Advances in Consumer Research
https://acr-journal.com/
Volume-2 | Issue-6| December 2025
Original Researcher Article

Identifying Barriers to the Sustainable Development of the Construction Industry in Developing Countries

Puspanathan Doraisingam[1]*, Motahareh Soheilipoor [2], Reza Falsaf[3], Anantha Raj A. Arokiasamy[4], Rosnizam Mat[5]
[1*]Faculty of Business and Communications, INTI International University, Address: Persiaran Perdana BBN Putra Nilai, 71800 Nilai, Negeri Sembilan,
Email ID : puspanathan.dsingam@newinti.edu.my, ORCID: https://orcid.org/0009-0005-5333-5802
[2] Department of Architectural Technology (Project and Construction Management), Faculty of Architecture and Urban Planning, Iran University of Art, Tehran, Iran.
Email ID : motaharehsoheili@gmail.com, ORCID: https://orcid.org/0009-0004-5930-9798
[3] Assistant Professor, Department of Architectural Technology (Project and Construction Management), Faculty of Architecture and Urban Planning, Iran University of Art, Tehran, Iran.
Email ID : R.falsafi@art.ac.ir, ORCID: https://orcid.org/0009-0003-4147-5416
[4]Faculty of Business and Communications, INTI International University, Address: Persiaran Perdana BBN Putra Nilai, 71800 Nilai, Negeri Sembilan,
Email ID : anantharaj.asamy@newinti.edu.my, ORCID: https://orcid.org/0000-0001-9784-6448
[5]Faculty of Business and Communications, INTI International University, Address: Persiaran Perdana BBN Putra Nilai, 71800 Nilai, Negeri Sembilan,
Email ID : rosnizam.mat@newinti.edu.my, ORCID: https://orcid.org/0009-0005-7700-9200
***Corresponding Author:**
Puspanathan Doraisingam
Faculty of Business and Communications, INTI International University, Address: Persiaran Perdana BBN Putra Nilai, 71800 Nilai, Negeri Sembilan,
Email ID : puspanathan.dsingam@newinti.edu.my , ORCID: https://orcid.org/0009-0005-5333-5802

ABSTRACT
Sustainable development in the construction industry is crucial for reducing environmental harm, using resources more efficiently, and creating long-term social and economic benefits. However, in many developing countries, the journey toward sustainability is slowed by a range of barriers, from financial constraints to outdated policies. Understanding these obstacles is vital for those seeking to drive real change. In this study, the barriers to sustainable development have been extracted from the literature and categorized, leading to a multi-level understanding of the key areas hindering the implementation and management of sustainability. After identifying the barriers, they were categorized into seven main groups: Economical, Technical and Technological, Knowledge and Awareness, Regulatory and Policy, Cultural and Behavioral, Governance and management, and Market. By shedding light on these barriers, this research provides important insights for policymakers, construction professionals, and researchers. It offers a clear framework to understand and tackle the challenges standing in the way of sustainable construction, particularly in developing countries where such efforts are most needed. The ultimate goal is to help pave the way for more sustainable practices, improving the construction industry's environmental, social, and economic outcomes...
Keywords: *Barriers, Sustainable Development, Developing Countries, Construction Industry.*

1. INTRODUCTION:

Since the rapid increase in urbanization in developing countries has occurred, construction projects have had a significant long-term impact on the environment, society, and economy. The construction industry is notably responsible for a sizeable portion of the world's consumption of raw materials and energy (Safinia et al., 2017). Recent studies show that the industry accounts for 16% of water, 25% of timber, 40% of raw materials, and 32% of total energy consumption (Hongyang et al., 2012; Serpell et al., 2013). Additionally, it contributes to approximately 40% of waste generation and one-third of carbon emissions, underscoring the industry's severe environmental, social, and economic consequences (Serpell et al., 2013).

The concept of sustainable development (SD) has been widely emerged and discussed as a response to these unfavorable effects as a strategy for lowering carbon emissions and encouraging more environmentally responsible building practices. The United Nations, through the Brundtland Report in 1987, defined SD as the ability to ensure that development meets present needs without compromising the ability of future generations to

meet their own (Toriola-Coker et al., 2021). SD aims to balance economic, social, and environmental factors in order to achieve sustainable outcomes (Emmanuel et al., 2014).

In the context of construction, sustainable development focuses on minimizing environmental harm while ensuring that new buildings also have positive social impacts. Sustainable construction enhances not only environmental sustainability but also the comfort, health, and productivity of building occupants, ultimately improving the quality of life for surrounding communities (Bolis et al., 2014; Kwofie et al., 2020), which supports **SDG goals 9 of Industry, Innovation, and Infrastructure**; and encourages the adoption of innovative construction technologies, resilient infrastructure, and sustainable industrial practices. As such, embracing sustainable practices in the construction industry is essential for achieving long-term benefits for both society and the environment which also relates to **SDG 11; Sustainable Cities and Communities**; which focuses on sustainable urban development, green buildings, efficient waste management, and improved housing solutions.

However, the current construction process remains laden with wasteful activities, with a predominant focus on profitability rather than considering long-term impacts (Tonder & Low, 2021). A recent report on the Sustainable Development Goals (SDGs) revealed that no country has fully met the targets outlined in the 2030 Agenda for Sustainable Development (Agyekum et al., 2021). This highlights the urgent need for industries across all nations to prioritize the creation of a sustainable environment (Tafazzoli, 2022). To address these challenges, many countries are now actively working to identify and overcome the key barriers to sustainable development, particularly within the construction industry. This study seeks to identify and classify the key barriers from the review of literature in developing countries, offering valuable insights for managers and professionals to support the implementation of more sustainable practices.

