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HINDRANCE AND BENEFITS TO GREEN BUILDING IMPLEMENTATION: EVIDENCE FROM BENIN CITY, NIGERIA

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Abstract

The clamour for sustainable development and reduction of greenhouse gases led to the green concept which in recent times has gained significant momentum. To encourage the widespread development of green buildings, an understanding of the awareness, benefits, and hindrances for its adoption is necessary.

This is relevant now that concerns over climate change have led to an increasing global demand for sustainability within the built environment. While the discourse is still rather muted in Nigeria, this study will contribute to the ongoing effort to raise public awareness about green building and its benefits by evaluating the opinion of professionals regarding the subject matter.

Structured questionnaires were distributed among five different professions in the built environment and information sourced includes the level/mode of awareness, benefits and bottleneck, and support for its development.

The survey results showed that 43.48% of the professionals advocated for its development in Nigeria. The benefits and bottlenecks were ranked according to their perceived importance. The study recommends the creation of public enlightenment on green education, enforcement of mandatory training, formulation and implementation of policies directed towards green building acceptability. This will help promote and protect the built environment and reduces health hazards posed by conventional developments.

Keywords: *awareness, built environment, green building, greenhouse gas, sustainable development*.

JEL Classification: *Q01, R31.*

Citation: Alohan, E. O., & Oyetunji, A. K. (2021). Hindrance and benefits to green building implementation: evidence from Benin city, Nigeria. *Real Estate Management and Valuation, 29*(3), 63-74.

DOI: https://doi.org/10.2478/remav-2021-0022

1. Introduction

In recent times, climate change has been a major source of concern all over the world. A contributory factor to climate change was identified as the discharge of greenhouse gasses. Gas flaring, motor vehicle emissions, bush burning, industrial process, land-use change, transport, and construction sector amongst others are an important source of greenhouse emissions in the world over the years.

The climate change effect, its attendant's problems and challenges generated the need and clamour for a sustainable environment, which in recent times has gained significant momentum worldwide particularly in the developed nations.

Greenhouse gases (GHGs) due to natural and human activities are believed to be responsible for about one-third of total anthropogenic carbon dioxide (CO_2) emitted into the atmosphere (Aggarwal & Markanda, 2013). Energy consumption is on the increase due to population growth, urbanization, and globalization through information technology and related businesses in India and China with more than 41% of energy consumption accounted for by buildings in developed countries, (Ramesh & Emran, 2013; Tathagat & Dod, 2015). To ameliorate the inefficiency of conventional buildings about energy consumption, waste generation, water conservation, land use efficiency, and reduction in greenhouse gases, emerge the green concept – the green buildings (Ramesh & Emran, 2013; Tathagat & Dod, 2015).

Gunnell (2009) also stated that the negative environmental effect of property development and rising energy prices alongside persistent water shortages led to the emerging concept of green buildings, which are designed to be energy and water efficient, use non-hazardous materials and provide healthy productive environments. This is why Darko et al., (2017) submitted that the concept of green building has gradually been adopted to minimize the negative impacts of the construction industry on the environment, economy, and society.

Despite the promotional efforts towards green building, the emissions and waste generated by buildings continue unabatedly. Matthew et al., (2019) while examining the effect of manufacturing industries and construction emissions on health conditions asserted that human activities release gaseous emissions that in turn affect human health. The study by Matthew et al., (2019) recommended that the government should formulate environmental policies to mitigate the adverse effect of carbon dioxide emissions, increase public health expenditure to adequately take care of the health of the individuals. The long-run effect of greenhouse gases on the aggregate health of individuals revealed that a percentage increase in greenhouse gas emissions can reduce life expectancy by 0.00422% (Matthew et al., 2018) with an increased mortality rate of 14.6%. It was therefore concluded that health outcomes can be improved by reducing the emissions of carbon dioxide through reduction of deforestation and conservation of land, controlling wildfire, adopting better methods of combusting residues of crops, and effective use of energy by forest dwellers amongst others.

