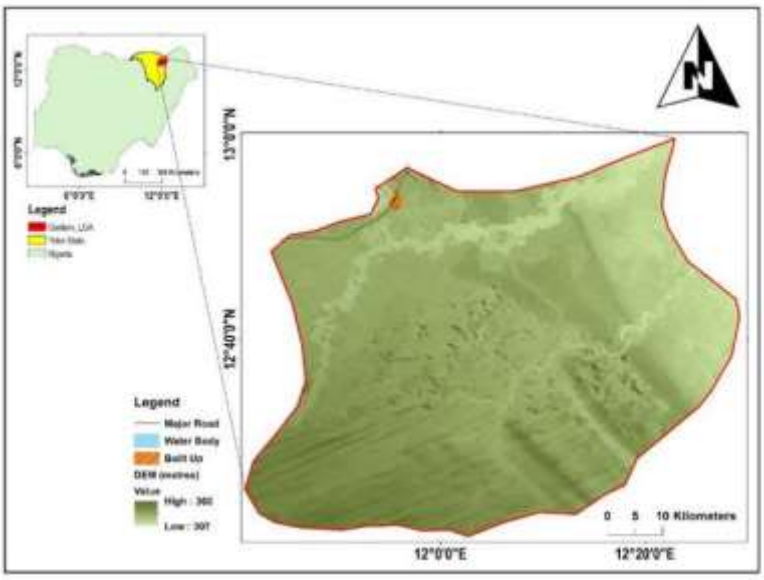
Security Challenges and Construction Activities: Insecurity, particularly from insurgency and banditry, disrupts construction projects through forced migration, destruction of infrastructure, and reluctance of investors to fund long-term projects. Ahmed and Abubakar (2022) observe that many building sites in the North-East region are either abandoned or completed using substandard methods due to the prevailing insecurity.

Use of Local Materials and Indigenous Techniques: Local building materials like mud, adobe, laterite, and thatch have been traditionally used in Geidam. These materials are often more thermally efficient and sustainable compared to modern alternatives. According to Musa and Garba (2019), indigenous construction techniques not only lower construction costs but also improve climate adaptability and community ownership.

Theoretical Framework: Resilience Theory: Resilience theory explains how systems withstand and recover from adverse conditions. In the context of sustainable building, resilience involves designing structures that can cope with environmental and security stressors. This

framework supports the integration of flexibility and adaptability into building design to sustain functionality during shocks (Folke, 2016).

Empirical Studies: Numerous studies have examined aspects of climate and construction.



Ibrahim et al. (2021) assessed passive cooling strategies in Maiduguri and found them effective in reducing indoor temperatures. Similarly, Umar and Yakubu (2020) highlighted that communities in Bauchi State have adapted their buildings using mixed techniques to confront both security and climatic challenges.

Research Gap: While various studies have addressed sustainability in building and effects of climate or conflict separately, there is limited literature focusing specifically on how both climatic and security challenges concurrently influence sustainable building practices in Geidam. This study bridges that gap by combining these two major stressors in a localized context.

3. METHODOLOGY

This study employed a descriptive survey design using a mixed-methods approach, integrating both quantitative and qualitative techniques. This design was chosen to enable the collection of comprehensive data from a diverse range of participants, providing both statistical insights and contextual depth. The research was carried out in Geidam, a local government area in the northeastern part of Yobe State, Nigeria. Situated within the Sahel savannah, Geidam is characterized by extreme weather conditions including high temperatures, low annual rainfall of less than 500 millimeters, sandy soils, and frequent dust storms. Additionally, the area has been significantly affected by persistent insecurity due to the activities of insurgent groups such as Boko Haram and the Islamic State West Africa Province (ISWAP). These conditions have led to the destruction of infrastructure and mass displacement, making Geidam a critical case for examining how environmental and security factors influence sustainable building practices.

Figure 1: Map Showing the Location of Geidam Town in Yobe State, Nigeria

The population of the study comprised building contractors, artisans, architects, engineers, residents, and government officials involved in construction and housing development within Geidam. A total of 150 participants were selected using purposive and stratified random sampling techniques to ensure that all major stakeholders were adequately represented. These included professionals such as engineers and architects, local builders and artisans including masons and carpenters, homeowners who have been directly affected by climatic and security challenges, and officials from the local planning authority and the Ministry of Housing.

Data collection relied on three primary tools: a structured questionnaire, a key informant interview guide, and a field observation checklist. The questionnaire, administered to artisans, residents, and building professionals, was designed to capture demographic data, perceived impacts of climate and insecurity on buildings, the extent to which sustainable practices are adopted, and the barriers to implementing such practices. In-depth interviews were conducted with selected professionals and government officials to provide richer insights into institutional responses and technical perspectives. Field observations were also carried out at selected construction sites to verify the claims made by respondents and to examine the types of materials and construction methods used in the area.