2. METHODOLOGY

To identify the barriers to sustainability development in infrastructure projects, a review of relevant literature, including research articles, was conducted. The search was performed using related external keywords on international websites such as MDPI, ScienceDirect, Google Scholar, Emerald, and Springer. The result of this search yielded approximately 100 relevant articles from reputable international sites, of which 35 articles were selected, indicating the richness of the theoretical background on the subject.

Documentary study and written sources form the basis for expressing, analyzing, describing, and interpreting materials in review studies. Therefore, in this study as well, a library-based approach was adopted through a comprehensive and detailed review of the extracted articles and their content analysis. The thematic categorization of the articles was focused on identifying and categorizing barriers to sustainable development in the construction industry, and the results of this categorization facilitated the intended content analysis.

Finally, as a result of this process and after identifying the barriers to sustainable development, which still appear to be open to further development and could attract the attention of researchers, a comprehensive classification of these barriers was completed, and the results were presented in this article.

3. LITERATURE REVIEW

Barriers to sustainable development of the construction industry

A review of the literature revealed a multitude of barriers that have been reported in the implementation of sustainable construction in developing countries. A review of 35 highly cited studies identified 32 barriers to the adoption of sustainable development. Seventeen barriers were identified as key barriers due to their repetition in different references. The key barriers are explained in the Results and Discussion section. Now, in this section, the extracted information is listed in Table 1, then categorized into seven main groups: Economical, Technical and Technological, Knowledge and Awareness, Regulatory and Policy, Cultural and Behavioral, Governance and Management, and Market.

Table 1: Overview of Identified Barriers and Their Classification

Group	Sub-group	References
Economical Barriers	High upfront costs discouraging clients despite long-term savings	(Hartshorn et al., 2005); (Griffin et al., 2010); (Ahn et al., 2013); (Djokoto et al., 2014); (Opoku et al., 2015); (E.E & Davies, 2017); (Chan et al., 2018); (Munyasya & Chileshe, 2018); (Opoku et al., 2019); (Tokbolat et al., 2020); (Zulu et al., 2022); (Fitriani & Ajayi, 2022)
	Perception of higher costs	
	High investment cost compared to conventional methods	
	The cost of procurement practices	(Hydes & Creech, 2010); (Bangdome-Dery et al., 2018); (Gan et al., 2015); (Wiewiora et al., 2015); (Opoku et al., 2019); (Ohiomah et al., 2019); (Abuzeinab et al., 2016); (Opoku & Ahmed, 2014)
	Lack of financial incentives	
	Pressure for short-term returns	
	High transaction costs	
	Low urban investment	(Djokoto et al., 2014); (Bangdome-Dery et al., 2018); (Opoku et al., 2019)

		(Adetunji et al., 2008); (Chan et al., 2018) (Häkkinen & Belloni, 2011); (Djokoto et al., 2014); (Opoku et al., 2015); (Ohiomah et al., 2019); (Fitriani & Ajayi, 2022); (Jaradat et al., 2024) (de Paula et al., 2017); (D'Incognito et al., 2015); (Ruparathna & Hewage, 2015) (Agarchand & Laishram, 2017); (Opoku et al., 2019) (Akindele et al., 2023); (Ogunmakinde et al., 2023)
Technical and Technological Barriers	Lack of expertise and technical know-how Technological deficiencies Lack of reliable data and information Lack of measurement tool and insufficient quantitative standards Insufficient infrastructure for sustainable construction (including materials, proficient workers, and etc.)	(Arif et al., 2009); (Häkkinen & Belloni, 2011); (Djokoto et al., 2014); (E.E & Davies, 2017); (Ohiomah et al., 2019); (Tokbolat et al., 2020); (Akindele et al., 2023) (Arif et al., 2009); (Häkkinen & Belloni, 2011); (Opoku et al., 2019); (Hartshorn et al., 2005); (Djokoto et al., 2014; Munyasya & Chileshe, 2018) (Häkkinen & Belloni, 2011); (D'Incognito et al., 2015); (Djokoto et al., 2014); (Hwang & Ng, 2013) (Häkkinen & Belloni, 2011); (Djokoto et al., 2014); (Gan et al., 2015); (E.E & Davies, 2017); (Fitriani & Ajayi, 2022); (Ogunmakinde et al., 2023); (Jaradat et al., 2024) (Gan et al., 2015); (Djokoto et al., 2014); (Häkkinen & Belloni, 2011); (E.E & Davies, 2017); (Ohiomah et al., 2019); (Zulu et al., 2022); (Ogunmakinde et al., 2023)
Knowledge and Awareness Barriers	Lack of knowledge and common language among professionals and the public about sustainability Lack of awareness among professionals and stakeholders of sustainable practice Lack of training and education Lack of knowledge sharing Shallow learning approach to sustainability in construction, with limited reporting and adoption.	(Roberts, 2004); (Häkkinen & Belloni, 2011); (Agarchand & Laishram, 2017); (Munyasya & Chileshe, 2018); (Opoku et al., 2019); (Ohiomah et al., 2019); (Tokbolat et al., 2020); (Fitriani & Ajayi, 2022); (Zulu et al., 2022); (Jaradat et al., 2024) (Arif et al., 2009); (Ojo et al., 2014); (Djokoto et al., 2014); (Gan et al., 2015); (E.E & Davies, 2017); (Ohiomah et al., 2019); (Zulu et al., 2022); (Ogunmakinde et al., 2023); (Akindele et al., 2023) (Häkkinen & Belloni, 2011); (Djokoto et al., 2014); (Opoku et al., 2015); (Gan et al., 2015); (Amiril et al., 2017); (Ohiomah et al., 2019); (Tokbolat et al., 2020); (Zulu et al., 2022); (Ogunmakinde et al., 2023); (Jaradat et al., 2024) (Häkkinen & Belloni, 2011); (Wilson & Rezgui, 2013); (Alkhaddar et al., 2012); (Duah et al., 2016); (Wilson & Rezgui, 2013); (Zuofa & Ochieng, 2016); (Akindele et al., 2023)

