



BARRIERS TO SUSTAINABLE GREEN BUILDING PRACTICE IN NIGERIA

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ABSTRACT

Green building approaches are becoming increasingly essential in the construction business. Green building entails designing buildings and employing methods that are ecologically responsible and efficient with resources throughout the life cycle of the building. It is viewed as a substitute to reducing or eliminating the negative environmental and climate change impacts of construction activities. Despite its benefits, green building uptake is hampered by a number of impediments. The study was conducted in the states of Abuja and Lagos, focusing on professionals, freelancers, and clients. The collected data was analyzed using SPSS 25.0, and the study's findings revealed that lack of understanding of Green Building Technologies was ranked first among the obstacles to green building acceptance with a RII of 0.79, followed by a lack of institutions to develop policies and set guidelines with a RII of 0.77, ambiguity with green equipment and materials with a RII of 0.76, lack of interest and interaction among project team members with 0.76, and lack of interest as well as communication among project team members with RII of 0.76. However, there are various hurdles to the implementation of ecologically conscious building in Nigeria. Long design and approval procedures for new technologies, a shortage of sustainable materials and goods, a proclivity to stick with present practices, a lack of building norms and regulations, and a lack of awareness about green products and powerful building systems are all examples. To guarantee a smooth transition to green building, industry players should investigate and apply sustainable solutions, particularly throughout the project design stages.

Keywords: Climate Change, Environment, Green Building Practice, Integrated Innovation Design, Sustainable Design

INTRODUCTION

The implementation of green building methods in the construction industry is rapidly approaching. Green construction refers to environmental procedures that are resource-efficient through the lifespan of a structure (US Environmental Protection Agency (USEPA), 2016). Green building is seen as a viable alternative to traditional building, having a key role in minimizing or eliminating the negative environmental and climate change impacts of construction operations (World Green Building Council (WGBC), 2017). Green building is currently being examined by authorities around the world as an approach for enhancing the construction industry's sustainability (Shen et al., 2017a). According to Hes (2015), integrating innovative green technologies into the framework of construction is a complex endeavor that necessitates the identification of impediments. Designers, on the other hand, must comprehend the technical and practical requirements connected with sustainable design while also realizing that the practice of design for sustainability involves a number of challenges. Although interest in and appreciation for sustainable design is growing, its application is limited (Hankinson & Breytenbach, 2012). In Nigeria, understanding of technical and scientific knowledge of green building is poor. The expertise required to implement the green building technology proposed to solve sustainability is still insufficient. The impediments to green building development must be thoroughly investigated. Due to rising urbanization, a developing nation like Nigeria is confronted with the issues of a housing deficit, massive power consumption, and high water demand. Increased urbanization is related with loss of arable land, a worsening water crisis,

environmental issues such as air and noise pollution, and high trash generated by buildings (Dalibi et al., 2017).

However, in Nigeria and other developing nations, the green construction niche is broadly open for research and application. In order to effectively and efficiently promote green buildings, the hurdles to development and acceptance must first be identified and overcome (Mao et al., 2015). There is a knowledge gap regarding green building barriers studies in developing countries, as noted by a recent review of green building research (Darko & Chan, 2016). This knowledge gap needs to be filled in particular because an improved comprehension of barriers is necessary for formulating effective approaches to overcome the challenges. However, few have attempted to analyze the use and barriers to green buildings in developing countries, and little or no research has focused on Nigeria involving the views of the construction managers on the obstacles to adoption in the construction industry (Chan et al., 2016). This is particularly crucial in developing nations like Nigeria, where the construction industry is still relatively new to green building. Furthermore, a multi-level analysis of the hurdles and criticalities surrounding the implementation of green buildings is necessary. Furthermore, Africa only makes up 4% of the world's greenhouse gas emissions at the moment, compared to 20% of the planet's territory and little over 15% of its population (China, the United States, the European Union, and India contribute 24%, 18%, 14%, and 6% of global emissions, respectively) (Wikipedia, 2012). However, research has indicated that the continent may be the most severely impacted by global warming (Richard et al., 2013), and the 2012 UN Conference on Sustainable Development's

conclusion document reflects this (UNCSD, or Rio+20) declares alternative in terms of adaptation to climate change to be an immediate and urgent global priority (UN, 2012). It is critical to promote sustainable practices in the built environment. The main barrier to implementing green building principles, according to Chan et al. (2009), is that green projects initially cost more to construct than conventional buildings. Furthermore, Zhang et al. (2011) emphasized that the design stage of energy-saving materials and green building appliances is more expensive. Guidelines have been created to promote the idea of green building, according to Umar and Khamidi's (2012) study on green building awareness. However, because of some elements that make it difficult to execute these principles, there is uncertainty regarding their application. This implies that in order to maintain up with the pace of progress in developing nations, a change in mindset is required. The purpose of the study is to evaluate Nigeria's impediments to the adoption of green buildings.

