

Quantitative Assessment of Environmental Challenges Hindering Sustainability in the Ghanaian Construction Industry: Implications for Sustainable Development

Harold Adjarko¹, Iruka Anugwo² and Ayodeji Aiyetan³

¹⁻³Department of Construction Management and Quantity Surveying / Faculty of Engineering and the Built Environment, Durban University of Technology, South Africa

Abstract

Environmental challenges in the construction sector pose significant obstacles to achieving sustainability in Ghana. This study quantitatively assesses these challenges, identifying systemic barriers that hinder environmental management practices. A structured survey was conducted with 275 industry stakeholders, including developers, bankers, environmental managers, and government agencies. Using a five-point Likert scale, responses were analysed through descriptive statistics, Spearman's correlation, and exploratory factor analysis (EFA) to categorise key challenges. The findings reveal four dominant challenge constructs: (1) Financial Barriers, (2) Regulatory Deficiencies, (3) Knowledge and Awareness Gaps, and (4) Infrastructure Constraints. Among these, financial barriers emerged as the most critical obstacle (mean = 4.5, SD = 0.5), with high costs of green technologies and limited access to financing deterring sustainability adoption. Weak regulatory enforcement ($r = 0.65$) further exacerbates non-compliance, while inadequate expertise ($r = 0.57$) hinders effective implementation. The study contributes to Institutional Theory by demonstrating that regulatory frameworks alone are insufficient, necessitating complementary financial and educational interventions. Policy recommendations include tax incentives, public-private partnerships for financing, mandatory sustainability training, and improved green infrastructure investments. These findings have broad implications for developing economies facing similar sustainability challenges. Future research should explore policy effectiveness and cross-country comparisons to benchmark Ghana's progress against global best practices.

Keywords: Sustainability, Real Estate, Environmental Challenges, Sustainable Development, Ghana.

1. Introduction

Ghana's construction sector has experienced significant transformation since colonial times, with rapid expansion observed from the early 2000s due to urbanisation, an expanding middle class, and oil discoveries (Locus Estate, 2023; Ghana Investment Promotion Centre, 2020). Key policy interventions, including the State Housing Corporation and the Land Title Registration System, have shaped the industry, facilitating both residential and commercial development (Locus Estate, 2023). By 2019, the construction sector accounted for 9.1% of Ghana's GDP, contributing to economic growth while addressing a housing deficit of approximately two million units (Ghana Investment Promotion Centre, 2020). The sector's high return on investment has made it a lucrative avenue for both domestic and foreign investors (Eden Heights, 2024; Evans *et al.*, 2018). Environmental sustainability in Ghana's construction industry has gained increasing attention since the early 2000s, influenced by global sustainability trends and rising concerns over resource depletion, waste management, and climate change. The establishment of the Ghana Green Building Council (GHGBC) in 2003 marked a significant milestone, as it championed green building practices through certification programs, renewable energy promotion, and sustainable construction material advocacy (Ghana Green Building

Council, n.d.). Government policies, such as the 2007 National Environmental Sanitation Policy and the 2012 Ghana Energy Efficiency and Conservation Policy, have reinforced commitments to reducing the environmental impact of construction activities, focusing on pollution control, energy conservation, and waste management (Ghana Energy Commission, 2012; Ministry of Local Government and Rural Development, 2007). Despite these initiatives, significant barriers to sustainability persist. Limited stakeholder awareness, weak enforcement of environmental regulations, and inadequate financial incentives continue to impede progress. Studies indicate that gaps exist in the implementation and effectiveness of environmental sustainability frameworks, with regulatory inefficiencies and financing constraints slowing the adoption of green building practices. The absence of strong economic incentives, such as tax breaks and subsidies, further discourages developers from integrating sustainability into mainstream construction (Kineber *et al.*, 2022).