Regulatory and Policy Barriers	Outdated and fragmented regulations Weak enforcement of sustainable construction policies (lack of building codes and regulations) Lack of government support and incentives Steering mechanism and policy challenges Lack of measurement tool and quantitative standards	(Djokoto et al., 2014); (Gan et al., 2015); (Häkkinen & Belloni, 2011) (Ojo et al., 2014); (E.E & Davies, 2017); (Djokoto et al., 2014); (Opoku et al., 2015); (Gan et al., 2015); (Ogunmakinde et al., 2023); (Jaradat et al., 2024); (Hartshorn et al., 2005) (Häkkinen & Belloni, 2011); (Djokoto et al., 2014); (Chan et al., 2018); (Ohiomah et al., 2019); (Tokbolat et al., 2020); (Zulu et al., 2022) (Wiewiora et al., 2015); (E.E & Davies, 2017); (Munyasya & Chileshe, 2018) (Häkkinen & Belloni, 2011); (Djokoto et al., 2014); (Gan et al., 2015); (E.E & Davies, 2017); (Fitriani & Ajayi, 2022); (Ogunmakinde et al., 2023); (Jaradat et al., 2024)
Cultural and Behavioral Barriers	Resistance to change among organizations and individuals to transition to sustainable practices Status quo and reluctance to adopt sustainable practices Focus on short-term profit over sustainability Lack of market demand for sustainability culturally undervalued practices attitude of professionals	(Hartshorn et al., 2005); (Adetunji et al., 2008); (Häkkinen & Belloni, 2011); (Djokoto et al., 2014); (D'Incognito et al., 2015); (E.E & Davies, 2017); (Tokbolat et al., 2020); (Zulu et al., 2022) (Häkkinen & Belloni, 2011); (Hwang & Ng, 2013); (Zhang et al., 2015); (Zulu et al., 2022) (Hydes & Creech, 2010); (Sev, 2009); (Alsaleh & Taleb, 2010); (D'Incognito et al., 2015); (Ruparathna & Hewage, 2015); (Djokoto et al., 2014); (de Paula et al., 2017; Rohracher, 2001) (Rohracher, 2001); (Häkkinen & Belloni, 2011); (Djokoto et al., 2014); (Bangdome-Dery et al., 2018); (Gan et al., 2015); (Ohiomah et al., 2019); (Perera & Ashworth, 2015); (E.E & Davies, 2017); (Zulu et al., 2022) (Rohracher, 2001); (Häkkinen & Belloni, 2011) (Arif et al., 2009); (Häkkinen & Belloni, 2011)
Governance and Management Barriers	Client requirements and specifications controlling design Lack of strategies Lack of stakeholder involvement and cooperation Prioritize initial costs over lifecycle ones	(Hartshorn et al., 2005); (Häkkinen & Belloni, 2011) (Sodagar et al., 2008); (Djokoto et al., 2014); (Häkkinen & Belloni, 2011); (E.E & Davies, 2017) (Häkkinen & Belloni, 2011); (Djokoto et al., 2014); (Munyasya & Chileshe, 2018); (Opoku et al., 2015); (Zuo et al., 2012); (Agarchand & Laishram, 2017) (Hydes & Creech, 2010); (Rohracher, 2001); (Sev, 2009); (Alsaleh & Taleb, 2010); (D'Incognito et al., 2015); (Ruparathna & Hewage, 2015); (Djokoto et al., 2014); (de Paula et al., 2017)
Market Barriers	Lack of market demand for sustainability Prioritize initial costs over lifecycle ones	(Rohracher, 2001); (Häkkinen & Belloni, 2011); (Djokoto et al., 2014); (Bangdome-Dery et al., 2018); (Gan et al., 2015); (Ohiomah et al., 2019); (Perera & Ashworth, 2015); (E.E & Davies, 2017); (Zulu et al., 2022)

		(Hydes & Creech, 2010); (Rohracher, 2001); (Sev, 2009); (Alsaleh & Taleb, 2010); (D'Incognito et al., 2015); (Ruparathna & Hewage, 2015); (Djokoto et al., 2014); (de Paula et al., 2017)

4. RESULT AND DISCUSSION

In this section, we address the categorization process and provide individual explanations for each category. The barriers to sustainable development were identified and drawn from the literature. The results were grouped into seven categories named: Economical, Technical and Technological, Knowledge and Awareness, Regulatory and Policy, Cultural and Behavioral, Governance and Management, and Market. In each group, the key barriers are selected and ranked based on Table 1, standing out as more significant than others due to stronger supporting references. In the following section, we will discuss these key barriers, providing detailed explanations for them individually.

