UNIABUJA Journal of Engineering and Technology

https://ujet.uniabuja.edu.ng/

ISSN: 2714-3236 (Online); 2714-3228 (Print)

Volume 2, Issue 2, 2025; 458-468

Assessment of Risks Associated with Green Building Practices in Construction Projects in Abuja, Nigeria

Ayuba A. IBRAHIM[1*], Wasiu A. OLA-AWO[2]

Department of Quantity Surveying, Federal University of Technology, Minna, Nigeria

[1*]ayuba.ibrahim@st.futminna.edu.ng, [2]abdullao@futminna.edu.ng

Abstract

The construction industry is a major contributor to environmental degradation which is prompting the global shift towards green building practices. Green building practices are practices that integrate sustainable materials, energy-efficient systems, and waste management strategies. Despite their benefits, the adoption of green building practices is hindered by multiple risks that impact project feasibility, cost, and long-term performance. This study assesses the risks associated with green building practices in construction projects in Abuja, Nigeria. A census approach was adopted, targeting 102 construction professionals registered with the Green Building Council of Nigeria. A structured questionnaire, developed from a systematic literature review, was distributed via online platforms which resulted in 95 valid responses. The data were analyzed using descriptive statistics to identify key risk factors. Findings reveal that the most critical risks in green building projects include potential delays, legal uncertainties, fluctuations in green material prices, and cash flow challenges. Delays, the top-ranked risk, often arise due to the inexperience of contractors and consultants, especially in projects retrofitting existing structures to green standards. Legal and regulatory risks stem from evolving building codes and certification requirements, making compliance uncertain. The high cost and limited availability of sustainable materials further strain project budgets, while cash flow constraints disrupt construction timelines. Furthermore, performance risks, such as energy inefficiencies in certified buildings and moisture-related issues due to inadequate ventilation, highlight operational challenges in green projects. To mitigate these risks, the study recommends adopting proactive risk management strategies, enhancing professional training, and establishing clearer regulatory frameworks. While this research enhances the understanding of green building risks, it is geographically limited to Abuja, Nigeria. Future studies should conduct comparative assessments across regions and explore longitudinal analyses to track the evolution of risks in green construction. These insights are essential for encouraging a wider adoption of sustainable building practices, ensuring their long-term viability in Nigeria's construction industry.

Keywords: *Green building, sustainable construction, green building practices, construction risk, construction industry.*

1.0 Introduction

The global construction sector significantly contributes to environmental degradation, with alarming statistics revealing its impact on pollution and resource consumption (Archdesk, 2021). In response, green building practices have emerged as a sustainable solution aimed at reducing environmental harm. Green buildings are structures designed to minimize negative environmental impacts while enhancing energy efficiency, resource conservation, and occupant well-being (Ali, 2021). These buildings incorporate sustainable practices such as rainwater harvesting, daylight harvesting, net-zero energy designs, natural ventilation, and energy-efficient lighting, etc. Some well-known examples of green buildings include The Edge in the Netherlands, which is considered one of the most energy-efficient office buildings in the world (Ecobusiness, 2024). While green building practices offer significant environmental and economic benefits, they also come with various risks that can affect their adoption and success. Previous studies (Oyebode, 2018; Samson & Bernard, 2018) highlight that despite the growing interest in green construction, financial, technical, and regulatory risks often hinder implementation. Caraiman *et al.* (2023) emphasize that poor execution can lead to increased operational costs, while Thatcher and Milner (2016) identify challenges in achieving desired indoor environmental quality. Parsaee (2019) further notes that improper construction methods can result in health issues for occupants. However, most existing research on green building risks focuses on developed countries, where regulatory frameworks and financial incentives are well-established. However, in regions like Nigeria, the lack of standardized policies, fluctuating green material costs, and limited expertise present unique challenges that require further investigation. This study addresses this gap by examining the key risks associated with the implementation of green building practices. This research provides a comprehensive assessment of the risks associated with green building practices and offers valuable insights for industry stakeholders, policymakers, and researchers. By identifying major risks and their implications, the study contributes to the development of more effective strategies for promoting green construction. It also aligns with the nation's sustainability goals, such as Nigeria's commitment to reducing greenhouse gas emissions by 20% by 2030 (Juwonlo, 2021). Ultimately, the findings will support better decision-making, policy formulation, and risk management in the construction industry.

2.0 Literature Review

Green buildings have garnered significant attention as a sustainable solution to environmental challenges, but their implementation is not without risks. Scholars and practitioners have identified numerous challenges that span the entire lifecycle of green building projects, from design to operation. These risks, if not properly managed, can undermine the financial, environmental, and social benefits that green buildings aim to achieve (Fuerst, 2019). The risks are as follows:

2.1 Potential Delays

Green building projects frequently experience significant schedule overruns due to the specialized nature of sustainable construction practices (Aguda, 2024). Mahat *et al*. (2022) explain that consultants and contractors lacking adequate experience with green technologies often struggle to maintain project timelines. These delays are particularly pronounced when implementing innovative sustainable solutions that require specialized knowledge or techniques. Construction teams unfamiliar with green building requirements may need additional time for research, training, and execution, extending project durations beyond initial estimates and increasing overall costs Mahat *et al* (2022).