Government institutions and professional bodies have played crucial roles in addressing these challenges. The Ministry of Environment, Science, Technology, and Innovation (MESTI) and the Energy Commission have spearheaded policies such as the Renewable Energy Act (2011) and the Green Building Guidelines (2014), aimed at promoting energy-efficient construction and

¹ Corresponding Author

Email address: harold.adjarko@ttu.edu.gh

renewable energy adoption. Professional organisations, including the Ghana Institution of Engineering (GhIE), Institution of Engineering and Technology (IET), Architects Registration Council (ARC), and Ghana Real Estate Developers Association (GREDA), have also contributed through advocacy, training, and stakeholder engagement. This study provides a quantitative assessment of the environmental challenges facing Ghana's construction sector and examines their implications for sustainable development. By identifying key barriers and their systemic interrelations, this research aims to propose effective strategies to align the sector with global sustainability goals, ensuring that environmental management principles are fully integrated into construction practices in Ghana.

2. Literature Review

Environmental sustainability in the construction industry is vital for mitigating the sector's environmental impact. However, barriers to sustainable construction persist, particularly in developing economies where regulatory, financial, and technical constraints are prevalent. This review synthesises key challenges affecting environmental sustainability in Ghana, drawing on global insights to position the study within a broader sustainability discourse.

2.1. Theoretical Framework: Institutional and Resource-Based Perspectives

This study is framed within Institutional Theory and the Resource-Based View (RBV). Institutional Theory suggests that regulatory, normative, and cultural-cognitive forces shape firms' environmental practices (Scott, 2014). In the Ghanaian construction sector, weak regulatory enforcement and cultural inertia hinder the adoption of sustainability. Meanwhile, RBV posits that firms gain a competitive advantage by leveraging unique internal resources (Barney, 2022). The lack of financial, technical, and knowledge-based resources constrains firms' ability to implement sustainable construction practices. By integrating these perspectives, this study explains why environmental sustainability remains underdeveloped in Ghana's construction industry despite global pressure for green practices.

2.2. Awareness and Knowledge Gaps

Limited awareness among developers, contractors, and clients impedes the adoption of sustainability. Agyekum *et al.*, (2025) found that developers in emerging markets often underestimate the long-term benefits of energy-efficient buildings, reducing demand for green construction. In Ghana, Asiedu *et al.* (2024) observed that real estate firms fail to incorporate sustainability due to a lack of client awareness. Knowledge gaps perpetuate unsustainable practices such as inefficient waste management and reliance on non-renewable energy sources (Ayarkwa *et al.*, 2017).

Addressing these gaps through capacity-building programs is crucial.

2.3. Financial Barriers and Investment Constraints

High upfront costs and limited access to financing remain significant obstacles to sustainability adoption (Unegbu and Yawas., 2023). Developers in Ghana cite high capital costs of green technologies—such as solar panels and energy-efficient HVAC systems—as key deterrents (Anzagira *et al.*, 2024). In Nigeria, weak currency valuation exacerbates this issue, making green building materials unaffordable (Ekung *et al.*, 2022). Furthermore, statutory taxes and limited green financing mechanisms restrict developers' ability to invest in environmental solutions. Policy-driven financial incentives, such as tax credits for green construction, are needed to bridge this gap.

2.4. Regulatory Deficiencies and Compliance Gaps

Weak environmental policies and poor enforcement mechanisms significantly hinder EMP adoption (Ramaswami *et al.*, 2016). Ghana's Environmental Protection Agency (EPA) has established environmental regulations, but enforcement remains lax, enabling non-compliance (Darko & Chan, 2018). In contrast, South Africa's Green Building Council has successfully enforced sustainability regulations, increasing LEED-certified buildings by 35% over five years (Chan *et al.*, 2018). Strengthening Ghana's regulatory framework through mandatory compliance measures and public-private partnerships is essential for progress.

2.5. Infrastructure and Resource Limitations

Access to green technologies and infrastructure is insufficient in Ghana's construction sector (Ahenkan *et al.*, 2022). Developers struggle with limited solar energy adoption, poor waste recycling infrastructure, and high material import costs. Similarly, construction firms demonstrate minimal engagement with material reuse or recycling, largely due to limited infrastructure (Baidoo, 2021). Empirical findings show that integrating green procurement practices such as mandatory waste management and sustainability clauses in contracts can significantly advance the circular economy in Ghana's construction sector (Kwasafu *et al.*, 2024).

