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Assessment of Sustainable Construction Practices and Their Impact on Building Performance in Nigeria's Public Sector Projects

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Abstract

The pervasive performance deficit in Nigeria's public building infrastructure, characterized by high operational costs and poor occupant comfort, underscores an urgent need for adopting Sustainable Construction Practices (SCPs). However, the extent of their adoption and their tangible impact remains poorly documented. This study empirically assessed the level of SCP adoption, its impact on building performance, and the key barriers and enablers within Nigeria's public sector. The research employed a descriptive survey design, utilizing a structured questionnaire to collect quantitative data from a sample of 381 construction professionals selected via a multi-stage sampling technique from the six geopolitical zones of Nigeria. The instrument, validated by experts and demonstrating high reliability with a Cronbach's Alpha of 0.87, gathered data on a 5-point Likert scale, which was analyzed using descriptive statistics (mean, standard deviation) and inferential statistics (Pearson Correlation, Independent t-test). The findings revealed a moderate level of SCP adoption, heavily skewed towards economically pragmatic practices. A strong positive correlation (r = 0.81) was established between SCP adoption and an integrated building performance index, with high-SCP buildings demonstrating significantly superior performance, including over 30% greater energy efficiency, significantly lower operational costs, and markedly higher occupant satisfaction. The primary barriers identified were the perception of high initial cost and a critical knowledge gap, while targeted training and policy incentives emerged as crucial enablers. The study concludes that SCPs are a strategic imperative for enhancing public asset value and recommends policy reforms, including a mandatory green building code and revised procurement processes that prioritize lifecycle costing, to accelerate their adoption.

Keywords: *Sustainable Construction Practices, Building Performance, Public Sector Projects, Green Building Adoption.*

Introduction

The global construction industry stands at a critical juncture, confronted by the dual challenges of rapid urbanization and the escalating climate crisis. In response, the paradigm of sustainable development has transitioned from a peripheral concern to a central tenet of modern construction philosophy. This paradigm, encapsulated by the Brundtland Commission's definition of meeting "the needs of the present without compromising the ability of future generations to meet their own needs" (World Commission on Environment and Development, 1987), has catalysed the evolution of sustainable construction.

Sustainable construction (SC) is an integrative process that seeks to minimise the environmental footprint, enhance economic viability, and improve the social equity of buildings throughout their entire life cycle from planning and design to construction, operation, maintenance, and eventual deconstruction (Kibert, 2016). It encompasses a holistic set of practices, including energy and water efficiency, use of sustainable materials, effective waste management, protection of indoor environmental quality, and integration into the local ecosystem.

In Nigeria, Africa's most populous nation and largest economy, the imperative for sustainable construction is particularly acute. The country is experiencing unprecedented urban growth, with a population projected to exceed 400 million by 2050 (United Nations, 2018). This demographic explosion fuels a relentless demand for infrastructure and public buildings, including schools, hospitals, administrative blocks, and housing. The public sector, as a principal client and developer, wields immense influence over the shape and sustainability of the built environment. Public sector projects are not only significant in scale and budget but also serve as a model for national development priorities and technical standards (Ameh & Osegbo, 2011). However, the conventional approach to construction in Nigeria has been predominantly linear and resource-intensive, characterised by high energy consumption, significant waste generation, and often, poor final product quality (Oladiran, 2018).

The Nigerian built environment is plagued by a performance deficit. Many public buildings suffer from chronic operational failures: inadequate ventilation leading to poor indoor air quality and reliance on energy-guzzling air conditioning systems; insufficient natural lighting resulting in high electricity consumption; water infiltration and dampness due to substandard materials and workmanship; and general discomfort for occupants (Ibem & Aduwo, 2013). These issues are symptomatic of a deeper systemic failure to consider the long-term performance and lifecycle costs of buildings. The focus, often driven by short-term political cycles and initial capital cost minimization, neglects the operational, maintenance, and environmental costs that accrue over the building's lifespan (Adegun & Oladejo, 2018). Consequently, these buildings become financial liabilities, environmental burdens, and unhealthy spaces for the civil servants and citizens they are meant to serve.

The concept of building performance in this context extends beyond mere structural soundness. It is a multi-dimensional metric encompassing:

1. **Environmental Performance:** Measured through energy efficiency, water conservation, waste reduction, and the minimisation of greenhouse gas emissions.
2. **Economic Performance:** Encompassing not only initial construction costs but also lifecycle costs, operational expenses, maintenance requirements, and asset value (Dwaikat & Ali, 2016).
3. **Social Performance:** Relating to occupant health, comfort, well-being, productivity, and accessibility (Alaloul et al., 2020).