Construction activities in developing countries consume resources, cause land degradation, loss of habitats, air and water pollution and involve high energy usage and produce approximately 23-40% of the world's greenhouse gas emissions (Ofori, 2012; Gunnell, 2009). Giwa et al., (2017) provided an inventory of the emission of greenhouse gas released into the atmosphere through the combustion of fossil fuels from 1980 to 2014. It was revealed that gasoline consumption accounted for 71.23% of the total amount of greenhouse gases with CO2 making up 98.72 %. The author opined that poor indoor and outdoor air quality occasioned by the burning of these fuels contributed significantly to public health and environmental problems. It was suggested that national policy on emissions should be reformulated and enforced, the electricity power supply must be resolved to reduce the incidence of using generators to cut down on greenhouse gas emissions.

The literature search revealed that green building technology is increasingly gaining recognition and acceptance in the construction industry. This led to the development of green building guidelines in most developed countries. They include Leadership in Energy and Environmental Design (LEED) developed by U.S. Green Building Council (USGBC), Building Research Establishment Environmental Assessment Method (BREEAM) introduced in the U.K. by the Building Research Establishment (BRE) and the Comprehensive Assessment System for Building Environmental Efficiency (CASBEE) which was introduced by the Japan Sustainable Building Consortium (JSBC) (Potbhare et al., 2009). The promotion and adoption of green buildings revealed that several strategies can be adopted for its implementation. For instance, Chan et al., (2017) asserted that finance, market-based incentives, government policies and regulations, availability of better information on cost and benefits, green rating, and labelling are strategies that can enhance the promotion of the adoption of green building technology in the construction industry.

The effects of rising energy prices and environmental challenges are already apparent in developing countries. Therefore, it is still a mystery to unravel that green building initiatives and technology are yet to fully gain prominence within the construction industry in Nigeria when

compared to its counterpart developing nations. This led to questions which call for urgent answers. For instance, "*can it be concluded that there is limited awareness regarding the concept among the stakeholder's in the building industry, is it that their perception to the benefits inherent in the green initiatives is unclear, or their perception about the hindrance to its implementation makes them shy away from its inclusion into the building sector*". As a result of these unanswered questions, this paper seeks to investigate the awareness and knowledge of the barriers and benefits of sustainable construction using green building technology. This was done by examining the opinion of the stakeholders involved in the construction and real estate market in Nigeria using Benin City as a representative case.

2. Literature review

As the saying goes, necessity is the mother of inventions. The clamour for a sustainable environment due to the emission of a large volume of pollutants and greenhouse gases and the energy inefficiency associated with conventional buildings gave room for the emergence of the green building initiative. In Nigeria, Edeoja and Edeoja (2015) adopted a three case study approach of construction firms to ascertain carbon emission management in the construction industry. This is done to estimate the energy consumption and the direct emissions of carbon as a result of construction activities. The study revealed that there was no policy regulating greenhouse gases within the various organization. This according to the authors reflect the general attitude towards environmental/carbon emission matters in Nigeria. Edeoja and Edeoja (2015) claimed that proper documentation of energy consumption, types, and amount spent will enhance carbon emission management and monitoring. Sagheb et al., (2011) suggest that in the construction of a conventional building, materials such as stone, steel, concrete, and Gypsum plaster have the highest energy consumption among other building materials. These materials can be replaced by materials with low carbon emissions such as recyclable, eco-friendly building materials, vernacular architecture, locally available materials, and designing the buildings concerning the nature for having better ventilation and using natural daylight.

Green building which is also referred to as "high-performance building", "sustainable building", "intelligent building" or "green construction (architecture)" has varied definitions depending on its perception. According to Alam and Haque (2016), it was defined as "*a building whose construction and an operational lifetime assure the healthiest possible environment while representing the most efficient and least disruptive use of land, water, energy and resources*". Okafor (2016) defined it as "*a structure that utilizes a process that is environmentally responsible and resource-efficient throughout its life-cycle from siting to design, construction, operation, maintenance, renovation, and demolition.* For this study, green building development refers to high-performance property that meets the occupier's and user's needs, satisfy their comfort and wellbeing as well as environmentally friendly without impacting human health.