Economical Barriers

Economical barriers, particularly high initial costs, are among the most significant challenges to sustainable construction. In developing countries, these costs are often linked to a perceived lack of expertise (Ohiomah et al., 2019), the additional time required to implement sustainability measures (Akadiri, 2015), and long payback periods for investments in sustainable technologies(Tokbolat et al., 2020). Griffin et al. (2010) also identified increased upfront costs as a major hindrance, although these can be offset by long-term savings, such as reduced operating costs and higher building values (Baiden et al., 2006). The perception of unfamiliar techniques and additional costs for testing and certifications further contributes to this economic barrier (Hydes & Creech, 2010). Studies conducted in Nigeria, South Africa, and Kazakhstan confirm that the perception of high initial costs remains a significant barrier in these regions (Akadiri, 2015; Ohiomah et al., 2019; Tokbolat et al., 2020).

Moreover, the lack of government incentives and supportive policies exacerbates the situation. In countries like Kazakhstan and South Africa, financial support for sustainable construction remains insufficient, further limiting the adoption of sustainable practices (Ohiomah et al., 2019; Tokbolat et al., 2020). Addressing these economic barriers requires not only raising awareness of the long-term benefits of sustainable construction but also increasing financial incentives and creating more supportive policy frameworks to encourage investment in sustainable practices.

Technical and Technological Barriers

Technical and technological barriers significantly hinder sustainable construction, primarily due to insufficient technical expertise among professionals, which limits the adoption of sustainable practices. Häkkinen and Belloni (2011) emphasized that a lack of awareness and shared understanding of sustainability obstructs progress. Professionals and clients often lack the necessary technical knowledge, affecting all phases of construction. Additionally, access to updated information and tools is limited, particularly in developing countries (E.E & Davies, 2017), further complicating efforts to implement sustainable solutions. Improved access to technical resources and expertise is crucial to overcoming these challenges.

In addition to knowledge gaps, the shortage of skilled workers and sustainable materials, along with inadequate infrastructure, further slows progress in sustainable construction (E.E & Davies, 2017; Gan et al., 2015). These technical barriers are exacerbated by a lack of standards and frameworks to guide sustainable efforts, making it difficult for professionals to implement best practices. Ogunmakinde et al. (2023) also point out that this lack of technical expertise, coupled with insufficient standards, further hinders progress. Addressing these challenges requires better collaboration within the industry, increased investment in sustainable resources, and more comprehensive environmental planning.

Another significant barrier is the lack of reliable data and measurement tools, which impedes informed decision-making and progress toward sustainability goals. Djokoto et al. (2014) argue that without accurate data, it is difficult for stakeholders to make decisions based on environmental, economic, or social impacts. Similarly, Häkkinen and Belloni (2011) assert that the absence of reliable, comparable, and quantitative data is a significant obstacle to adopting sustainable building solutions, as it makes it difficult to accurately assess market value and ensure impartial evaluations of the benefits and risks associated with sustainable practices. These challenges underscore the need for improved technical knowledge and streamlined systems to support sustainable construction practices.

Lack of Knowledge and Awareness Barriers

Research in developing countries consistently identifies a lack of knowledge and awareness as the most significant barrier to implementing sustainability, leading to inadequate practices (Bonsu et al., 2020; Rock et al., 2019). In Kazakhstan, Tokbolat et al. (2020) found that insufficient knowledge about sustainable technologies and professional expertise hindered sustainable construction, a finding mirrored in South Africa where Ohiomah et al. (2019) noted that a lack of expertise, training, and awareness of sustainable project management were key barriers. Similarly, Amiril et al. (2017) identified a lack of education and training as critical obstacles in a Malaysian railway project, contributing to the slow adoption of sustainable practices. Addressing this knowledge gap requires robust training and professional development programs (Shari, 2012), as

the superficial implementation of sustainability remains prevalent in some regions (Alkhaddar et al., 2012; Zuofa & Ochieng, 2016).

In addition to knowledge gaps, fragmented knowledge sharing and the lack of a common language around sustainability further hinder collaboration in achieving sustainable goals (Häkkinen & Belloni, 2011; Munyasya & Chileshe, 2018). This lack of consistent communication and shared understanding across the industry aggravates the challenges, creating disjointed efforts toward sustainability in the construction sectors of developing countries. These findings emphasize the need for cohesive strategies, improved knowledge sharing, and a unified approach to sustainability in construction practices across these regions.

Regulatory and Policy Barriers

Regulatory and policy barriers present significant challenges to sustainable development in the construction industry. In many cases, regulations are outdated and fragmented, as seen in China, where laws primarily focus on environmental aspects, leaving other critical sustainability areas unaddressed (Gan et al., 2015). One of the most significant barriers is related to the complexity and inefficiency of regulatory tools, such as labeling systems, which make it difficult for stakeholders to navigate and implement sustainability standards effectively (Häkkinen & Belloni, 2011).

Moreover, Zulu et al. (2022) revealed that the complexity of codes and regulations related to green building and sustainable construction, as well as the lack of efficient codes and standards, were substantial barriers. This highlights the need for streamlined and clear regulatory frameworks to support the widespread adoption of sustainability practices. Fitriani and Ajayi (2022) emphasize the essential role of governments as regulators, policymakers, and drivers of sustainability practices. Governments are expected to commit to sustainability by introducing and enhancing legislation, strengthening policy guidance, and promoting transparency to raise public awareness.