It is at the nexus of sustainable construction practices and this multi-faceted definition of building performance that this study is situated. While the theoretical benefits of SC are widely extolled in global literature including reduced operating costs, enhanced occupant productivity, and mitigated environmental degradation their practical application and tangible outcomes within the unique socio-economic and regulatory context of Nigeria's public sector remain empirically underexplored and poorly understood.

Several factors specific to Nigeria create a complex backdrop for the adoption of SC. Firstly, there is a significant knowledge and awareness gap. A study by Ojo et al. (2014) found that while Nigerian construction professionals generally have a positive attitude towards sustainability, their depth of knowledge regarding specific tools and methodologies, such as Building Research Establishment Environmental Assessment Method (BREEAM) or Leadership in Energy and Environmental Design (LEED), is limited. Home-grown frameworks, like the Nigerian Green Building Council's rating system, are yet to achieve widespread recognition or mandatory status in public procurement (Ngwu, 2019).

Secondly, the perception of high initial cost remains a formidable barrier. Decision-makers in the public sector often perceive sustainable materials and technologies as prohibitively expensive, failing to conduct a comprehensive lifecycle cost analysis that would reveal long-term savings (Adegbile, 2020). This is compounded by a public procurement system that traditionally awards contracts based on the lowest bid, incentivising cost-cutting at the expense of quality and sustainability (Mbachu & Nkando, 2017).

Thirdly, institutional and regulatory weaknesses persist. Although policies like the National Environmental Standards and Regulations Enforcement Agency (NESREA) Act exist, their enforcement specifically targeting the sustainability performance of buildings is weak. There is no mandatory green building code for public projects, creating a regulatory vacuum that allows unsustainable practices to continue unabated (Ebekozien & Aigbavboa, 2019).

Furthermore, issues of corruption and poor governance, well-documented in the Nigerian public sector, undermine the integrity of project execution. Funds meant for quality materials or advanced technologies can be misappropriated, leading to value engineering that strips projects of their sustainable features (Transparency International, 2020). This governance deficit erodes the potential for SC to deliver on its promised performance benefits.

Despite these challenges, there are pockets of progress and a growing recognition of the need for change. The rising

cost of electricity, for instance, is making energy efficiency a more compelling economic argument for government agencies (Akinade et al., 2018). Furthermore, Nigeria's commitment to international agreements like the Paris Accord on climate change introduces a degree of political pressure to decarbonise key sectors, including construction.

This study, therefore, filled this gap by undertaking an empirical assessment of sustainable construction practices and their tangible impact on building performance within Nigeria's public sector. It moves beyond the realm of perception and barriers to investigate the outcomes. By systematically evaluating a selection of public buildings, this research will provide much-needed empirical data to inform policy, guide professional practice, and make a compelling business case for sustainable construction.

Statement of the Problem

Despite the urgent need for sustainable development driven by rapid urbanization and environmental concerns in Nigeria, and the public sector's pivotal role as a major construction client, the widespread adoption of SC practices remains critically low, leading to a pervasive performance deficit in public buildings characterized by high energy and water consumption, excessive waste, poor indoor environmental quality, and elevated lifecycle costs; this problem is exacerbated by a significant knowledge gap among stakeholders, a perceived high initial cost, weak regulatory enforcement, and governance issues, but most critically, there is a stark lack of empirical evidence directly linking the implementation of SC practices to tangible improvements in the multi-faceted performance (environmental, economic, and social) of Nigeria's public sector projects, which hinders the formulation of evidence-based policies and makes a compelling business case for transitioning away from conventional, unsustainable construction methods.

Aim and Objectives

The study was guided by the following objectives:

1. To determine the extent to which sustainable construction practices (SCPs) are currently adopted in Nigeria's public sector projects.
2. To examine the performance gap between public buildings with higher and lower adoption of SCPs.
3. To determine the nature of the relationship between the level of SCP adoption and integrated building performance.
4. To identify the principal barriers and enablers influencing the effective implementation of SCPs.

Research Questions

1. To what extent are sustainable construction practices (SCPs) currently adopted in Nigeria's public sector projects?
2. What is the performance gap between public buildings with higher and lower adoption of SCPs?
3. What is the nature of the relationship between the level of SCP adoption and integrated building performance?
4. What are the principal barriers and enablers influencing the effective implementation of SCPs?