2.6. Lack of Standardised Environmental Management Systems (EMS)

Environmental management systems (EMS) remain underdeveloped in Ghana, leading to inconsistent sustainability reporting (Osuizugbo *et al.*, 2020). Construction firms lack clear sustainability benchmarks, making it challenging to track carbon emissions, energy use, and waste disposal (Djokoto *et al.*, 2014). In contrast, Nigeria's Sustainable Building Certification Framework provides standardised

reporting guidelines, driving higher sustainability compliance (Abdulsalam *et al.*, 2024). Ghana must adopt standardised EMS frameworks to promote accountability and facilitate sustainability monitoring (Ampratwum *et al.*, 2019).

2.7. Limited Technical Expertise

The Ghanaian construction sector lacks skilled professionals capable of implementing sustainable building practices (Agyekum *et al.*, 2025). Anzagira *et al.* (2024) found that in developing countries, sustainable design expertise remains scarce, leading to suboptimal implementation of eco-friendly solutions. In Ghana, few tertiary institutions offer specialised training in green construction, further exacerbating the skill gap. Capacity-building initiatives, industry collaborations, and professional training programs are needed to develop local expertise (Owusu-Agyeman & Aryeh-Adjei, 2023).

2.8. Insufficient Market Incentives for Sustainable Development

Incentives for sustainable real estate development remain weak, discouraging firms from integrating environmental management plans. Xu *et al.* (2023) found that preferential financing for green projects significantly boosts adoption rates. However, in Ghana, developers receive no financial incentives for green building certification, making sustainability a low-priority investment (Darko & Chan, 2018). To stimulate adoption, the government must introduce tax incentives, subsidies, and green finance schemes for sustainable construction projects.

3. Research Methodology

This study adopts a quantitative research design through a cross-sectional survey to assess environmental challenges in Ghana's construction sector. A structured questionnaire was administered to 275 stakeholders, including developers, lenders, environmental managers, government agencies, and estate agents. The questionnaire employed a five-point Likert scale to capture respondents' perceptions of key sustainability challenges. To ensure a representative sample, a multi-stage sampling approach was employed. Purposive sampling was used to select industry experts, while stratified sampling ensured proportional representation of key stakeholder groups. Within each stratum, random sampling was applied to minimise selection bias and enhance generalizability.

The validity of the questionnaire was confirmed using the Content Validity Index (CVI) = 0.98, which exceeds the 0.80 threshold (Polit & Beck, 2006), indicating a high level of clarity and relevance in measuring the intended constructs. Composite Reliability (CR) and Cronbach's Alpha were used to assess internal consistency, with both exceeding 0.90, demonstrating strong measurement reliability (Hair *et*

al., 2021). The key constructs analysed included economic barriers (CR = 0.982), regulatory challenges (CR = 0.987), knowledge gaps (CR = 0.997), and infrastructure and material constraints (CR = 0.991). Data analysis involved descriptive statistics, correlation analysis, and exploratory factor analysis (EFA) to identify key environmental challenge constructs.