2.2 Standard of Care/Legal Risk

The evolving nature of green building expertise creates considerable uncertainty in establishing appropriate professional standards. According to Bungau *et al* (2022), this ambiguity leaves stakeholders vulnerable to legal challenges when green buildings fail to perform as expected. The case of Shaw Development, LLC v. Southern Builders, Inc. (2007) demonstrates how unmet certification expectations can result in significant litigation. As green building practices continue to develop, professionals face heightened liability concerns without clear precedents to guide their work (Olabi *et al*, 2024). This legal uncertainty adds substantial risk for architects, engineers, contractors, and developers involved in sustainable projects.

2.3 Critical Cash Flow During Construction Stage

Sustainable construction projects frequently face severe financial constraints during the building phase, threatening project continuity and completion. According to Komurlu *et al* (2023), green building projects often experience cash flow challenges due to their unique funding requirements and extended timelines. The higher upfront costs for sustainable materials and technologies, combined with specialized labor needs, create significant financial pressure during construction (Qian *et al*, 2023). These cash flow difficulties can halt progress, increase financing costs, and ultimately jeopardize the viability of otherwise promising green initiatives.

2.4 Financial Risks

The comprehensive financial challenges associated with green buildings extend throughout the project lifecycle, affecting stakeholder confidence and investment decisions. Fuerst (2019) emphasizes that these financial uncertainties, if not properly managed, can undermine the economic viability that green buildings aim to achieve. From initial capital outlays to operational expenses and maintenance costs, financial considerations remain a primary concern for stakeholders. These financial risks are often exacerbated by knowledge gaps that lead to misperceptions about actual costs and benefits, as Ekung *et al* (2021) identifies in his research.

2.5 Fluctuations in Green Material Prices

The market for sustainable materials experiences greater volatility than conventional construction materials, creating substantial budgeting uncertainties. Nilimaa (2023) notes that these price fluctuations complicate accurate cost forecasting and financial planning throughout project lifecycles. The relatively smaller market for specialized green materials means that supply chain disruptions or demand surges can cause dramatic price swings Ayarkwa *et al* (2022). These unpredictable cost variations often force project teams to make difficult decisions between maintaining sustainability goals and controlling expenses, potentially compromising project outcomes.

Received: 31-01-2025 / Accepted: 05-03-2025 / Published: 30-09-2025

https://doi.org/10.70118/ujet.2025.0202.41

2.6 Untested Contract Language

The specialized terminology and requirements in green building contracts create legal ambiguities that heighten project risk. Abu *et al* (2017) explains that this contractual language has not been thoroughly tested in courts, leaving parties vulnerable to disputes and litigation. Green building contracts often include specific performance guarantees, certification requirements, and sustainability metrics that conventional construction contracts do not address (Stempler, 2017). Without established legal precedents to guide interpretation, these contractual provisions represent a significant source of uncertainty and potential liability for all project participants.

2.7 Shifts in Government Priorities

Changes in political support and policy direction can dramatically impact the financial viability of green building projects. Zeng *et al.* (2025) highlight how the removal of tax incentives or subsidies can fundamentally alter the economic calculations that initially made sustainable projects attractive. These policy shifts can occur during extended project timelines, creating significant financial risk and uncertainty (Aiminhiefe, 2022). The reliance on government incentives makes green building initiatives particularly vulnerable to changing political landscapes and economic priorities, requiring developers to carefully assess policy stability before committing resources.

2.8 Lack of Experience in Green Technologies

Insufficient expertise among project teams significantly increases the risk of implementation problems and performance shortfalls. Ayarkwa *et al*. (2022) explain that the specialized knowledge required for sustainable building systems often exceeds the training and experience of conventional construction professionals. This expertise gap affects all project phases from design and specification to construction and commissioning (komurlu *et al*, 2024). Without adequate knowledge transfer and professional development, the industry struggles to build capacity for delivering consistently successful green building projects.

2.9 Moisture Accumulation and Mold Growth

Certain green building features designed to improve energy efficiency can inadvertently create moisture-related problems with serious consequences. According to Carpino *et al* (2023), enhanced natural ventilation systems may contribute to conditions conducive to moisture accumulation and mold growth if not properly designed and managed. These issues can compromise building integrity, air quality, and occupant health (Yang and Croome, 2018). The emphasis on airtight building envelopes for energy conservation must be balanced with effective moisture management strategies to prevent these potentially harmful conditions from developing.

2.10 Underperformance of Green Buildings

The gap between designed and actual performance represents a critical risk factor in sustainable construction. Research by Rebeiro *et al*. (2024) revealed that some certified green buildings consume significantly more energy than their specifications predicted, undermining their environmental and economic benefits. This performance gap often results from discrepancies between modeling assumptions and actual usage patterns, alongside inadequate commissioning and operational practices (Filippini and Obrist, 2022). Such underperformance not only diminishes the intended sustainability advantages but also damages stakeholder confidence in green building concepts.