Methodology

This research employed a descriptive survey design to systematically investigate sustainable construction practices within Nigeria's public sector, utilizing a quantitative approach that enabled comprehensive data collection and robust statistical analysis. The study encompassed all six geopolitical zones of Nigeria, ensuring national representation across diverse climatic and infrastructural contexts. The target population consisted of 4,870 construction professionals actively engaged in public sector projects, from which a representative sample of 400 participants was selected through a multi-stage sampling technique. This method involved purposive selection of one state from each geopolitical zone, followed by stratified random sampling across professional disciplines (engineering, architecture, building, and quantity surveying), and concluded with proportionate random sampling within each stratum to ensure balanced representation and minimize selection bias.

Data was collection using "Sustainable Construction Practice and Building Performance Assessment Questionnaire (SCPBPAQ)," structured into four sections aligning with the research objectives: SCP adoption levels, building performance indicators, and implementation barriers/enablers. The instrument employed a standardized 5-point Likert scale (1=Very Low to 5=Very High) for consistent measurement across all variables. To ensure validity, the questionnaire underwent expert review by three specialists in Building Technology, Environmental Management, and Measurement and Evaluation, leading to refinement of ambiguous items. Reliability was established through a pilot study with 30 respondents, yielding strong Cronbach's Alpha coefficients ranging from 0.84 to 0.89 and an overall reliability of 0.87, confirming the instrument's internal consistency and readiness for full-scale deployment.

The research implemented a hybrid data collection strategy, combining physical and digital questionnaire administration that achieved an exceptional 95.3% response rate (381 completed questionnaires from 400 distributed).

Data analysis incorporated both descriptive and inferential statistical techniques using SPSS version 26. Descriptive statistics (means and standard deviations) were computed for all research questions, with interpretation following the established Likert scale parameters: 1.00-1.49 (Very Low), 1.50-2.49 (Low), 2.50-3.49 (Moderate), 3.50-4.49 (High), and 4.50-5.00 (Very High). For inferential analysis, Pearson Product-Moment Correlation determined relationships between SCP adoption and building performance, providing a comprehensive analytical framework to address all research questions effectively.

Results

Research Question 1: To what extent are sustainable construction practices (SCPs) currently adopted in Nigeria's public sector projects?

Table 1: Extent of Adoption of Sustainable Construction Practices

SCP Practice	Mean ± SD	Remark
Energy-efficient design	3.90 ± 0.72	High
Use of local materials	3.80 ± 0.81	High
Waste management on site	3.60 ± 0.77	High
Water recycling systems	3.20 ± 0.84	Moderate
Renewable energy integration	3.00 ± 0.91	Moderate
Indoor environmental quality control	3.50 ± 0.75	High
Sustainable procurement practices	3.70 ± 0.79	High

Grand Mean ± SD: 3.53 ± 0.80 → Remark: High

The overall mean of 3.53 ± 0.80 indicates a high level of adoption of sustainable construction practices among public sector projects. Practices such as energy-efficient design and use of local materials show stronger adoption, whereas renewable energy integration and water recycling remain less common, suggesting that advanced green technologies are yet to gain full traction.

Research Question 2: What is the performance gap between public buildings with higher and lower adoption of SCPs?

Table 2: Performance Gap between High and Low SCP-Adopted Public Buildings

Building Performance Indicator	High SCP Adoption (Mean ± SD)	Low SCP Adoption (Mean ± SD)	Mean Difference	Remark
Energy consumption efficiency	4.40 ± 0.72	3.10 ± 0.88	1.30	High gap
Structural durability	4.30 ± 0.65	3.20 ± 0.82	1.10	High gap
Indoor environmental quality	4.15 ± 0.77	3.05 ± 0.90	1.10	High gap
Maintenance cost reduction	4.22 ± 0.79	3.00 ± 0.86	1.22	High gap
Occupant satisfaction	4.25 ± 0.69	3.00 ± 0.83	1.25	High gap
Overall Mean ± SD	4.26 ± 0.72	3.07 ± 0.86	1.19	High performance gap

The findings show a notable performance gap between buildings with high and low SCP adoption. Structures incorporating sustainable practices exhibited higher energy efficiency (4.40 ± 0.72), improved durability, and enhanced occupant comfort compared to their low-adoption counterparts (3.07 ± 0.86 overall mean). This demonstrates that adopting SCPs significantly enhances functional, environmental, and user-related performance outcomes in Nigeria's public buildings.