To ensure the validity of the instruments, they were reviewed by experts in building technology and research methodology. A pilot study involving ten participants in Yunusari, a nearby local government area with similar environmental conditions, was conducted to refine the instruments for clarity and relevance. The reliability of the questionnaire was tested using Cronbach's Alpha, with a minimum acceptable coefficient of 0.70 used to confirm internal consistency.

Quantitative data collected through the questionnaires were analyzed using descriptive statistics such as frequencies, percentages, and means, as well as inferential statistics including chi-square tests and correlations, with the aid of SPSS software. The qualitative data derived from interviews and observations were subjected to thematic analysis, which involved coding and categorizing responses to identify patterns relevant to the study objectives.

4. RESULTS

4.1 Key Climatic and Security Factors Influencing Building Construction in Geidam

Data collected reveal that a significant portion of the population (78%) identified excessive heat as a key climatic challenge affecting building construction in the area. Respondents also pointed to frequent sandstorms (65%) and prolonged droughts (52%) as major environmental factors.

On security challenges, 85% of respondents indicated that insecurity, largely due to insurgency, has led to the abandonment of construction projects, delays, and an increase in temporary and makeshift building structures. Interviews confirmed that fear of attacks and displacement hinders investment in durable and sustainable construction.

Table 4.1: Key Climatic and Security Factors Influencing Building Construction in Geidam

Factor	Frequency (n=150)	Percentage (%)
Excessive heat	117	78%
Sandstorms	98	65%
Drought	78	52%
Disruption due to insecurity	128	85%
Abandonment of building projects	114	76%
Migration and displacement effects	103	69%

4.2 Extent of Sustainable Practices in Current Building Projects While 64% of respondents acknowledged an awareness of sustainable building practices, only 42% reported actual implementation. The reasons cited for the low level of implementation included:

- High cost of sustainable materials
- Limited availability of green construction materials
- Lack of technical expertise
- Focus on urgent construction needs due to security instability

Observations on construction sites revealed a lack of passive design techniques, minimal use of local renewable materials, and poor consideration for energy efficiency.

Table 4.2: Awareness and Implementation of Sustainable Building Practices

Item	Yes (Frequency)	Yes (%)	No (Frequency)	No (%)
Awareness of sustainable practices	96	64%	54	36%
Implementation of sustainable practices	63	42%	87	58%
Use of passive design strategies	45	30%	105	70%
Access to sustainable building materials	52	35%	98	65%

4.3 Adaptation of Local Materials and Construction Techniques A majority of the respondents (58%) stated that traditional materials like mud and thatch, though historically effective, are now seen as inadequate against present-day challenges. Builders have adapted by modifying clay bricks with cement for added strength and opting for corrugated metal roofing for its durability, despite its poor thermal performance.

Interview responses also indicated that some builders use reinforced concrete for enhanced security, even though it may not always be climate-appropriate. The adaptations observed are typically short-term and reactive.

Table 4.3: Adaptation of Local Materials and Construction Techniques

Adaptation Strategy	Frequency (n=150)	Percentage (%)
Modified mud bricks with cement	87	58%
Use of metal roofing for durability	105	70%
Reinforced concrete for improved security	91	61%
Integration of traditional and modern methods	78	52%
Limited or no adaptation	39	26%

4.4 Policy or Design Recommendations to Enhance Sustainable Building Outcomes From the responses, about 71% of the participants emphasized the importance of government intervention through policy formulation and subsidy provision. Key recommendations include:

- Enforcing sustainable building codes
- Providing incentives for builders who adopt eco-friendly practices
- Creating awareness campaigns about sustainable construction
- Incorporating local knowledge into modern building designs

Interview participants also stressed the need for technical training for local craftsmen and collaboration with NGOs for funding and capacity-building.

Table 4.4: Policy and Design Recommendations from Respondents

Recommendation	Frequency (n=150)	Percentage (%)
Government subsidies for sustainable materials	107	71%
Enforcement of sustainable building regulations	96	64%
Public sensitization and community training	92	61%
Collaboration with NGOs for technical assistance	84	56%
Incentives for using local, eco-friendly techniques	89	59%

Major Findings The findings from the study are:

- Excessive heat, sandstorms, drought, and insecurity are the most significant challenges impacting building construction in Geidam.
- There is moderate awareness of sustainable building practices (64%), but actual implementation remains low (42%).
- Adaptation strategies include the use of modified mud bricks, metal roofing, and

reinforced concrete, though not always in climate-responsive ways.

- Respondents strongly support government policy interventions, public awareness campaigns, and collaboration with NGOs to enhance sustainability.

The findings reveal that climatic and security challenges have a profound impact on building practices in Geidam. While there is moderate awareness of sustainable practices, actual implementation is limited. Builders are adapting local materials but often lack access to resources and training. Policy and institutional support are critical for improving sustainability in construction under the existing challenges.