Green Building Practice

Since their beginning, academics, professionals, the government, and the general population have all expressed a wide range of interests in green building studies (Aghimien et al., 2018). Notwithstanding the endless discussions surrounding this topic, it is undeniable that the building sector is one of the numerous industries that contribute to the unstable nature of the global environment. The government employed the building sector to give the populace access to the infrastructure they required (Aghimien et al., 2018). Through GDP contribution and infrastructure development, the construction industry plays a major role in the economy. Like other businesses, the building sector has an influence on the environment. It has been identified as one of the major sources of indoor and outdoor pollution (Ding, 2008; Geng & Doberstein, 2008). It is responsible for 36% of energy-related CO₂ emissions in industrialized nations (Nassen et al., 2007), and environmental degradation, energy use, and resource utilization are major global concerns (Berg & BenDor 2011).

Green Building

Green building refers to a procedure that integrates various technique and process with the aim of reducing a building's energy utilization and improving human health (Qian, Chan, & Khalid, 2015). Sustainable construction, also known as green building is part of sustainable development. though, as Feltes (2007) highlighted that, it is not a sensible option if it is not inexpensively efficient compared to other modern construction methods. To achieve sustainability in green building, a study by Tsai et al. (2013) identified the following factors and criteria as essential.

Environmental Quality

Chen et al. (2010) found that prefabrication construction is more environmentally friendly than on-site construction, and Kubba (2010) states that carefully planned green buildings prioritize the standard of the indoor and outdoor environments, leading to sustainable performance and reduced pollution.

Energy Efficiency

Kubba (2010) emphasizes the importance of using renewable sources and devices that are energy- to accomplish overall energy efficiency. The client's primary focus and most important consideration when planning a building project is cost reduction (Jaillon et al., 2009).

Advantages of Green Building

The literature has a wealth of information about the advantages of green building and its technologies. According to Geng et al. (2017), the construction sector is responsible for roughly 40% of greenhouse gas emissions, but traditional buildings are the largest users of energy and emit the most carbon dioxide (CO₂). Green construction can lessen these negative effects on the environment. According to Rumaithi and Beheiry (2016), green buildings have extra advantages over conventional ones. These include lessening the ecological effect and carbon footprint on the environment, encouraging residents and users to lead healthier lifestyles, extending the life of buildings, using less energy and water, and requiring less maintenance. However, using the proper green building techniques is the only way to reap these benefits. According to US General Services Administration output, Das et al. (2011) also discovered that green buildings can cut energy consumption by 26% and water use by 54%. They also concurred that it may improve building occupants' health and safety and cut solid waste by 70%.

Industrialized nations' obstacles to green design

It's important to identify, comprehend, and resolve the obstacles preventing the widespread use of green construction materials and technology. These obstacles need to be examined in developed nations as well; they are not exclusive to underdeveloped ones. According to Ahn et al. (2003), the primary barriers to the adoption of green building technologies and materials in the United States of America (USA) are their high costs, lengthy payback periods, inclination toward the use of existing building methods, and users' inadequate knowledge and skill sets. Similar to this, Chan et al. (2016) noted that lack of government incentives, opposition to change, high costs of materials and technology, and insufficient knowledge and experience are the main obstacles to green building in the United States. These results were confirmed by a number of additional investigations (Meryman & Silman, 2004; Mulligan, 2014; Rodriguez-Nik, et. al., 2015; Darko & Chan, 2017). Research carried out in industrialized nations has demonstrated that inadequate communication is prevalent during green projects. The main problems were unclear about the performance and advantages of green building technologies and practices, a lack of understanding and interest among users, professionals, and sectors, and a lack of research on adoption obstacles (Hwang, & Ng, 2013). Love, et al., (2012) discovered that the main obstacles to the implementation of green building practices and technologies were a lack of building norms and regulations and strained stakeholder relations. According to Hwang et al. (2017), the adoption of green building methods and equipment was impacted by the absence of government support and incentives, as well as the fact that the initial implementation costs of green building materials and technologies were significantly higher than those of traditional ones.