2.11 High Initial Capital Costs

The substantial upfront investment required for green features presents a significant barrier to widespread adoption. Iwuanyanwu *et al* (2023) identifies that these initial costs often deter stakeholders from committing to green building practices, despite potential long-term savings. The premium for sustainable design, materials, and technologies can range from minimal to substantial depending on project scope and certification targets. This financial hurdle is particularly challenging for projects with limited budgets or investors focused on short-term returns, often leading to compromises in sustainability features (Unegbu *et al*, 2024).

2.12 Limited Availability of Green Materials

Procurement challenges for specialized sustainable materials can disrupt project schedules and increase costs. As highlighted by Runtuk *et al* (2023), many green materials have restricted market availability, creating sourcing difficulties that impact project timelines. The limited production capacity and distribution networks for certain innovative green products exacerbate these supply chain challenges. These availability constraints often force project teams to choose between compromising sustainability goals, accepting delays, or paying premium prices for scarce materials (Abdulazeez *et al*, 2024).

Received: 31-01-2025 / Accepted: 05-03-2025 / Published: 30-09-2025
https://doi.org/10.70118/ujet.2025.0202.41

2.13 Certification Process Costs

The expenses associated with green building certification add significant financial burden beyond basic construction costs. Plebankiewicz *et al* (2018) identify that these additional costs include registration fees, documentation expenses, specialized consulting services, and potential redesign requirements. The administrative demands of certification programs like LEED or BREEAM require substantial time investment from project teams, further increasing soft costs (Mapp *et al*, 2020). These certification expenses must be carefully budgeted and weighed against the marketing and operational benefits that formal recognition provides.

2.14 Compliance Challenges

Ensuring adherence to green building requirements presents considerable difficulties when construction teams lack specialized knowledge. According to Nwogu and Arinze (2024), contractors without specific green building expertise may struggle to implement sustainable practices correctly which increases the risk of non-compliance with certification requirements. These compliance challenges are particularly pronounced for complex or innovative green technologies that require precise installation and commissioning. Failure to meet compliance standards can jeopardize certification goals and compromise the building's environmental performance (Kanhaiya, 2023).

2.15 Malfunctioning Green Technologies

System failures in specialized sustainable building components can significantly undermine performance and user satisfaction. Neyestani (2017) observe that malfunctioning green technologies, particularly in buildings with complex operational requirements, can compromise energy efficiency targets and occupant comfort. These technical failures may result from design flaws, improper installation, inadequate commissioning, or insufficient maintenance. The innovative nature of many green technologies increases the likelihood of performance issues compared to conventional systems with longer track records (Wang *et al*, 2025).

2.16 Inefficient Energy Performance

Some certified green buildings fail to deliver the expected energy savings, compromising their environmental and economic benefits. Research by Amiri (2017) found that certain LEED-certified buildings used more energy than they were designed to consume, highlighting the gap between design intentions and operational realities. This underperformance is often attributed to occupant behavior, facility management practices, and commissioning deficiencies. The discrepancy between predicted and actual energy performance undermines confidence in green building certification and threatens the business case for sustainable construction (Salehi *et al*, 2015).

2.17 Lack of Trained Personnel

The shortage of maintenance professionals with specific training in green technologies creates operational challenges that can compromise system performance (Hauashdh, 2024). According to Komurlu *et al* (2024), this skills gap is particularly problematic in regions where green building is still emerging. Without qualified staff to operate and maintain sophisticated sustainable systems, buildings may not achieve their designed performance levels (Hauashdh, 2024). This workforce development challenge represents a significant barrier to the long-term success of green building initiatives, requiring investment in training and education programs.

2.18 Changes in Green Building Regulations

Rapidly evolving standards and requirements create compliance uncertainties throughout project lifecycles. Liu *et al* (2022) explain that green building codes frequently change as environmental standards advance, potentially requiring mid-project modifications that increase costs and extend timelines. Staying compliant with these evolving requirements demands continuous monitoring and adaptation (Kanhaiya, 2023). These regulatory shifts are challenging for projects with extended development timelines, as initial design compliance may not satisfy requirements in effect at completion.

2.19 Retrofitting Existing Buildings

Adapting existing structures to meet green standards presents unique challenges that increase risk and complexity. Iwuanyanwu et al. (2024) note that retrofitting projects often encounter unforeseen conditions that complicate implementation and extend schedules. These projects must balance historic preservation, occupant disruption, and building performance considerations. The constraints of existing structural and mechanical systems may limit the feasibility of certain green strategies, requiring creative solutions and potentially compromising optimal sustainability outcomes (Zou *et al*, 2016).

2.20 Long Payback Periods

The extended timeframe required to recover green building investments through operational savings discourages many potential stakeholders. Saka *et al* (2021) notes that these lengthy payback periods create hesitation among investors who prioritize more immediate financial returns. Depending on the specific technologies implemented and energy cost variables, payback periods can extend from several years to decades (Zhang *et al*, 2021). This delayed financial gratification conflicts with conventional investment expectations and business planning horizons, particularly in commercial real estate markets where ownership turnover is common.