5.CONCLUSION AND RECOMMENDATIONS

Conclusion The study concludes that the combined effects of climate and insecurity significantly hinder sustainable building development in Geidam. While builders are making efforts to adapt to these challenges, such efforts are often constrained by resource limitations, lack of technical knowledge, and absence of supportive policy frameworks. Without deliberate intervention, the sustainability of the built environment in Geidam remains threatened.

Recommendations Based on the findings, the following recommendations are made:

1. Policy Implementation**:** Government should enforce policies that mandate the use of sustainable construction practices, especially in conflict-prone and climate-sensitive areas.
2. Capacity Building**:** Training programs should be introduced for builders and artisans on modern sustainable construction techniques that can be blended with local materials.
3. Financial Incentives**:** Provide subsidies and tax incentives for developers and homeowners who adopt sustainable and climate-resilient materials.
4. Public Awareness**:** Conduct public sensitization campaigns to raise awareness about the benefits of sustainable building practices.
5. Partnerships: Encourage collaboration between government agencies, NGOs, and private sector stakeholders to improve access to sustainable building resources and technical assistance.

REFERENCES

Adedeji, Y. M. D., & Oduwaye, L. (2012). Resilient Architecture: A Response to Climate and Conflict in Nigeria. *Journal of Environmental Design and Management*, 4(1), 25–33.

Ahmed, S., & Abubakar, A. (2022). Insecurity and Construction Projects in North-East Nigeria. *Journal of Security Studies*, 14(2), 44–58.

Federal Ministry of Environment. (2019). *National Building Code*. Abuja, Nigeria: FGN Press.

Folke, C. (2016). Resilience and sustainable development: Building adaptive capacity in a world of transformations. *Global Environmental Change*, 16(3), 253–267.

Ibrahim, U., Sani, M., & Aliyu, T. (2021). Climate-adaptive strategies for sustainable housing in Maiduguri. *Built Environment Review*, 9(1), 22–34.

International Crisis Group. (2020). *An Exit from Boko Haram? Assessing Nigeria's North-East Security Strategy*. Retrieved from https://www.crisisgroup.org

International Crisis Group. (2020). *Facing the challenge of the Sahel*. Retrieved from https://www.crisisgroup.org

John Wiley & Sons. Musa, A., & Garba, A. (2019). Indigenous Building Practices in Northern Nigeria: Challenges and Prospects. *International Journal of Sustainable Architecture*, 6(3), 89–97.

Kibert, C. J. (2016). *Sustainable Construction: Green Building Design and Delivery* (4th ed.).

Oladokun, V. O., & Aigbavboa, C. O. (2018). Towards Climate-Responsive Housing in Nigeria: Challenges and Prospects. *Procedia Engineering*, 196, 446–453.

Oladokun, V. O., Adeniran, A. O., & Ajayi, K. (2020). Passive Cooling Techniques for Energy Efficiency in Nigerian Homes. *Energy for Sustainable Development*, 57, 15–23.

Otegbulu, A. C. (2011). Energy efficiency and climate responsive building design in Nigeria. *International Journal of Sustainable Construction Engineering and Technology*, *2*(1), 33–44.

Otegbulu, A. C. (2011). Sustainable Building Materials for Low-Income Housing in Hot Humid Climates. *International Journal of Sustainable Construction Engineering & Technology*, 2(1), 15–21.

Sahara Reporters. (2024a, January 5). *Boko Haram terrorists attack Yobe community, kill pastor, 13 others; burn church, houses, cars*. Retrieved from https://saharareporters.com/2024/01/05/breaking-boko-haram-terrorists-attack-yobe-community-kill-pastor-13-others-burn-church

Sahara Reporters. (2024b, October 5). *ISWAP terrorists invade Geidam town in Yobe, kill resident, destroy properties*. Retrieved from https://saharareporters.com/2024/10/05/iswap-terrorists-invade-geidam-town-yobe-kill-resident-destroy-properties

Sahara Reporters. (2025, March 18). *Boko Haram terrorists invade Yobe communities, give residents seven days to relocate*. Retrieved from https://saharareporters.com/2025/03/18/exclusive-boko-haram-terrorists-invade-yobe-communities-give-residents-seven-days

Umar, B., & Yakubu, A. (2020). Adaptation to Security and Climate-Induced Challenges in Bauchi State. *Journal of African Built Environment*, 3(2), 66–81.

Umar, H. (2023, November 1). *Extremists kill 37 villagers in latest attack in Nigeria's hard-hit northeast*. AP News. Retrieved from https://apnews.com/article/041cb9299f198d9ba15526079c729d7d

UN-Habitat. (2021). *Rebuilding for Resilience: Housing Recovery in Conflict Zones*. Nairobi: United Nations Human Settlements Programme.