Obstacles to eco-friendly design in poor nations

Research by Luthra et al. (2015) in India, Potbhare et al. (2009) in Ghana, Djokoto et al. (2014) in Ghana, and Aktas & Ozorhon (2015) in Turkey has established obstacles to the uptake of green construction technology and practices in developing nations. The results of earlier studies have been confirmed by these investigations, which have also brought attention to new obstacles such the dearth of databases and information on green building techniques and technology. Critical obstacles to green construction methods have been identified by Darko & Chan (2016) and include those related

to government, people, knowledge and information, market, cost, and risk. According to Aktas & Ozorhon (2015), it's critical to carry out research tailored to each nation in order to find solutions that are appropriate for that particular setting and can promote the use of green building techniques and technology. Asia, especially China and Malaysia, has been the focus of the majority of research on the obstacles that emerging nations face when implementing green building techniques and technologies. Therefore, by analyzing the obstacles to the adoption of green construction methods in developing nations using Nigeria as a case study, this research seeks to close the gap in the body of material already in existence.

MATERIALS AND METHODS

A descriptive method was used to perform an extensive literature assessment of the Nigerian construction sector. Ametepey et al. (2015), Aghimien et al. (2018), Mosly (2015), Ahn et al. (2013), and Djokoto et al. (2014) were among the several references that were cited. 22 barriers were found (Enshassi & Mayer, 2005; Darko & Chan, 2016; Abraham & Gundimeda, 2018; Hasan & Zhang, 2016). The study used an organized survey to collect information on respondents' demographics and perceived barriers to implementing and adopting green building methods. Important participants in the study were principal contractors, clients, and professionals in the construction industry. The study focused on Lagos State and Abuja the Federal Capital territory. Lagos State and Abuja were selected because of the high construction activity volume and high concentration of various sizes and types of contractors. In order to approach individuals that are not easily accessible, the snowball sampling method was employed (Alvi, 2016). Prior to distributing the research tool to the respondents, an experiment was carried out to evaluate its accuracy and completeness. In order to accomplish the goal of the study, a list of obstacles to green building was utilized in the creation of the questionnaire survey. There were two sections in the questionnaire. The study's first portion sought to learn more about the participants' backgrounds, and its second part identified potential obstacles to the application of

green building techniques in Nigeria's construction sector. Using the purposive sample approach, 117 questionnaires in total were sent to respondents; each respondent received an equal number of questionnaires. An average response rate of 64% (75) was noted for the study. The study's response rate was greater than that of earlier research in the construction sector by Olatunji (2010) and Emuze (2011), which, in turn, were 25.4% and 33.5%. Using SPSS, the data from the questionnaire replies was examined. Descriptive statistics like mean and standard deviation were employed in the analysis. The study concentrated on the research issue and provided the facts objectively, clearly, and after removing any extraneous material. Using a 5-point Likert scale, survey participants were asked to assess how much each barrier had an impact on the widespread acceptance of green buildings. Frequency, percentage, mean, relative importance index, and ranking were used to examine the data that was gathered. The hurdles to the adoption of green building practices in Nigeria's construction industry were ranked using the relative significance index (RII). In Mbamali and Okotie's (2012) study, the RII was calculated as follows:

$$RII = \frac{\sum fx}{\sum f} \cdot \frac{1}{k} = \frac{x}{k}$$

$$\text{Where, Mean} = \frac{\sum fx}{\sum f}$$

x = the weights that each participant assigned on a Likert scale from 1 to 5, where 1 represents strongly disagree, 2 disagree, 3 neutral, 4 agree, and 5 strongly agree.

f is the frequency with which respondents selected each point on the scale x, and k denotes the maximum point (k = 5) on the Likert scale.

Every barrier factor's computed RII was sorted according to size.

RESULTS AND DISCUSSION

75 of the 117 surveys that were sent out were satisfactorily completed and returned, amounting to a 64% response rate. The participants' background data included gender, years of experience in the building business, years of professional background, highest academic credentials.