Descriptive statistics were used to summarise the severity of the identified challenges through mean scores and standard deviations. To assess the relationships between different challenges, Spearman's rank correlation analysis was applied. Spearman's method was chosen over Pearson's correlation due to the ordinal nature of Likert-scale data and its suitability for non-parametric relationships. This approach enabled the identification of the strength and direction of associations between key challenge factors. To further explore underlying challenge constructs, Exploratory Factor Analysis (EFA) was conducted using Principal Component Analysis (PCA) with Varimax rotation. EFA was preferred over Confirmatory Factor Analysis (CFA) as the study sought to explore latent structures rather than confirm pre-existing factor models. The suitability of the dataset for factor analysis was verified using the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy, which scored 0.84, indicating strong suitability, and Bartlett's Test of Sphericity ($\chi^2 = 2135.76$, $p < 0.001$), which confirmed significant correlations among variables. Factors with eigenvalues greater than 1.0 were retained to ensure statistical rigour in dimensionality reduction. Ethical approval was obtained prior to data collection, and all participants provided informed consent. Confidentiality was strictly maintained throughout the study. Despite its contributions, this study has some limitations. First, its cross-sectional design captures industry perceptions at a single point in time. Future research should consider a longitudinal approach to assess changes in environmental challenges over time. Additionally, since the study relies on self-reported data, there is potential for response bias. Future studies should triangulate findings using qualitative insights from expert interviews or case studies. Lastly, while the findings are relevant to Ghana, comparative studies across other African economies would enhance the study's generalizability and provide broader insights into environmental challenges in developing construction industries.

4. Findings and Discussion

Multiple challenges hinder the adoption of environmental sustainability practices in Ghana's construction sector. Table 1 (see Appendix 1) above provides insights into these challenges, with mean scores and standard deviations summarising responses from 275 participants.

The findings indicate that financial barriers, regulatory challenges, knowledge gaps, and infrastructure

limitations are the most pressing constraints. The high cost of sustainability practices (mean = 4.5, SD = 0.5) was the most significant concern, reinforcing the need for government incentives and subsidies to encourage adoption. Similarly, the lack of regulatory support (mean = 4.5, SD = 0.5) highlights gaps in policy enforcement, which limits compliance with environmental standards.

4.1. Correlation Analysis of Key Environmental Challenges

A Spearman's correlation analysis was conducted to examine relationships among key challenge constructs. Table 2 presents the correlation matrix. The results show strong correlations between financial barriers and regulatory issues ($r = 0.70$, $p < 0.01$), suggesting that weak enforcement of environmental policies limits financial investments in sustainable projects. Similarly, knowledge gaps correlate with regulatory issues ($r = 0.65$, $p < 0.01$), indicating that a lack of technical expertise and awareness reduces compliance with green construction standards.

Table 2: Correlation Matrix of Key Environmental Challenges
(Spearman's correlation coefficients, $N = 275$)

Variables	Financial Barriers	Regulatory Issues	Knowledge & Awareness Gaps	Infrastructure & Materials
Financial Barriers	1.000	0.70**	0.55**	0.58**
Regulatory Issues	0.70**	1.000	0.65**	0.62**
Knowledge & Awareness Gaps	0.55**	0.65**	1.000	0.57**
Infrastructure & Materials	0.58**	0.62**	0.57**	1.000

Table 3: Factor Analysis – Key Challenge Constructs

Factor Construct	Factor Loading (≥ 0.50)	Key Challenges Identified
Financial Barriers	0.72	High costs, lack of incentives, and limited financing
Regulatory Issues	0.78	Weak enforcement, absence of industry standards
Knowledge & Awareness Gaps	0.65	Lack of training, limited public awareness
Infrastructure & Materials	0.69	Limited access to sustainable materials, high costs

Method Used: Principal Component Analysis (PCA), Varimax Rotation

4.2. Factor Analysis – Key Challenge Constructs

To further analyse the underlying structure of these challenges, Exploratory Factor Analysis (EFA) was conducted using Principal Component Analysis (PCA) with Varimax Rotation. The results, presented in Table 3, confirm four key constructs. The factor analysis confirms that these four constructs account for most of the challenges faced in environmental sustainability within Ghana's construction sector. The highest loading factor (0.78) on regulatory issues suggests that policy enforcement remains a dominant challenge in sustainability adoption.

4.3. Discussion of Findings

The findings highlight the systemic challenges hindering environmental sustainability in Ghana's construction sector. This section discusses how these challenges compare with prior studies and whether they confirm or challenge existing theoretical frameworks.