A green building helps in the reduction of operating costs like energy and water as a result of the green features and facilities that are integrated into it. Another striking attribute of the green building is the healthy environment that it provides throughout the lifetime of its construction. Tathagat and Dod (2015) opined that green building is concerned with the provision of comfort for humans, safety, productivity and the extension of the life span of natural resources, hence, they are designed for occupant comfort, resource efficiency, environmental responsibility, wellbeing and community sensitivity. Green buildings as asserted by Ramesh and Emran (2013) helps to reduce the demand for new plant as it reduces the overall demand for energy resulting in the reduction of greenhouse gases (GHG) emission. Ishan et al., (2014) also opined it was fundamental to reduce greenhouse gas emissions which are produced by conventional buildings to slow down the pace of global climate change. This new phenomenon is now widely accepted and has been promoted in the US (Cryer et al., 2006).

Studies have shown that the construction of conventional buildings promotes the destruction of non-renewable natural resources and increased environmental impact due to the extraction of building materials and construction industry waste. Besides, a large amount of energy is required for all of these processes, contributing to global ecological degradation and greenhouse gas emission. Ishan, et al., (2014) stated that buildings could be associated with greenhouse gases through construction and demolition debris and extraction and manufacturing of building materials. Energy expended in heating and powering our buildings is largely from the burning of fossil fuels which generate carbon dioxide (CO_2). Contrary to the conventional type of buildings, the green or intelligent building minimizes the use of non-renewable resources and promotes the use of renewable natural resources in other to sustain our future. Mehta et al., (2014) argued that, in sustaining the urban

future, the option was to adopt the green concept by building in ways that improve the health of the ecosystem, protect natural resources, and reduce environmental damages. Today, many developed nations of the world like Germany, USA, UK, Korea, China, and many others have fully evolved into the use of the green concept in their construction industry, whereas some counties are either ignoring or slowing down in accepting the concept for some reasons (Dalibi, et al., 2017).

In Nigeria, conventional buildings are still very dominant and will continue to be used in years to come. The building industry is still more focused on the development of conventional buildings as more of it is ongoing all over the country today. However, very few buildings try to introduce some element of green design in their buildings through the introduction of solar panels as an alternative to electric power supply generated through hydro-power to provide energy for cooling, lighting and providing power for their equipment and installing other energy-efficient fixtures to increase the level of insulation in the building. With the advancement in technology, these buildings can be retrofitted to increase efficiency, environmental responsibility, and wellbeing of the occupant. In civil engineering, retrofitting is referred to as the addition of new technology or features into an old structure to improve efficiency. It tends to create a high-performance building from the old or formal structure.

Green buildings have been found to promote well-being with great benefit to human health and community; improving environmental quality, reducing the use of energy and water, and improves life-cycle economic performance (Durmus-Pedini & Ashuri, 2010; Ramesh & Emran, 2013). Researches on green buildings revealed that green buildings had fewer carbon emissions, higher occupant satisfaction, use less energy, lower aggregate maintenance costs, and use less water (Durmus-Pedini & Ashuri, 2010). They also opined that other studies showed that green buildings with LEED-EB compliance had operational cost savings over the operational costs of traditional buildings. Studies have also shown that green building life cycle yields more benefit through energy and other operational cost savings when compared to traditional buildings. For instance, Durmus-Pedini and Ashuri (2010) asserted that an investment of an extra 2% of the construction cost will yield over ten times the initial investment through energy and other operational cost savings over the life cycle of the building. Durmus-Pedini and Ashuri (2010) summarized the benefit of a green building under five headings as environmental, health and community, financial, market and industry benefits. Ishan et al, (2014) stated that the economic and environmental performance of buildings can be maximized through the successful implementation of green building strategies. The authors also opined that green building has benefits which they categorised as an environmental, economic, and social benefit. Ramesh and Emran (2013) stated the benefits of green buildings and is shown in Table 1.