Table 1: Demographic characteristics of the sample

S/No	Title Characteristics	Category	Frequency	Percent (%)
1	Gender	Male	41	54.67
		Female	34	45.33
	Total		75	100
2	Education	Graduate	54	72.00
		Postgraduate and above	21	28.00
	Total		75	100
3	Experience	0-10	18	24.00
		11-19	34	45.33
		>20	23	30.67
	Total		75	100
4	Discipline	Architect	10	13.33
		Quantity Surveyor	24	32.00
		Builders	19	25.33
		Civil/Structural Engineer	9	12.00
		Others	13	17.33
Total		75	100	

Nine (12%) of the participants were identified by the results as civil/structural engineers, followed by builders (19), architects (10), quantity surveyors (24), and other professionals (13), such as the project managers. According

to the participant breakdown, 72% of participants have a graduate degree, while 28% have a postgraduate degree or above. Furthermore, a majority of the respondents-75 percent have worked in the construction industry for 11 years or

longer, with some of them possessing over 31 years of experience. These results verify that the subjects were a good fit for the research.

Obstacles to Green Building Adoption

Table 2 lists the possible obstacles to Nigeria's construction industry, which were arranged according to their Relative Importance Index (RII).

Table 2: Barriers of Green Building

S/No	Barriers of Green Building	Weighting (x) /Response Frequency (f)					£f	£fx	Mean	RII	Rank
		1	2	3	4	5					
1	Lack of knowledge about Green Building Technologies	2	8	13	21	31	75	296	3.95	0.79	1
2	Tendency to maintain current practices	2	11	15	16	31	75	288	3.84	0.77	2
3	Uncertainty with green equipment and materials	4	9	15	17	30	75	285	3.80	0.76	3
4	Lack of institutions to formulate policies and set guidelines.	6	9	11	18	31	75	284	3.79	0.76	4
5	Lack of interest from clients and market demand	2	12	14	19	28	75	284	3.79	0.76	5
6	Lack of government incentives	4	9	14	21	27	75	283	3.77	0.75	6
7	Poor relationship between stakeholders	4	9	16	17	29	75	283	3.77	0.75	7
8	Lengthy preconstruction	5	9	16	14	31	75	282	3.76	0.75	8
9	Higher costs of green products and materials	4	7	16	28	20	75	278	3.71	0.74	9
10	Long payback periods	5	9	19	21	25	79	289	3.66	0.73	10
11	Human resource and client knowledge	8	6	15	21	25	75	274	3.65	0.73	11
12	Low level of awareness with regard to sustainability issues	5	9	14	28	19	75	272	3.63	0.73	12
13	Lack of research	3	11	16	26	19	75	272	3.63	0.73	13
14	Industry Practitioners' awareness is low	8	11	13	16	27	75	268	3.57	0.71	14
15	Risks and uncertainties involved, unfamiliarity	7	10	15	21	22	75	266	3.55	0.71	15
16	Lack of information and awareness	3	11	20	25	16	75	265	3.53	0.71	16
17	There is no sufficient training, workshop and seminars	6	8	20	28	13	75	259	3.45	0.69	17
18	Lengthy planning and approval process for new technology	8	12	15	18	22	75	259	3.45	0.69	18
19	Unavailability of sustainable materials and products	9	11	14	19	22	75	259	3.45	0.69	19
20	Lack of interest and communication amongst project team members	8	10	17	23	17	75	256	3.41	0.68	20
21	Lack of building codes and regulations	7	12	18	20	18	75	255	3.40	0.68	21
22	Lack of information about green products and high-performance building systems	10	11	15	18	21	75	254	3.39	0.68	22

The empirical analysis's findings show that Nigeria has a number of obstacles in the implementation of green construction practices. Lack of understanding of green building technologies (RII of 0.79), absence of organizations to create policies and guidelines (RII of 0.77), ambiguity surrounding green tools and materials (RII of 0.76), lack of interest and communication within the project team (RII of 0.76), and lack of interest from clients (public and private) and market demand (RII of 0.76) are the top five constraints. On the other side, the lengthy planning and approval procedure for new technologies (RII = 0.69) rank lowest among the hurdles to the implementing green building in Nigeria. Lack of building regulations and codes (RII of 0.68), a propensity to stick with present practices (RII of 0.69), the absence of sustainable materials and products (RII = 0.69), and a lack of knowledge about high-performance building systems and green products (RII = 0.68). Table 2 displays these barriers' respective rankings: 18th, 19th, 20th, 21st, and 22nd. It is imperative that the government take a leading role in encouraging the construction industry to embrace green building methods. The results of earlier research carried out in a number of nations, including Ametepey et al. (2015), Aghimien et al. (2018), Mosly (2015), and Djokoto et al.