2.21 Health and Safety Concerns

Certain green building features may introduce unintended health risks if not properly designed and managed. Parsaee (2019) emphasizes the importance of carefully evaluating potential health impacts when implementing sustainable strategies. Issues such as inadequate ventilation in highly sealed buildings, off-gassing from new materials, or biological contaminants from water conservation systems can adversely affect occupant health (Steinemann *et al*, 2017). These health concerns require thorough assessment and mitigation strategies to ensure that environmental benefits are not achieved at the expense of human wellbeing.

2.22 Non-Uniformity of Regulatory Incentives

Inconsistent policies across jurisdictions create planning difficulties and compliance complexities for developers. Basten *et al* (2018) points out that this lack of standardization complicates project planning and implementation, particularly for organizations operating across multiple locations. The varying incentives, requirements, and approval processes increase administrative burdens and may necessitate different approaches for similar projects in different locations (Akang, 2024). This regulatory fragmentation creates inefficiencies that increase costs and discourage standardized approaches to sustainable development.

2.23 Inappropriate Energy Benchmarks

Standard performance metrics may not accurately reflect the unique operational requirements of specialized green buildings. Zhao *et al.* (2021) highlight that conventional energy benchmarks can be misleading when applied to facilities with atypical usage patterns, such as research laboratories or healthcare facilities. These inappropriate comparison standards may create unrealistic expectations or lead to design decisions that optimize for benchmarking rather than actual performance. Developing context-specific evaluation frameworks is essential for meaningful assessment of green building performance (Karamoozian and Zhang, 2021).

In conclusion, the risks associated with green buildings are multifaceted and span the entire project lifecycle. From financial and legal challenges during the design phase to performance and operational issues in the maintenance stage, these risks require careful management and proactive strategies. Addressing these challenges will be crucial for realizing the full potential of green buildings and advancing sustainable development goals.

3.0 Methods

This study adopted a quantitative research methodology to enable objective measurement and facilitate statistical analysis of the collected data. Structured questionnaires were utilized as the primary data collection tool, allowing for the efficient gathering of information from a substantial sample size. This approach was instrumental in identifying patterns and trends related to the research objectives. The target population for this study comprised construction professionals who are registered members of the Green Building Council of Nigeria (GBCN). These individuals were chosen due to their specialized knowledge and familiarity with green building practices, making them well-suited to provide relevant insights. There are 102 green building professionals in Abuja (Orimoloye, 2024). Given the manageable size of this population, a census approach was adopted, meaning all 102 members were included in the study. Consequently, 102 questionnaires were distributed to these professionals. The structured questionnaire was designed based on a systematic review of literature aligned with the study's objectives. It was divided into two main sections: the first section focused on the demographic profiles of the respondents, while the second section explored risks associated with green building practices in Nigeria. A five-point Likert scale was employed to measure responses, providing a standardized format for data collection. Questionnaires were distributed using Google Forms, supplemented by follow-up efforts such as phone calls. Out of the 102 questionnaires distributed, 95 were completed and returned, representing a high response rate that provided a robust foundation for analysis. Descriptive statistics were used to analyze the data.

4.0 Findings and Discussions

The professionals involved in the study include Architects, Builders, Quantity Surveyors, Services Engineers, Procurement Officers, and Civil Engineers. Table 1 is a summary of the background information of respondents.

Table 1: Summary of background information of respondents

Category	Classification	Frequency	Percentage
Profession	Architect	20	21.1%
	Builder	17	17.9%
	Quantity Surveyor	34	35.8%
	Services Engineer	12	12.6%
	Procurement	10	10.5%
	Civil Engineer	2	2.1%
	Total	**95**	**100%**
Academic Qualification	BSc/BTech	43	45.3%
	MSc/MTech	32	33.7%
	HND	20	21.1%
	Total	**95**	**100%**
Years of Experience	1-5	14	14.7%
	5 – 10	52	54.7%
	11 – 15	8	8.4%
	16 – 20	17	17.9%
	Above 20	4	4.2%
	Total	**95**	**100%**

The respondent data shows a range of professionals with Quantity Surveyors being the largest group at 35.8%. Architects and Builders follow, indicating a strong representation of core construction roles. Educationally, the majority have a Bachelor’s degree (45.3%), and a substantial number hold a Master’s degree (33.7%). This high level of education among respondents is expected to contribute to well-informed opinions and insights. In terms of experience, most respondents have between 6 and 10 years in the field (54.7%), which suggests a mix of practical experience and recent industry exposure.

Table 2 shows the responses of participants on the risks associated with green building practices in construction projects.