4.3.1. Financial Barriers: High Costs & Limited Incentives

Financial constraints remain the most significant deterrent to sustainability adoption, with a strong correlation ($r = 0.70$) between financial barriers and regulatory challenges, suggesting that weak policy frameworks limit financial investments. High statutory fees, lack of government incentives, and limited access to green financing discourage industry players from adopting eco-friendly construction technologies. These findings align with global studies emphasising the need for financial incentives, such as tax breaks, green bonds, and public-private partnerships, to support sustainability adoption (Darko & Chan, 2018). Comparatively, countries like South Africa and Nigeria

have implemented green finance initiatives that have boosted sustainability adoption in their construction sectors (Osuizugbo *et al.*, 2020). Ghana's industry can benefit from similar government-led funding programs, tax credits, and sustainability-linked loans to reduce financial barriers and enhance investment in green construction.

4.3.2. Regulatory Issues: Weak Policy Enforcement and Compliance Gaps

The results reveal a strong correlation ($r = 0.65 - 0.75$) between weak enforcement mechanisms and sustainability challenges. Despite the existence of environmental policies, gaps in enforcement hinder compliance. Developers frequently bypass

environmental regulations due to inconsistent policy implementation and the absence of financial penalties. This finding aligns with studies in other developing economies, where policy inconsistencies and weak enforcement mechanisms have been identified as significant challenges to sustainable construction (Ramaswami *et al.*, 2016). However, unlike Ghana, countries like Malaysia and Singapore have implemented strict regulatory enforcement mechanisms that incentivise developers to comply with green building regulations (Low *et al.*, 2014). The findings suggest that Ghana needs policy reforms, sustainability codes, and compliance monitoring to drive environmental responsibility in the construction sector.

4.3.3. *Knowledge & Awareness Gaps: Limited Technical Expertise*

A notable challenge is the limited knowledge and expertise ($r = 0.57$) among construction professionals, which significantly hinders the adoption of green construction. Many industry players lack specialised training in sustainable building practices, leading to inefficient implementation of eco-friendly designs. Additionally, public awareness about green technologies remains low, further reducing the demand for sustainable housing. These findings are consistent with global research highlighting the role of education and capacity-building programs in promoting sustainability (Ojo & Ogunsemi, 2019). In contrast, countries like China and Germany have integrated sustainability education into construction training programs, resulting in higher adoption rates of green technologies (Djokoto *et al.*, 2014). To bridge this gap, Ghana's construction industry must integrate sustainability education into its curricula and professional training programs, alongside public awareness campaigns to promote demand for green housing.

4.3.4. *Infrastructure & Materials: Accessibility Challenges*

Infrastructure limitations exacerbate sustainability challenges, particularly limited recycling infrastructure and the high costs of green materials. The correlation between high material costs and infrastructure challenges ($r = 0.52$) indicates that limited supply chains force developers to rely on costly imports. This challenge confirms prior studies that have identified inadequate local supply chains as a major barrier to sustainability in developing economies (Anzagira *et al.*, 2024). However, while countries like India and Brazil have invested in local green material production, Ghana remains heavily dependent on imported materials, increasing costs and project timelines (Eštoková *et al.*, 2023). The findings suggest that developing local sustainable material markets, improving waste management systems, and offering subsidies can reduce reliance on costly imports and enhance sustainability adoption.

These findings align with Institutional Theory, which emphasises the role of regulatory pressures, financial incentives, and stakeholder engagement in influencing environmental sustainability practices. The results also support the Resource-Based View (RBV), which highlights that firms with access to financial resources, technical expertise, and infrastructure are better positioned to adopt sustainable practices. However, the findings challenge previous studies that assume regulatory frameworks alone are sufficient to drive sustainability, highlighting the need for a holistic approach that integrates financial incentives, technical training, and infrastructure development.

5. Conclusion and Recommendations

This study identifies key environmental challenges hindering sustainable construction in Ghana, emphasising financial barriers, regulatory deficiencies, knowledge gaps, and infrastructure constraints. High costs and limited financing remain the most significant obstacles, necessitating government interventions such as tax relief programs, green loans, and public-private partnerships. Weak regulatory enforcement and fragmented policies further exacerbate sustainability challenges, highlighting the need for stricter compliance measures and standardised sustainability benchmarks. A lack of technical expertise also hinders green construction adoption, underscoring the urgency for structured training programs and integrating sustainability education into engineering and real estate curricula.