Cultural and Behavioral Barriers

Cultural and behavioral barriers are deeply embedded in the construction industry, making the shift to sustainable practices a challenge. Many organizations and individuals resist change, preferring to stick to familiar, traditional methods rather than embracing sustainable alternatives (D'Incognito et al., 2015; Djokoto et al., 2014). As E.E & Davies (2017) asserts that the Nigerian construction industry has seen limited growth over the past decades, making it difficult to modernize, particularly in terms of construction methods and materials. Similarly, Tokbolat et al. (2020) found that resistance to change from traditional methods is a significant barrier in Kazakhstan's construction industry. The reluctance to adopt sustainable practices is reinforced by two main factors. First, the industry's low-risk culture, where innovation is often viewed as a risk rather than an opportunity (Adetunji et al., 2008; Häkkinen & Belloni, 2011). Second, it is related to the lack of awareness and cost-related perceptions among stakeholders (Durdyev, Ismail, et al., 2018; Durdyev, Zavadskas, et al., 2018).

In addition to resistance to change, higher initial costs are often considered one of the most significant barriers to adopting sustainable practices in the construction industry. Although these higher upfront costs can be offset through long-term economic benefits, such as operational cost savings and life-cycle cost reductions (Baiden et al., 2006), the status quo mindset prevents professionals from adopting long-term sustainability goals. Instead, they focus on immediate, conventional approaches (Hwang & Ng, 2013; Zulu et al., 2022).

Governance and Management Barriers

Managerial barriers are a critical challenge to the implementation of sustainable practices in construction projects. Throughout the life of any construction project, numerous stakeholders are involved, and their collaboration is essential for the project's success. Weak project management and poor coordination among stakeholders often result in missed opportunities to incorporate sustainability into the project (Fitriani & Ajayi, 2022; Munyasya & Chileshe, 2018). Djokoto et al. (2014) identified a lack of cooperation as a significant barrier to sustainable construction in the Ghanaian construction industry. Similarly, in India, Agarchand and Laishram (2017) found that insufficient stakeholder participation is one of the major challenges hindering sustainable infrastructure development.

These findings underscore the importance of strengthening communication, interaction, and networking among stakeholders to ensure more cohesive and effective collaboration.

Market Barriers

One of the primary issues is the lack of demand for sustainable construction, as many clients and stakeholders remain unaware of the long-term benefits, such as lower operational costs and improved performance (Häkkinen & Belloni, 2011; Zulu et al., 2022). A lack of demand is particularly problematic because building projects cannot be executed along sustainable lines without the owner or developer's full support for sustainable concepts. This reluctance often stems from a lack of environmental concern and a lack of awareness about the advantages of sustainable construction (Zulu et al., 2022).

In many regions, the market for sustainable technologies remains underdeveloped, making it difficult for owners to justify the additional costs associated with these innovations (Gan et al., 2015)This issue is exacerbated by the construction industry's focus on short-term profits over long-term sustainability, which conflicts with the principles of sustainable construction (Djokoto et al., 2014; Rohracher, 2001)Furthermore, many developers perceive sustainable projects as too risky or unprofitable, further reducing interest in adopting these practices (Perera & Ashworth, 2015).

5. CONCLUSION

In conclusion, this study has systematically identified and categorized the key barriers to sustainable development in the construction industry, focusing on the challenges prevalent in developing countries. The barriers, grouped into seven categories, Economical, Technical and

Technological, Knowledge and Awareness, Regulatory and Policy, Cultural and Behavioral, Governance and Management, and Market ; highlight the multifaceted obstacles that hinder the adoption of sustainable practices. Economical barriers, such as high initial costs and insufficient financial incentives, coupled with technical challenges like a lack of expertise and technological infrastructure, are particularly prominent. Furthermore, insufficient knowledge sharing, outdated regulations, cultural resistance, and low market demand exacerbate these issues, making it difficult for the industry to transition toward sustainability. To address these barriers, targeted interventions such as enhanced education, regulatory reforms, financial incentives, and stronger market support are essential. This study provides a foundational understanding of the obstacles impeding sustainable construction and offers a framework for stakeholders to develop solutions that promote more sustainable practices in the construction sector. Future research should explore practical strategies to mitigate these barriers and accelerate the implementation of sustainability in the construction industry.

Sustainable building reduces environmental effects and increases efficiency, particularly in developing nations. Developed nations that have successfully launched a variety of sustainability projects may teach us a lot. For instance, Germany's innovative concrete uses nanomaterials to increase energy efficiency and lower emissions related to building construction (Konbr & Mamdouh, 2022). A competitive advantage that the UK might assert in terms of sustainable design is the increased transparency and accountability of green building projects brought about by sustainability reporting and certification systems like BREEAM (Kazemi et al., 2023). Additionally, energy-efficient designs and sophisticated building management systems are required by Singapore's green construction rules, which resulted in decreased absolute carbon footprints (Nwaogbe et al., 2025). The examples demonstrate how the construction industry may undergo a paradigm shift towards sustainability through the adoption of sustainable policies, technology advancements, and regulatory frameworks. By implementing sustainability reporting requirements, investing in green building technology, and aligning policies with global norms, emerging nations may achieve similar outcomes. They must be put into practice to guarantee long-term economic and environmental advantages, such as the use of nanomaterials, energy-efficient designs, and green finance systems, and they can aid in achieving the sustainability objective.