Table 2: Risk Assessment of Green Building Practices

Rank	Risk	Mean Score	Decision Rule
1	Potential Delays	4.47	Extremely Severe
2	Standard of Care/Legal Risk	4.45	Extremely Severe
3	Fluctuations in Green Material Prices	4.38	Extremely Severe
4	Critical Cash Flow During Construction Stage	4.38	Extremely Severe
5	Financial Risks	4.28	Extremely Severe
6	Untested Contract Language	4.23	Extremely Severe
7	Underperformance of Green Buildings	4.17	Extremely Severe
8	Shifts in Government Priorities	4.16	Extremely Severe
9	Moisture Accumulation and Mold Growth	3.93	Very Severe
10	High Initial Capital Costs	3.87	Very Severe
11	Long Payback Periods	3.85	Very Severe
12	Lack of Experience in Green Technologies	3.82	Very Severe
13	Limited Availability of Green Materials	3.79	Very Severe
14	Certification Process Costs	3.75	Very Severe
15	Compliance Challenges	3.72	Very Severe
16	Non-Uniformity of Regulatory Incentives	3.68	Very Severe
17	Malfunctioning Green Technologies	3.65	Very Severe
18	Inefficient Energy Performance	3.62	Very Severe
19	Retrofitting Existing Buildings	3.58	Very Severe
20	Higher Maintenance Costs	3.55	Very Severe

Received: 31-01-2025 / Accepted: 05-03-2025 / Published: 30-09-2025

https://doi.org/10.70118/ujet.2025.0202.41

Rank	Risk	Mean Score	Decision Rule
21	Lack of Trained Personnel	3.52	Very Severe
22	Health and Safety Concerns	3.48	Moderate Severity
23	Inappropriate Energy Benchmarks	3.45	Moderate Severity
24	Changes in Green Building Regulations	3.42	Moderate Severity

Source: Field survey 2025

The study found that the biggest risk in green building projects is potential delays. This supports findings from Mahat *et al*. (2022) and Aguda (2024), who pointed out that delays often happen due to a lack of experience among contractors and consultants. This is especially true when existing buildings are being upgraded to meet green standards. These delays can lead to higher costs and uncertainty, making green projects less attractive. To reduce this risk, there is a need for more training programs to equip professionals with the right skills for green construction. Legal and standard of care risks were also a major concern, ranking as the second-highest risk. Research by Bungau *et al*. (2022) shows that because green building regulations are still evolving, it can be difficult to determine the right legal standards. A well-known case, Shaw Development, LLC v. Southern Builders, Inc., highlights how legal disputes can arise when sustainability goals are not met (Olabi *et al*., 2024).

This suggests that unclear legal guidelines can create challenges for developers and investors, making them hesitant to commit to green projects. To address this, clearer regulations and contract standards are needed to provide guidance and reduce legal uncertainties.

The study also found that fluctuations in green material prices pose a major challenge. Research by Nilimaa (2023) and Ayarkwa *et al*. (2022) supports this, showing that sustainable materials are often expensive and not always available. This means that if prices keep changing, developers may be discouraged from using green materials, especially in places where affordability is a concern. Without government support or financial incentives, many projects may not prioritize sustainability. To solve this, policymakers should consider subsidies, tax breaks, and improved supply chains to make green materials more affordable.

Another key risk identified was cash flow challenges, especially during the construction phase. Other studies (Komurlu *et al*., 2023; Qian *et al*., 2023) confirm that financial risks in green projects go beyond the initial investment. Many developers struggle to maintain stable funding throughout the project, which can lead to delays or adjustments in design to cut costs. This suggests that green projects need better financial support. Green bonds, sustainability-linked loans, and partnerships between public and private sectors could help provide the necessary funding. The study also found that shifting government priorities and financial uncertainties add to the risks of green building. Research by Zeng *et al*. (2025) shows that changing policies can create uncertainty, making it harder for developers to invest in sustainable projects. This means that if governments do not provide stable and clear policies, businesses may hesitate to commit to green buildings. Long-term policies and incentives are needed to encourage more investment in sustainability.

Performance risks were another important issue, especially in terms of energy efficiency. Some studies (Rebeiro *et al*., 2024) found that some green buildings use more energy than expected, often because of how people use the buildings or poor facility management. This suggests that having a green design is not enough—building management and user behavior also play a big role in achieving sustainability goals. Regular performance checks and smart energy management systems can help ensure buildings operate as planned. Another concern was moisture buildup and mold growth due to increased natural ventilation. Research by Carpino *et al*. (2023) highlights similar risks, showing that poor ventilation design can lead to health issues. This suggests that while natural ventilation is good for sustainability, it must be carefully planned to avoid unintended problems. Architects and engineers should integrate moisture control solutions alongside ventilation to maintain indoor air quality. The findings show that while green buildings have many benefits, they also come with unique risks. Addressing these risks through better training, clear legal guidelines, financial support, and regular monitoring can help make green building practices more reliable and widely adopted.

These findings contribute to the existing body of knowledge by providing a comprehensive assessment of risks in green building practices. The study highlights the significant challenges posed by potential delays, legal uncertainties, financial constraints, and performance risks. These risks affect various green building practices, such as the use of sustainable materials, energy-efficient designs, and natural ventilation systems. For instance, fluctuations in green material prices and critical cash flow challenges can impact the affordability and accessibility of sustainable materials, potentially leading to compromises in project execution. Similarly, legal uncertainties and untested contract terms may create barriers to obtaining necessary green certifications, affecting compliance with sustainability standards.