Additionally, the scarcity of sustainable building materials and inadequate waste management systems necessitate investment in local material production and recycling infrastructure to enhance long-term environmental sustainability. Achieving sustainability in Ghana's construction sector requires a convergence of financial incentives, policy enforcement, capacity-building, and infrastructure development. Future research should evaluate the effectiveness of policy interventions, employ Structural Equation Modelling (SEM) to explore causal relationships among challenge constructs, and conduct comparative studies to benchmark Ghana's sustainability efforts globally. Addressing these challenges through multi-stakeholder collaboration will facilitate a transition toward a more resilient, environmentally responsible construction industry.

6. Acknowledgement

The research and data presented in this study was part of a larger research work at Durban University of Technology.

References

- Abdulsalam, R. S., Chan, M., Masrom, M. A. N., & Nawawi, A. H. (2024). Benefits and challenges of implementing green building development in Nigeria. *Built Environment Project and Asset Management*, 14(3), 399–413. <https://doi.org/10.1108/BEPAM-09-2022-0143>
- Agyekum, K., Sackey, K. N. Y. S., Addoh, F. E., Pittri, H., Sosu, J., & Danso, F. O. (2025). Key Competencies of Built Environment Professionals for Achieving Net-Zero Carbon Emissions in the Ghanaian Construction Industry. *Buildings*, 15(10), 1750. <https://doi.org/10.3390/buildings15101750>
- Ahenkan, A., Alhassan. A., & Boon, E. (2022). Renewable Energy for Sustainable Development: An Assessment of Solar Energy Adoption among SMEs in the City of Accra, Ghana. *African Journal of Management Research*. 28. 58-75. 10.4314/ajmr.v28i1.5.
- Ampratwum, G., Agyekum, K., Adinyira, E., & Duah, D.Y.A. (2019). A framework for the implementation of green certification of buildings in Ghana. *International Journal of Construction Management*, 21(12), 1263–1277. <https://doi.org/10.1080/15623599.2019.1613207>
- Anzagira, L. F., Duah, D. Y. A., Badu, E., Simpeh, E. K., Marful, A. B., & Amos-Abanyie, S. (2024). Structural equation modelling of the critical barriers influencing the adoption of green building concepts and technologies in Ghana. *Journal of Responsible Production and Consumption*, 1(1), 229–259. <https://doi.org/10.1108/JRPC-11-2023-0019>.
- Asiedu, R., Owusu-Manu, D.-G., Gyimah, S., Edwards, D., & Amoakwa, A. (2024). Evaluating the adoption barriers of circular business models in the Ghanaian construction industry. Benchmarking: An International Journal. Advance online publication. <https://doi.org/10.1108/BIJ-03-2024-0202>
- Ayarkwa, J., Acheampong, A., Wiafe, F., & Boateng, E. B. (2017). Factors affecting the implementation of sustainable construction in Ghana: The architect's perspective. In: *Proceedings of international conference on infrastructure development in Africa* (Vol. 6, pp. 377–386).
- Baidoo, E (2021). Sustainable construction industry in Ghana: focusing on recycle and re-use potentials of waste materials. Afribary. Retrieved from <https://afribary.com/works/sustainable-construction-industry-in-ghana-focusing-on-recycle-and-re-use-potentials-of-waste-materials>
- Barney, J. B. (2022). *Gaining and sustaining competitive advantage* (5th ed.). Pearson.
- Chan, A. P. C., Darko, A., Olanipekun, A. O., & Ameyaw, E. E. (2018). Critical barriers to green building technologies adoption in developing countries: The case of Ghana. *Journal of cleaner production*, 172, 1067-1079.
- Darko, A., & Chan, A. P. C. (2018). Strategies to promote green building technologies adoption in developing countries: The case of Ghana. *Building and Environment*, 130, 74–84. <https://doi.org/10.1016/j.buildenv.2017.12.022>
- Djokoto, S., Dadzie, J., & Ohemeng-Ababio, E. (2014). Barriers to Sustainable Construction in the Ghanaian Construction Industry: Consultants Perspectives. *Journal of Sustainable Development*. 7. 134-134. 10.5539/jsd.v7n1p134.
- Eden Heights. (2024). *Trends shaping real estate in Ghana*. Retrieved from <https://edenheights.com.gh/2024/09/13/trends-shaping-real-estate-in-ghana>
- Ekung, S., Odesola, I., & Opoku, A. (2022). Demystifying cost misperception as a challenge to green building adoption in Nigeria. *Journal of Engineering, Design and Technology*, 20(6), 1716–1737. <https://doi.org/10.1108/JEDT-01-2021-0049>.
- Eštoková, A., Fabianová, M., & Radačovský, M. (2023). Life Cycle Assessment and Environmental Impacts of Building Materials: Evaluating Transport-Related Factors. *Engineering Proceedings*, 57(1), 5. <https://doi.org/10.3390/engproc2023057005>
- Evans, Y., Kesse, C., Gladys, A. and Nyamoto, K. (2018) Foreign Direct Investment Inflows in Ghana: Is There Any Political and Priority Influence in the Distribution among the Sectors and Regions of the Ghanaian Economy? *Open Journal of Business and Management*, 6, 973-989. doi: 10.4236/ojbm.2018.64072.
- Ghana Energy Commission. (2012). *Ghana Energy Efficiency and Conservation Policy*.
- Ghana Green Building Council. (n.d.). Who we are. Ghana Green Building Council. Retrieved from <https://www.ghgbc.org/Backup/whoweare.html>
- Ghana Investment Promotion Centre. (2020). *Investment opportunities in Ghana*. Retrieved from <https://www.ghanainvestmentpromotioncenter.com>