REFERENCES

1. Abuzeinab, A., Arif, M., Kulonda, D., & Awuzie, B. O. (2016). Green business models transformation: evidence from the UK construction sector. Built Environment Project and Asset Management, 6, 478-490. https://doi.org/10.1108/BEPAM-10-2015-0060
2. Adetunji, I., Price, A., & Fleming, P. (2008). Achieving sustainability in the construction supply chain. Proceedings of The Institution of Civil Engineers-engineering Sustainability - PROC INST CIV ENG-ENG SUSTAIN, 161, 161-172. https://doi.org/10.1680/ensu.2008.161.3.161
3. Agarchand, N., & Laishram, B. (2017). Sustainable infrastructure development challenges through PPP procurement process: Indian perspective. International Journal of Managing Projects in Business, 10. https://doi.org/10.1108/IJMPB-10-2016-0078
4. Agyekum, K., Botchway, S., Adinyira, E., & Opoku, A. (2021). Environmental performance indicators for assessing sustainability of projects in the Ghanaian construction industry. Smart and Sustainable Built Environment, ahead-of-print. https://doi.org/10.1108/SASBE-11-2020-0161
5. Ahn, Y. H., Pearce, A. R., Wang, Y., & Wang, G. (2013). Drivers and barriers of sustainable design and construction: The perception of green building experience. International Journal of Sustainable Building Technology and Urban Development, 4(1), 35-45. https://doi.org/10.1080/2093761X.2012.759887
6. Akadiri, P. O. (2015). Understanding barriers affecting the selection of sustainable materials in building projects. Journal of Building Engineering, 4, 86-93. https://doi.org/https://doi.org/10.1016/j.jobe.2015.08.006
7. Akindele, O., Ajayi, S., Toriola-Coker, O., Oyegoke, A., Alaka, H., & Lyson, S. (2023). Sustainable construction practice in Nigeria: barriers and strategies for improvement. Built Environment Project and Asset Management, 13. https://doi.org/10.1108/BEPAM-06-2022-0085
8. Alkhaddar, R., Wooder, T., Sertyesilisik, B., & Tunstall, A. (2012). Deep learning approach's effectiveness on sustainability improvement in the UK construction industry. Management of Environmental Quality: An International Journal, 23, 126-139. https://doi.org/10.1108/14777831211204886
9. Alsaleh, Y., & Taleb, H. (2010). The Integration of Sustainability within Value Management Practices: A Study of Experienced Value Managers in the GCC Countries. Project Management Journal, 41, 50-59. https://doi.org/10.1002/pmj.20147
10. Arif, M., Egbu, C., Haleem, A., Kulonda, D., & Khalfan, M. (2009). State of green construction in India: Drivers and challenges. Journal of Engineering, Design and Technology, 7, 223-234. https://doi.org/10.1108/17260530910975005
11. Baiden, B. K., Price, A. D. F., & Dainty, A. R. J. (2006). The extent of team integration within construction projects. International Journal of Project Management, 24(1), 13-23. https://doi.org/https://doi.org/10.1016/j.ijproman.2005.05.001
12. Bangdome-Dery, A., Eghan, G., & Afram, S. (2018). Overview of Self-Help (Self-Build) Housing Provision in Ghana: Policies and Challenges.
13. Bolis, I., Morioka, S., & Sznelwar, L. (2014). When sustainable development risks losing its meaning. Delimiting the concept with a comprehensive