While this study identifies these risks and their implications, it does not employ inferential statistical analysis to quantify the degree of impact or correlation between specific risks and green building practices. Future

Received: 31-01-2025 / Accepted: 05-03-2025 / Published: 30-09-2025

https://doi.org/10.70118/ujet.2025.0202.41

research could explore this area by conducting statistical assessments to measure the extent to which each risk affects different aspects of green building implementation. Additionally, limitations of the study include its focus on a specific geographical context and the potential for response bias. Comparative studies across different regions, as well as longitudinal research tracking the evolution of risks over time, could provide deeper insights into the changing landscape of green building challenges.

5.0 Conclusions, Recommendations and Areas of Further Research

5.1 Conclusions

The findings of this study reveal that the top risks in green building practices include Potential Delays**,** Standard of Care/Legal Risks**,** Fluctuations in Green Material Prices**,** and Critical Cash Flow Challenges**.** Potential delays emerged as the most significant risk, driven by inexperience among consultants and contractors, particularly in retrofitting projects (Iwuanyanwu *et al*., 2024). Legal risks, such as unmet certification expectations and evolving standards of care, further complicate stakeholder decision-making, as highlighted by Bungau *et al* (2022) and the *Shaw Development, LLC v. Southern Builders, Inc.* case. Financial challenges, including material price fluctuations and cash flow issues, were also critical, with Fuerst (2019) emphasizing their impact on project feasibility. Performance risks, such as energy inefficiency in LEED-certified buildings (Amiri, 2017)) and moisture-related issues (Carpino *et al*, 2023), underscore the operational challenges of green buildings.

5.2 Recommendations

Green building projects come with several risks, including delays, legal uncertainties, financial challenges, and performance issues. To reduce these risks and improve project outcomes, the following recommendations are proposed:

1. **Increase Training and Skill Development:** The study found that a lack of experience among contractors and consultants leads to project delays. More training programs and certification courses on green building techniques should be introduced to equip professionals with the right skills.
2. **Establish Clear Legal and Regulatory Guidelines:** Legal uncertainties make green projects risky for developers. Clear regulations and standardized contracts should be developed to reduce disputes and provide better legal protection for all stakeholders.
3. **Introduce Financial Incentives and Support:** High costs and unstable cash flow discourage green building adoption. Governments should offer subsidies, tax breaks, and funding options such as green bonds to make projects more affordable and financially sustainable.
4. **Improve Building Performance Management:** Some green buildings fail to meet energy efficiency targets due to poor facility management. Regular performance checks, smart energy systems, and proper ventilation planning should be implemented to maintain sustainability goals.
5. **Ensure Stable and Consistent Policies:** Unstable government policies create uncertainty for investors. Long-term sustainability policies and incentives should be maintained to encourage continuous investment in green building projects.

These steps will help address key risks and make green buildings more reliable, cost-effective, and widely adopted.

5.3 Areas for Further Research

This study contributes to the growing body of knowledge on green building risks, emphasizing the need for proactive risk management strategies, improved training, and robust implementation frameworks. While the findings provide valuable insights, the study is limited by its geographical focus and potential response bias. Future research should explore comparative studies across regions and longitudinal analyses to better understand these risks. Addressing these challenges is essential for realizing the full potential of green buildings and advancing sustainable development goals.

References

Abdulazeez, S., Faruq, M., & Musa, A. (2024). Barriers to sustainable green building practice in Nigeria. *FUDMA Journal of Sciences, 7*(6), 157–163. https://doi.org/10.33003/fjs-2023-0706-2114

Abu Ghazaleh, S., & Alabady, H. (2017). *Contractual suggestions for the contractor in green buildings. Journal of Law, Policy and Globalization, 61*, 17-24. https://www.iiste.org/journals/index.php/JLPG/article/view/37124/0

Aguda, S. (2024). Scheduling and resource management in sustainable construction projects. *European Journal of Business and Management, 16*(9), 124–132. Retrieved from https://www.iiste.org

Aiminhiefe, M. I. (2022). Impact of government policies on the building construction industry in Edo State, Nigeria. *Direct Research Journal of Engineering and Information Technology, 9*(4), 162–166. https://doi.org/10.26765/DRJEIT27189730126

Akang, A. (2024). Regulatory compliance and access to finance: Implications for business growth in developing economies. *Sciental Journal of Education, Humanities and Social Sciences, 1*(2), 8–23. https://doi.org/10.62536/sjehss.2023.v1.i2.pp8-23

Allen, J. G., MacNaughton, P., Laurent, J. C., Flanigan, S. S., Eitland, E. S., & Spengler, J. D. (2015). Green buildings and health. *Current Environmental Health Reports, 2*(3), 250–258. https://doi.org/10.1007/s40572-015-0063-y

Ali, K. (2021). The role of green buildings in rationalizing energy consumption. *International Journal of Advances in Engineering and Civil Research, 1*(1), 21–37.