(2014), are consistent with the lack of sufficient government support for sustainable construction in Nigeria. Second, in line with previous research, Nigeria's lack of pertinent legislation and regulations hinders the use of green building. (Enshassi & Mayer, 2005; Aghimien et al., 2018; Abraham & Gundimeda, 2018; Darko & Chan, 2016; Ametepey et al., 2015; Mosly, 2015) throughout many nations. Green building can be facilitated by a number of tools, according to Djokoto et al. (2014). An important factor in encouraging the use of green building techniques is the government. This includes implementing construction codes, offering incentives, updating current laws and policies, enforcing regulations, and utilizing other financial tools. Aghimien et al. (2018) state that in order to motivate the construction sector to adopt greener practices, these initiatives are essential. Onososen et al. (2019) also underlined that in order to successfully counter the challenges posed by the building sector, government interventions must be socially and economically responsible as well as environmentally friendly. The results of studies conducted in other nations (Djokoto et al., 2014; Enshassi & Mayer, 2005; Darko & Chan, 2016) support the idea that Nigeria's green building adoption is impacted by clients' lack of desire for green buildings. An increase in demand typically

leads to an increase in supply. The expansion of green buildings and satisfying consumer demand depend heavily on education and training (Oke et al., 2019). One obstacle to green building is a lack of client demand (Ametepey et al., 2015). According to Djokoto et al. (2014), the majority of clients are still not persuaded of the value of asking for green buildings. The survey also showed that, particularly when contrasted to their peers in developed nations, there is a lack of driving policy to enhance the technical capabilities of builders in order to engage in green building. This is because the government has not provided enthusiastic and forward-thinking assistance. Over 50% of the participants concur that there are insufficient trainings, seminars, workshops, and conferences available on this novel idea. Professionals receive little training on green building expertise. Research from other nations has shown that low awareness of green construction has an impact on the adoption of sustainable building methods in Nigeria (Djokoto et al., 2014; Enshassi & Mayer, 2005). Furthermore endorsing this conclusion is Oke et al. (2019). Acceptance of sustainable building approaches is highly dependent on the public's level of understanding regarding green building (Davies & Davies, 2017). Certain building designs and construction techniques have been shown to be unsustainable in Lagos state, Nigeria. This has resulted in excessive energy consumption, air and water pollution, carbon dioxide emissions, and the usage of non-renewable materials. According to Oke et al., (2019), awareness and interest are the first steps in the adoption of green construction practices. The practice of green building may be hampered by this misunderstanding or lack of understanding of sustainability (Djokoto et al., 2014). It has been shown that one major barrier to the adoption of green construction methods in Nigeria is the concern about the increased investment costs involved. The results of this study agree with those of earlier studies conducted in a number of different nations (Ametepey et al., 2015; Aghimien et al., 2018; Darko & Chan, 2016; Abraham & Gundimeda, 2018; Hasan de Zhang, 2016). The primary barrier to promoting the green building process is its expense as stated by Djokoto et al. in 2014. The anticipated increased expenses associated with green building have resulted in a rise in consulting rates. According to Ametepey et al. (2015), this is partly caused by the design teams and the contractors' lack of experience with green building techniques. As to the findings of Djokoto et al. (2014), there is a modest average cost difference between green and conventional structures; however, this difference does not reach statistical significance. Ametepey et al. (2015) did point out that although there would likely be a 1 to 25% rise in the initial construction cost of green building methods, this will be offset by large savings in operating expenses and increased user comfort.

CONCLUSION

The purpose of this study was to look into Nigeria's obstacles to green building. After an examination of the literature, it was discovered that while most developing nations lack effective green building methods, industrialized nations lead the way in this area. Twenty-two possible obstacles to green building in industrialized and developing nations were highlighted by the study. The results showed that the main obstacle to the adoption of green buildings was a lack of knowledge about green building technologies. This was followed by a lack of organizations to create policies and guidelines, uncertainty about green equipment and materials, a lack of interest and communication among project team members, a lack of interest from clients (both public and private), and a lack of demand in the market. There are a number of obstacles

preventing Nigeria from adopting sustainable construction practices. These include, among other things, protracted planning and approval procedures for new technology, a dearth of sustainable products and materials, a propensity to stick with established methods, a lack of building codes and regulations, and a lack of knowledge about high-performance building systems and green products. In order to facilitate the shift to green building, industry participants must investigate and embrace sustainable ideas, particularly in the project design phase. Promoting and putting into practice sustainable strategies ought to include the government more. To find out how different businesses may implement green building practices and lower greenhouse gas emissions in the built environment, more research is required. Examining leadership positions is also crucial to ensuring that industry stakeholders have the backing they need to switch from conventional building materials to green building techniques.

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