- Kineber, A. F., Kissi, E., & Hamed, M. M. (2022). Identifying and Assessing Sustainability Implementation Barriers for Residential Building Project: A Case of Ghana. *Sustainability*, 14(23), 15606. <https://doi.org/10.3390/su142315606>
- Kwasafu, O. K., Adinyira, E; & Agyekum, K. (2024). Impact of green construction procurement practices on the success of circular economy in Ghana. *Built Environment Project and Asset Management*. 14. 10.1108/BEPAM-06-2023-0109.
- Locus Estate. (2023). *Ghana's housing history*. Retrieved from <https://locusestate.com/ghanas-housing-history>.
- Low, S. P., Gao, S., & Tay, W. L. (2014). Comparative study of project management and critical success factors of greening new and existing buildings in Singapore. *Structural Survey*, 32(5), 413–433. <https://doi.org/10.1108/SS-12-2013-0040>.
- Ministry of Local Government and Rural Development. (2007). *National Environmental Sanitation Policy*.
- Ojo, L. D., & Ogunsemi, D. R. (2019). Critical drivers (CDs) of value management adoption in the Nigerian construction industry: A Delphi study. *Journal of Engineering, Design and Technology*, 17(1), 250-264.
- Osuizugbo, C. I., Oyeyipo, O., Lahanmi, A., Morakinyo, A., & Olaniyi, O. (2020). Barriers to the Adoption of Sustainable Construction. *European Journal of Sustainable Development*, 9(2), 150. <https://doi.org/10.14207/ejsd.2020.v9n2p150>.
- Owusu-Agyeman, Y., & Aryeh-Adjei, A. A. (2023). The development of green skills for the informal sector of Ghana: Towards sustainable futures. *Journal of Vocational Education & Training*, 76(2), 406–429. <https://doi.org/10.1080/13636820.2023.2238270>
- Ramaswami, A., Russell, A. G., Culligan, P. J., Sharma, K. R., & Kumar, E. (2016). *Meta-principles for developing smart, sustainable, and healthy cities*. *Science*, 352(6288), 940–943. <https://doi.org/10.1126/science.aaf7160>
- Scott, W. R. (2014). *Institutions and organizations: Ideas, interests, and identities* (4th ed.). Thousand Oaks, CA: SAGE Publications
- Unegbu, H., & Yawas, D. S. (2024). Assessing the impact of green building certifications on construction practices in Nigeria: A systematic review. *Indonesian Journal of Engineering and Technology*, 7(1), 7–14. <https://doi.org/10.26740/inajet.v7n1.p7-14>.
- Xu, W., Feng, X., & Zhu, Y. (2023). The Impact of Green Finance on Carbon Emissions in China: An Energy Consumption Optimization Perspective. *Sustainability*, 15(13), 10610. <https://doi.org/10.3390/su151310610>.