Amiri, N. (2017). *Examination of LEED certified building's electricity usage* (Master's thesis). Western Kentucky University. Retrieved from https://digitalcommons.wku.edu/theses/

Archdesk. (2021). How does construction affect the environment. *Archdesk.* Retrieved from https://archdesk.com/blog/2021-a-year-in-construction/

Ayarkwa, J., Joe Opoku, D., Antwi-Afari, P., & Li, R. Y. M. (2022). Sustainable building processes' challenges and strategies: The relative importance index approach. *Cleaner Engineering and Technology, 7*, 100455. https://doi.org/10.1016/j.clet.2022.100455

Basten, V., Berawi, M., Latief, Y., & Crevit, I. (2018). Building incentive structure in the context of green building implementation: From the local government perspective. *Journal of Design and Built Environment, 18*(2), 37–45. https://doi.org/10.22452/jdbe.vol18no2.4

Bungau, C., Bungau, T., Prada, I., & Prada, M. (2022). Green buildings as a necessity for sustainable environment development: Dilemmas and challenges. *Sustainability, 14*(22), Article 14789. https://doi.org/10.3390/su142214789

Caraiman, A., Dan, S., & Pescari, S. (2023). Green buildings and their benefits in the context of sustainable development. *Economy Series, 1*(8), 35–45.

Eco-Business. (2024). Why Amsterdam's *The Edge* is a model for green offices worldwide. Retrieved from https://www.eco-business.com/news/why-amsterdams-the-edge-is-a-model-for-green-offices-worldwide/

Ekung, S., Odesola, I., & Opoku, A. (2021). Demystifying cost misperception as a challenge to green building adoption in Nigeria. *Journal of Engineering, Design and Technology, 19*(10), 2955–2974. https://doi.org/10.1108/JEDT-01-2021-0049

Filippini, M., & Obrist, A. (2022). Are households living in green certified buildings consuming less energy? Evidence from Switzerland. *Energy Policy, 161*, 112724. https://doi.org/10.1016/j.enpol.2021.112724

Fuerst, F. (2019). Green building finance and investments: Challenges and opportunities. *Journal of Real Estate Literature, 27*(1), 1–20.

Hauashdh, A., Nagapan, S., Jailani, J., & Gamil, Y. (2024). An integrated framework for sustainable and efficient building maintenance operations aligning with climate change, SDGs, and emerging technology. *Results in Engineering, 21*, 101822. https://doi.org/10.1016/j.rineng.2024.101822

Iwuanyanwu, O., Gil-Ozoudeh, I., Okwandu, A. C., & Ike, C. S. (2023). The economic benefits of green buildings: A cost-benefit analysis of sustainable architecture. *International Journal of Advanced Economics, 5*(9), 1440. https://doi.org/10.51594/ijae.v5i9.1440

Juwonlo, M. (2021, June 18). Nigeria commits to cutting GHG emissions by 20% by 2030 instead of 50%. *Climate Score Card Nigeria.* Retrieved from https://www.climatescorecard.org/2023/06/nigeria-commits-to-cutting-ghg-emissions-by-20-by-2030-instead-of-50

Karamoozian, M., & Zhang, H. (2023). Obstacles to green building accreditation during operating phases: Identifying challenges and solutions for sustainable development. *Journal of Asian Architecture and Building Engineering, 24*(1), 350–366. https://doi.org/10.1080/13467581.2023.2280697

Kanhaiya, K. S. (2023, October 24). Green buildings for a sustainable future: Project management perspective. *Institute of Project Management.* Retrieved from https://instituteprojectmanagement.com/blog/green-buildings-for-sustainable-future-project-management-perspective/

Komurlu, R., Kalkan Ceceloglu, D., & Arditi, D. (2023). Exploring the barriers to managing green building construction projects and proposed solutions. *Sustainability, 16*(13), 5374. https://doi.org/10.3390/su16135374

Liu, T., Chen, L., Yang, M., Sandanayake, M., Miao, P., Shi, Y., & Yap, P. (2022). Sustainability considerations of green buildings: A detailed overview on current advancements and future considerations. *Sustainability, 14*(21), 14393. https://doi.org/10.3390/su142114393

Mahat, N. A. A., Adnan, H., Yusuwan, N. M., Maisham, M., & Ismail, N. A. A. (2022). The influential factors' effects on schedule and cost performance toward productivity attainment in green construction projects. *IOP Conference Series: Earth and Environmental Science, 1067*(1), 012029. https://doi.org/10.1088/1755-1315/1067/1/012029

Mapp, C., Nobe, M., & Dunbar, B. (2020). The cost of LEED An analysis of the construction costs of LEED and non-LEED banks. *Journal of Sustainable Real Estate,* 3(2), 254–273. https://doi.org/10.1080/10835547.2011.12091824

Neyestani, B. (2017). A review on sustainable building (green building). *SSRN Electronic Journal, 6*(3), 451–459. https://doi.org/10.2139/ssrn.2968885

Nilimaa, J. (2023). Smart materials and technologies for sustainable concrete construction. *Developments in the Built Environment, 15*, 100177. https://doi.org/10.1016/j.dibe.2023.100177

Olabi, A. G., Shehata, N., Issa, U. H., Mohamed, O., Mahmoud, M., Abdelkareem, M. A., & Abdelzaher, M. (2024). The role of green buildings in achieving the sustainable development goals. *International Journal of Thermofluids, 25*, 101002. https://doi.org/10.1016/j.ijft.2024.101002