literature review and a conceptual model. Journal of Cleaner Production, 83, 7–20. https://doi.org/10.1016/j.jclepro.2014.06.041
14. Bonsu, G. A., Chisin, A. V., & Cronjé, J. (2020). Challenges to Sustainability in the Graphic Design Practices of a Developing Nation. Design and Culture, 12(1), 57-81. https://doi.org/10.1080/17547075.2020.1694263
15. 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. https://doi.org/https://doi.org/10.1016/j.jclepro.2017.10.235
16. D'Incognito, M., Costantino, N., & Migliaccio, G. (2015). Actors and barriers to the adoption of LCC and LCA techniques in the built environment. Built Environment Project and Asset Management, 5, 202-216. https://doi.org/10.1108/BEPAM-12-2013-0068
17. de Paula, N., Arditi, D., & Melhado, S. (2017). Managing sustainability efforts in building design, construction, consulting, and facility management firms. Engineering, Construction and Architectural Management, 24(6), 1040-1050. https://doi.org/10.1108/ECAM-07-2016-0165
18. Djokoto, S., Dadzie, J., & Ohemeng, E. A. (2014). Barriers to Sustainable Construction in the Ghanaian Construction Industry: Consultants Perspectives. Journal of Sustainable Development, 7. https://doi.org/10.5539/jsd.v7n1p134
19. Duah, D., Ford, J., & Syal, M. G. M. (2016). Role of Expert Knowledge in Home Energy Retrofits. International Journal of Architecture, Engineering and Construction, 5. https://doi.org/10.7492/IJAEC.2016.008
20. Durdyev, S., Ismail, S., Ihtiyar, A., Abu Bakar, N. F. S., & Darko, A. (2018). A partial least squares structural equation modeling (PLS-SEM) of barriers to sustainable construction in Malaysia. Journal of Cleaner Production, 204, 564-572. https://doi.org/https://doi.org/10.1016/j.jclepro.2018.08.304
21. Durdyev, S., Zavadskas, E., Thurnell, D., Banaitis, A., & Ihtiyar, A. (2018). Sustainable Construction Industry in Cambodia: Awareness, Drivers and Barriers. Sustainability, 10. https://doi.org/10.3390/su10020392
22. E.E, D., & Davies, O. (2017). Barriers to implementation of sustainable construction techniques. Journal of Environmental Science, 2.
23. Emmanuel, A.-J., Ibrahim Ahmed, D., & Adogbo Kulomri, J. (2014). An assessment of professionals' perception of the sustainability performance of infrastructure projects in Nigeria. Journal of Construction Project Management and Innovation, 4(sup-1), 912-932. https://doi.org/10.10520/EJC162730
24. Fitriani, H., & Ajayi, S. (2022). Barriers to sustainable practices in the Indonesian construction industry. Journal of Environmental Planning and Management, 66, 1-23. https://doi.org/10.1080/09640568.2022.2057281
25. Gan, X., Zuo, J., Ye, K., Skitmore, M., & Xiong, B. (2015). Why sustainable construction? Why not? An owner's perspective. Habitat International, 47, 61-68. https://doi.org/10.1016/j.habitatint.2015.01.005
26. Griffin, C., Knowles, C., Theodoropoulos, C., & Allen, J. H. (2010). Barriers to the implementation of sustainable structural materials in green buildings. Structures and Architecture - Proceedings of the 1st International Conference on Structures and Architecture, ICSA 2010, 1349-1357. https://doi.org/10.1201/b10428-180
27. Häkkinen, T., & Belloni, K. (2011). Barriers and drivers for sustainable building. Building Research and Information - BUILDING RES INFORM, 39, 239-255. https://doi.org/10.1080/09613218.2011.561948
28. Hartshorn, J., Maher, M., Crooks, J., Stahl, R., & Bond, Z. (2005). Creative destruction: Building toward sustainability. Canadian Journal of Civil Engineering, 32, 170-180. https://doi.org/10.1139/l04-119
29. Hongyang, L., Ng, S., & Skitmore, M. (2012). Public participation in infrastructure and construction projects in China: From an EIA-based to a whole-cycle process. Habitat International, 36, 47–56. https://doi.org/10.1016/j.habitatint.2011.05.006
30. Hwang, B.-G., & Ng, W. J. (2013). Project management knowledge and skills for green construction: Overcoming challenges. International Journal of Project Management, 31(2), 272-284. https://doi.org/https://doi.org/10.1016/j.ijproman.2012.05.004
31. Hydes, K., & Creech, L. (2010). Reducing mechanical equipment cost: The economics of green design. Building Research & Information, 28, 403-407. https://doi.org/10.1080/096132100418555
32. Jaradat, H., Alshboul, O. A. M., Obeidat, I. M., & Zoubi, M. K. (2024). Green building, carbon emission, and environmental sustainability of construction industry in Jordan: Awareness, actions and barriers. Ain Shams Engineering Journal, 15(2), 102441. https://doi.org/https://doi.org/10.1016/j.asej.2023.102441
33. Kazemi, M. Z., Elamer, A. A., Theodosopoulos, G., & Khatib, S. F. A. (2023). Reinvigorating research on sustainability reporting in the construction industry: A systematic review and future research agenda. Journal of Business Research, 167, 114145. DOI: 10.1016/j.jbusres.2023.114145.
34. Konbr, U. & Mamdouh, H. (2022). A proposed strategy to evaluate nanomaterials in construction to boost sustainable architecture. Civil Engineering and Architecture, 10(7), 3206-3226. DOI: 10.13189/cea.2022.100732.
35. Kwofie, T., Aigbavboa, C., & Thwala, W. (2020). Clusters of key barriers to life cycle assessment adoption in the South African construction industry: perspectives of stakeholders. Journal of Engineering, Design and Technology, ahead-of-print. https://doi.org/10.1108/JEDT-06-2020-0223
36. Munyasya, B., & Chileshe, N. (2018). Towards

Sustainable Infrastructure Development: Drivers, Barriers, Strategies, and Coping Mechanisms. Sustainability, 10, 4341. https://doi.org/10.3390/su10124341