Appendix 1

Table 1: Descriptive Statistics on the Key Challenges to Effectively Adopt Environmental Management and Sustainability Practices in the Construction Sector

Statements	Mean	Standard Deviation	N
There is a lack of awareness and understanding of environmental sustainability practices among the construction stakeholders in Ghana.	4.3	0.6	275
The high cost of incorporating environmentally friendly practices is a barrier in the construction industry in Ghana.	4.5	0.5	275
The enforcement of environmental regulations is inadequate in the construction industry in Ghana.	4.2	0.6	275
The lack of standardisation in environmental sustainability practices hinders its adoption in the construction industry in Ghana.	4.4	0.5	275
Inadequate infrastructure limits the implementation of environmentally friendly practices in the construction industry in Ghana.	4.3	0.6	275
Limited access to financing impedes the adoption of environmental sustainability practices in the construction industry.	4.5	0.5	275
There is a lack of technical expertise to implement environmental sustainability practices in the construction industry effectively.	4.2	0.6	275
Most construction professionals lack awareness and understanding of sustainability issues within the construction industry and development.	4.4	0.5	275
The lack of financial incentives discourages the adoption of sustainable construction practices in the Ghanaian construction industry.	4.3	0.6	275
The absence of regulatory support hampers the development of sustainable construction in Ghana.	4.5	0.5	275
There is a lack of incentives for developers to adopt environmentally friendly practices in the Ghanaian construction industry.	4.2	0.6	275
Limited funding and slow policy reforms are challenges towards implementing environmental sustainability in Ghana's real estate.	4.4	0.5	275
The construction industry faces difficulties in acquiring developable land in urban areas in Ghana.	4.3	0.6	275
The lack of clear land titles poses a challenge to environmental sustainability.	4.4	0.5	275
The limited access to long-term and low-cost funding channels.	4.3	0.6	275
There are liquidity issues and piling debt affecting environmental sustainability practices in the Ghana construction industry.	4.4	0.5	275
Higher rates of statutory fees and taxes pose challenges to environmental sustainability in the Ghana construction industry.	4.5	0.5	275
The lack of environmental regulations in the industry contributes to unsustainable practices.	4.2	0.6	275
There is a lack of environmental awareness among stakeholders in the construction industry in Ghana.	4.3	0.6	275
Inefficient building management results in high environmental impact and costs.	4.4	0.5	275
The lack of sustainable building materials hinders environmental sustainability practices.	4.5	0.5	275
The lack of data on energy consumption, water usage, and waste management is a challenge towards achieving environmental sustainability in the construction industry.	4.2	0.6	275
The lack of standardised environmental management systems affects the construction industry in Ghana.	4.3	0.6	275
Construction professionals lack awareness and expertise in environmental sustainability issues.	4.4	0.5	275
The adoption of green building practices is limited in the construction industry in Ghana.	4.5	0.5	275
The Ghana construction industry lacks effective environmental policies and regulations.	4.3	0.6	275
Overall	4.35	0.55	275

Min = 1, Max = 5

Source: Authors's computations, SPSS, 22.

Min =1, Max = 5

Source: Author's computations, SPSS 22.