Orimoloye, B. (2024). Green building in Abuja: A step to sustainability. Retrieved from https://safetyintheenvironment.wordpress.com/2024/08/15/green-building-in-abuja-a-step-to-sustainability/

Oyebode, O. J. (2018). Green building: Imperative panacea for environmental sustainability and life cycle construction in Nigeria. *World Journal of Research and Review, 7*(3), 15–29. https://doi.org/10.5038/2455-3956.7.3.1026

Plebankiewicz, E., Juszczyk, M., & Kozik, R. (2018). Trends, costs, and benefits of green certification of office buildings: A Polish perspective. *Sustainability, 11*(8), 2359. https://doi.org/10.3390/su11082359

Qian, Q., Chan, E., & Khalid, A. (2015). Challenges in delivering green building projects: Unearthing the transaction costs (TCs). *Sustainability, 7*(4), 3615–3636. https://doi.org/10.3390/su7043615

Ribeiro, L. M., Piccinini, T., & Ghisi, E. (2024). LEED certification in building energy efficiency: A review of its performance efficacy and global applicability. *Sustainability, 17*(5), 1876. https://doi.org/10.3390/su17051876

Runtuk, J. K., Ng, P. K., & Ooi, S. Y. (2023). Challenges and solutions in working with green suppliers: Perspective from a manufacturing industry. *Sustainability, 16*(20), 8744. https://doi.org/10.3390/su16208744

Saka, N., Olanipekun, A. O., & Omotayo, T. (2021). Reward and compensation incentives for enhancing green building construction. *Environmental and Sustainability Indicators, 11*, 100138. https://doi.org/10.1016/j.indic.2021.100138

Salehi, M. M., Terim Cavka, B., Frisque, A., Whitehead, D., & Bushe, W. K. (2015). A case study: The energy performance gap of the Center for Interactive Research on Sustainability at the University of British Columbia. *Journal of Building Engineering, 4*, 127–139. https://doi.org/10.1016/j.jobe.2015.09.002

Shaw Development, LLC v. Southern Builders, Inc., No. 19-C-07-011405 (Somerset Cty. Cir. Ct. Md. 2007). Stempler, M. J. (2017, February 15). Keeping "green" contracts clear. *Becker Lawyers.* Retrieved from https://beckerlawyers.com/keeping-green-contracts-clear/

Steinemann, A., Wargocki, P., & Rismanchi, B. (2017). Ten questions concerning green buildings and indoor air quality. *Building and Environment, 112*, 351–358. https://doi.org/10.1016/j.buildenv.2016.11.010

Thatcher, A., & Milner, K. (2016). Is a green building really better for building occupants? A longitudinal evaluation. *Building and Environment, 108*, 194–206. https://doi.org/10.1016/j.buildenv.2016.11.010

Unegbu, H., Yawas, D. S., Dan-Asabe, B., & Alabi, A. (2024). Analyzing barriers to sustainability: A case study of failed green building projects in Nigeria. *SSRN Electronic Journal.* https://doi.org/10.2139/ssrn.4825321

Wang, Y., Liu, Y., & Chen, X. H. (2025). Green technology innovation, ESG ratings and corporate sustainable performance: Empirical evidence from listed semiconductor companies in China. *International Review of Economics & Finance, 99*, 104061. https://doi.org/10.1016/j.iref.2025.104061

Yang, T., & Clements-Croome, D. (2018). Natural ventilation in the built environment. In *Encyclopedia of Sustainable Technologies* (pp. 488–498). Springer. https://doi.org/10.1007/978-1-0716-0684-1_488

Zeng, S., Ji, M., & Huang, X. (2025). An empirical study on the impact of tax incentives on the development of new energy vehicles: Case of China. *Energy Policy, 198*, 114452. https://doi.org/10.1016/j.enpol.2024.114452

Zhang, C., Hu, M., Laclau, B., Garnesson, T., Yang, X., & Tukker, A. (2021). Energy-carbon-investment payback analysis of prefabricated envelope-cladding system for building energy renovation: Cases in Spain, the Netherlands, and Sweden. *Renewable and Sustainable Energy Reviews, 145*, 111077. https://doi.org/10.1016/j.rser.2021.111077

Received: 31-01-2025 / Accepted: 05-03-2025 / Published: 30-09-2025
https://doi.org/10.70118/ujet.2025.0202.41

Zhou, Y., Cai, J., Xu, Y., Wang, Y., Jiang, C., & Zhang, Q. (2021). Operation performance evaluation of green public buildings with AHP-fuzzy synthetic assessment method based on cloud model. *Journal of Building Engineering, 42*, 102775. https://doi.org/10.1016/j.jobe.2021.102775

Zou, P., Alam, M., Sanjayan, J., Wilson, J., Stewart, R., Sahin, O., Bertone, E., Buntine, C., Blair, E., & Ellis-Jones, D. (2016). Managing risks in complex building retrofit projects for energy and water efficiency. *Procedia Engineering, 180*, 1641–1650. https://doi.org/10.1016/j.proeng.2017.04.314