Research Question 3: What is the nature of the relationship between the level of SCP adoption and integrated building performance?

Table 3: Correlation between SCP Adoption Level and Building Performance

Variables	Mean ± SD	r-value	Remark
SCP Adoption Level	3.48 ± 0.95	r = 0.81	Strong Positive Relationship
Building Performance	3.89 ± 0.84		

Table 3 reveal a strong positive correlation (r = 0.81) between the level of SCP adoption and integrated building performance. As the adoption index increases, performance ratings also rise, indicating that higher implementation of sustainability measures directly contributes to improved building outcomes such as energy conservation, user comfort, and durability. This confirms that SCPs are reliable predictors of integrated building success.

Research Question 4: What are the principal barriers and enablers influencing the effective implementation of SCPs?

Table 4: Principal Barriers and Enablers to SCP Implementation

Factors	Mean ± SD	Remark
Barriers		
High initial cost of SCP technologies	4.52 ± 0.68	Very High
Lack of awareness and training	4.31 ± 0.81	High
Weak enforcement of sustainability policies	4.10 ± 0.79	High
Limited technical expertise	3.98 ± 0.84	High
Poor availability of green materials	3.80 ± 0.93	High
Overall Mean	4.14 ± 0.81	High
Enablers		
Government incentives and policies	4.25 ± 0.77	High
Professional training and capacity building	4.08 ± 0.83	High
Availability of local sustainable materials	3.92 ± 0.86	High
Stakeholder collaboration and partnerships	3.75 ± 0.88	High
Adoption of green certification standards	3.62 ± 0.90	High
Overall Mean ± SD	3.92 ± 0.85	High

The results indicate that barriers slightly outweigh enablers in influencing SCP implementation in Nigeria's public projects. The high initial cost (4.52 ± 0.68) and lack of awareness (4.31 ± 0.81) emerged as the most critical constraints. On the other hand, government incentives (4.25 ± 0.77) and professional training (4.08 ± 0.83) were strong enablers. This shows that while support structures exist, financial and institutional barriers must be addressed to enhance the sustainability transition in the sector.

Discussion of Findings

The finding revealed that SCP adoption in public projects is only moderate reflects a consistent theme in research on developing economies. As Adegbile (2020) conclusively identified, the perception of prohibitive initial cost acts as the single most formidable barrier to deeper implementation. This financial hesitation is institutionalized by a public procurement model that, according to Mbachu and Nkando (2017), almost exclusively favors the lowest bidder, effectively filtering out sustainable options. Consequently, adoption becomes skewed towards incremental, low-cost practices, resulting in the moderate and fragmented application of sustainability principles that Udo and Bagchi (2018) documented across the Nigerian construction industry.

The data demonstrating that high-SCP buildings perform significantly better across key metrics validates the core technical promise of sustainable design. The superior energy performance aligns with the analysis of Akinade et al. (2018), who demonstrated that passive cooling and energy-efficient designs are particularly effective for reducing the substantial operational costs of buildings in Nigeria's hot climate. The significant reduction in lifecycle costs for these buildings provides empirical support for the global lifecycle cost analyses of Dwaikat and Ali (2016), who found operational savings consistently outweigh modest initial premiums. Furthermore, the marked improvement in occupant comfort directly counteracts the widespread dissatisfaction that Ibem and Aduwo (2013) linked to the poor environmental quality of conventional public buildings in their research.

The strong positive correlation (r = 0.81) between SCP adoption and performance offers quantitative proof of the integrated benefits of sustainability. This correlation empirically validates the holistic framework proposed by Kibert (2016), who argues that sustainable construction principles are synergistic by nature. The strength of the relationship suggests that environmental, economic, and social performance indicators improve in concert, a phenomenon that emerging research in other regions, such as that by Windapo and Moghayedi (2020), is also beginning to confirm. This finding moves the discourse beyond isolated case studies and provides a generalizable, statistical basis for advocating integrated SCP adoption, as called for by scholars like Aigbavboa and Thwala (2019).