37. Nwaogbe, G., Urhoghide, O., Ekpenyong, E., & Emmanuel, A. (2025). Green construction practices: Aligning environmental sustainability with project efficiency. International Journal of Science and Research Archive, 14(01), 189-201. DOI: 10.30574/ijsra.2025.14.1.0023.
38. Ogunmakinde, O., Egbelakin, T., Sher, W., Omotayo, T., & Ogunnusi, M. (2023). Establishing the limitations of sustainable construction in developing countries: a systematic literature review using PRISMA. Smart and Sustainable Built Environment, 13. https://doi.org/10.1108/SASBE-10-2022-0223
39. Ohiomah, I., Aigbavboa, C., & Thwala, W. (2019). An assessment on the drivers and obstacles of sustainable project management in South Africa: A case study of Johannesburg. IOP Conference Series: Materials Science and Engineering, 640, 012022. https://doi.org/10.1088/1757-899X/640/1/012022
40. Ojo, E., Mbowa, C., & Akinlabi, E. T. (2014). Barriers in implementing green supply chain management in construction industry.
41. Opoku, A., & Ahmed, V. (2014). Embracing sustainability practices in UK construction organizations. Built Environment Project and Asset Management, 4(1), 90-107. https://doi.org/10.1108/BEPAM-02-2013-0001
42. Opoku, A., Cruickshank, H., & Ahmed, V. (2015). Organizational leadership role in the delivery of sustainable construction projects in UK. Built Environment Project and Asset Management, 5, 154-169. https://doi.org/10.1108/BEPAM-12-2013-0074
43. Opoku, D.-G., Ayarkwa, J., & Agyekum, K. (2019). Barriers to environmental sustainability of construction projects. Smart and Sustainable Built Environment, 8. https://doi.org/10.1108/SASBE-08-2018-0040
44. Perera, S., & Ashworth, A. (2015). Cost Studies of Buildings. https://doi.org/10.4324/9781315708867
45. Roberts, B. H. (2004). The application of industrial ecology principles and planning guidelines for the development of eco-industrial parks: an Australian case study. Journal of Cleaner Production, 12(8), 997-1010. https://doi.org/https://doi.org/10.1016/j.jclepro.2004.02.037
46. Rock, S., Hosseini, M. R., Nikmehr, B., Martek, I., Abrishami, S., & Durdyev, S. (2019). Barriers to “green operation” of commercial office buildings. Facilities, 37(13/14), 1048-1065. https://doi.org/10.1108/F-08-2018-0101
47. Rohracher, H. (2001). Managing the Technological Transition to Sustainable Construction of Buildings: A Socio-Technical Perspective. Technology Analysis & Strategic Management, 13(1), 137-150. https://doi.org/10.1080/09537320120040491
48. Ruparathna, R., & Hewage, K. (2015). Sustainable procurement in the Canadian construction industry: current practices, drivers and opportunities. Journal of Cleaner Production, 109, 305-314. https://doi.org/https://doi.org/10.1016/j.jclepro.2015.07.007
49. Safinia, S., Al-Hinai, Z., Yahia, H., & Abushammala, M. (2017). Sustainable Construction in Sultanate of Oman: Factors Effecting Materials Utilization. Procedia Engineering, 196, 980-987. https://doi.org/10.1016/j.proeng.2017.08.039
50. Serpell, A., Kort, J., & Vera, S. (2013). Awareness, actions, drivers and barriers of sustainable construction in Chile. Technological and Economic Development of Economy, 19, 272-288. https://doi.org/10.3846/20294913.2013.798597
51. Sev, A. (2009). How Can the Construction Industry Contribute to Sustainable Development? A Conceptual Framework. Sustainable Development, 17, 161-173. https://doi.org/10.1002/sd.373
52. Shari, Z. (2012). Delivering sustainable building strategies in Malaysia: Stakeholders' barriers and inspirations. ALAM CIPTA, International Journal of Sustainable Tropical Design Research and Practice, 5, 3-12.
53. Sodagar, B., Fieldson, R., & Gilroy-Scott, B. (2008). Design for Sustainable Architecture and Environments. The International Journal of Environmental, Cultural, Economic, and Social Sustainability: Annual Review, 4. https://doi.org/10.18848/1832-2077/CGP/v04i04/54505
54. Tafazzoli, M. (2022). Construction Automation and Sustainable Development. In (pp. 73-95). https://doi.org/10.1007/978-3-030-77163-8_4
55. Tokbolat, S., Karaca, F., Durdyev, S., & Calay, R. (2020). Construction Professionals’ Perspectives on Drivers and Barriers of Sustainable Construction. Environment Development and Sustainability. https://doi.org/10.1007/s10668-019-00388-3
56. Tonder, P., & Low, M. (2021). The effect of CO 2 loading on the properties of normal concrete vs fly ash concrete. Journal of Engineering, Design and Technology, 19, 1472-1487. https://doi.org/10.1108/JEDT-08-2020-0315
57. Toriola-Coker, L. O., Alaka, H., Bello, W. A., Ajayi, S., Adeniyi, A., & Olopade, S. O. (2021). Sustainability Barriers in Nigeria Construction Practice. IOP Conference Series: Materials Science and Engineering, 1036(1), 012023. https://doi.org/10.1088/1757-899X/1036/1/012023
58. Wiewiora, A., Keast, R., & Brown, K. (2015). Opportunities and Challenges in Engaging Citizens in the Co-Production of Infrastructure-Based Public Services in Australia. Public Management Review, 18, 1-25. https://doi.org/10.1080/14719037.2014.999820
59. Wilson, I., & Rezgui, Y. (2013). Barriers to construction industry stakeholders' engagement with sustainability: Toward a shared knowledge experience. Technological and Economic Development of Economy, 19, 289-309. https://doi.org/10.3846/20294913.2013.799105
60. Zhang, X., Wu, Y., & Shen, L. (2015). Embedding “green” in project-based organizations: the way

ahead in the construction industry? Journal of Cleaner Production, 107, 420-427. https://doi.org/https://doi.org/10.1016/j.jclepro.2014.10.024

61. Zulu, S., Zulu, E., Chabala, M., & Mwango, N. (2022). Drivers and barriers to sustainability practices in the Zambian Construction Industry. International Journal of Construction Management, 23. https://doi.org/10.1080/15623599.2022.2045425
62. Zuo, J., Jin, X.-H., & Flynn, L. (2012). Social Sustainability in Construction – An Explorative Study. International Journal of Construction Management, 12(2), 51-63. https://doi.org/10.1080/15623599.2012.10773190
63. Zuofa, T., & Ochieng, E. (2016). Sustainability in Construction Project Delivery: A Study of Experienced Project Managers in Nigeria. Project Management Journal, 47. https://doi.org/10.1177/875697281604700604