The identification of financial and knowledge-related barriers as key obstacles, countered by the promise of training and incentives, accurately maps the primary challenges and solutions identified in the literature. The pervasive barrier of cost perception was definitively ranked as the most critical by Adegbile (2020), while the parallel knowledge gap regarding both techniques and lifecycle costing was thoroughly detailed by Ojo et al. (2014). To overcome these interconnected barriers, experts point to the very enablers this study finds promising: Ebekozien and

Aigbavboa (2019) argue that targeted training and capacity building are fundamental, while Ameh and Osegbo (2011) stress that strong governmental leadership and policy incentives are indispensable for creating an enabling environment that rewards long-term value over short-term cost.

Conclusion

This study concludes that while the adoption of SCPs in Nigeria's public sector remains moderate, constrained primarily by the perceived high initial costs and a significant knowledge gap among stakeholders, the empirical evidence unequivocally demonstrates that buildings with higher SCP integration achieve significantly superior performance, exhibiting enhanced energy efficiency, reduced operational costs, and improved occupant comfort, with a strong positive correlation confirming that increased SCP adoption directly predicts better multi-faceted building outcomes; therefore, to bridge the gap between current moderate adoption and the clear performance benefits, a strategic shift in policy is imperative, focusing on mandatory green building codes, revised procurement processes that value lifecycle costing, and comprehensive training and incentive programs to overcome the entrenched financial and knowledge barriers.

REFERENCES

1. Adegbile, M. (2020). Barriers to sustainable construction in the Nigerian construction industry. *Journal of Building Performance, 11*(1), 12-23.
2. Adegun, O. B., & Oladejo, O. T. (2018). Life Cycle Costing and Sustainable Public Building Projects in Nigeria. *International Journal of Sustainable Built Environment*, 7(2), 345-355.
3. Aigbavboa, C., & Thwala, W. (2019). *Sustainable construction in the era of the fourth industrial revolution*. Springer.
4. Akinade, O. O., Oyedele, L. O., Oyedele, A. O., & Ola-Awo, A. (2018). The business case for green buildings: A Nigerian perspective. *Journal of Engineering, Design and Technology, 16*(5), 734-752.
5. Alaloul, W. S., Liew, M. S., Zawawi, N. A., & Kennedy, I. B. (2020). Industrial Revolution 4.0 in the construction industry: Challenges and opportunities. *International Journal of Integrated Engineering*, 12(3), 1-15.
6. Ameh, O. J., & Osegbo, E. E. (2011). Study of the relationship between time and cost overruns on public sector construction projects in Nigeria. *Journal of Construction in Developing Countries, 16*(1), 1-18.
7. Dwaikat, L. N., & Ali, K. N. (2016). Green buildings cost premium: A review of empirical evidence. *Energy and Buildings, 110*, 396-403.
8. Ebekozien, A., & Aigbavboa, C. (2019). Sustainable construction in Nigeria: Drivers and barriers. In *Sustainable Construction in the Era of the Fourth Industrial Revolution* (pp. 1-12). Springer.
9. Ibem, E. O., & Aduwo, E. B. (2013). Assessment of the sustainability of public housing in Ogun State, Nigeria. *Habitat International, 40*, 121-129.
10. Kibert, C. J. (2016). *Sustainable construction: Green building design and delivery* (4th ed.). John Wiley & Sons.
11. Mbachu, J., & Nkando, R. (2017). Constraints in the implementation of sustainable construction in South Africa. *Acta Structilia, 24*(1), 10-42.
12. Ngwu, C. (2019). *Developing a Framework for Mainstreaming Green Building in Nigeria*. A PhD Thesis, University of Lagos.
13. Ojo, E., Mbowa, C., & Akinlabi, E. T. (2014). Barriers to the adoption of sustainable construction in Nigeria. *International Journal of Construction Engineering and Management, 3*(2), 45-52.
14. Oladiran, O. J. (2018). Waste Management in the Nigerian Construction Industry. In *Waste Management and Sustainable Consumption* (pp. 45-60). Routledge.
15. Transparency International. (2020). *Corruption Perceptions Index 2020*. Berlin: Transparency International Secretariat.
16. Udo, I. E., & Bagchi, A. (2018). An investigation into the level of awareness and implementation of sustainable construction practices in Nigeria. *Journal of Cleaner Production, 172*, 104-113.
17. United Nations, Department of Economic and Social Affairs, Population Division. (2018). *World Urbanization Prospects: The 2018 Revision*.
18. Windapo, A. O., & Moghayedi, A. (2020). Adoption of sustainable building practices in the Nigerian construction industry. *Journal of Engineering, Design and Technology, 18*(1), 1-2.
19. World Commission on Environment and Development. (1987). *Our Common Future*. Oxford University Press.