Table 1

Benefits from Green Buildings

Real Estate Value	Sustainable Asset Management	Environmental Effects	Ultimate Effects
– Improved indoor air quality, productivity and occupation satisfaction – Advance capabilities to deal with "Chun" (occupant turnover/ evolving mission) – Reduced future capital expenditures – Higher resale value or lease rates	– Optimized asset management and better space utilization – Reduced cost for moves, adds and changes – Reduced capital costs including cabling, administration, training and project management	– Reduced greenhouse gas and carbon dioxide emissions – Reduced energy and water usage – Reduced construction and demolition waste – Leverage renewable energy technologies	– Healthier and more comfortable building environment – Improved long-term economic performance – Sustainability ie. easier to maintain and built to last – More competitive: "best of breed" procurement – More efficient use of O&M

Source: Ramesh & Emran (20130.

Several factors have been identified to limit and hinder the growth and adoption of green developments in different countries. For instance in China, Wu et al (2019) identified 24 potential barriers that hinder green building development while Zhang et al (2011) also established that higher cost is a limiting factor to its development. Williams and Dair (2007) claimed that in England, high perceived costs, lack of consideration and inadequate expertise are limiting factors. Love et al (2012) pointed out that the key barriers to its developments in Australia are lack of relevant knowledge and government incentives while In Hong Kong, Lam Patrick et al (2009) established that limited availability of reliable suppliers, delay and additional cost involved are the barriers hindering the development of green buildings. Masrom et al. (2017) discovered that higher cost and lack of green consciousness are barriers in Malaysia, while in Ghana, Chan et al. (2018) revealed that the barriers to green building development are grouped into five categories.

In South Africa, Simpeh and Smallwood (2015, 2018) argued that capacity barriers, cultural and social resistance, lack of incentives for its promotion, inadequate cost data, limited range of green products and materials, delays in obtaining permits and certification and inadequate information about the financial and economic benefits and opportunities are the main barriers to green developments. Dalibi et al (2017) highlighted 10 factors responsible for hindering the development of green buildings. These include the perception of the concept being expensive; in-availability of local materials and other components and high cost of imported green building materials; divergent interests and views of success factors and success criteria of green building developments among stakeholders; lack of green building cost data and other performance-related data; lack data for using green building assessment systems; green building as a new change with its associated risks; green building technical know-how; cultural, economic, social and technical barriers; green building awareness and lack of locally or a single standard green building assessment system. Similarly, Uwazie, et al, (2015) identified the major challenges confronting the green economy to include developmental, energy and environmental and data challenges. Dahiru et al (2014) also identified the problems to the practice of green building development to include no enabling environment, uncertain economic environment, technological barriers, the dearth of integrated research and lack of interest in the issue of sustainability.

3. Data and Methods

This paper investigates the level of awareness, benefits and hindrances to the adoption of the green concept by stakeholders in the Nigerian built environment. This is achieved with a special focus on five prominent land-related professions in the construction industry in Benin City, Nigeria. To collate the primary data in response to the research questions, a structured questionnaire was used as a tool for gauging the respondents' perception regarding green building initiatives. Relevant information was sourced from these professionals (estate surveyors, quantity surveyors, land surveyors, architects and builders) in the built environment within the study area.

These professionals were chosen based on their presence within the study location. They were deemed suitable to complete the questionnaire because of their experience, exposure and involvement in the construction sector thereby contributing to the growth of the economy. The respondents were selected using purposive sampling techniques. The comprehensive sampling frame for the participants could not be ascertained, hence, the sample selection was purposely chosen from the available register in the state secretariat of the professionals in the study area. The purposive sampling technique adopted involves identifying and selecting the participants that are knowledgeable about or experienced with a phenomenon of interest (Cresswell & Plano Clark, 2011). In addition to knowledge and experience, the availability and willingness to participate, and the ability to communicate experiences and opinions in an articulate, expressive, and reflective manner were also considered (Bernard, 2002). Although there are challenges in identifying and applying appropriate purposive sampling strategy, this however does not affect the outcomes of the research. This element of bias was eliminated using the judgement of the researcher for selecting the units of investigation. The participants are then selected according to the needs and requirements of the study.

A structured questionnaire was administered to these professionals between October 2019 to April 2020 using a face-to-face approach as the responses were obtained before the nation was shut down due to the coronavirus pandemic that ravages the world at large. The research data collected were analyzed using the SPSS statistical package. A five-point Likert scale ranging from 5 to 1 in

descending order was adopted for questions on the perceived benefit and hindrances to the development of the green building. Responses from the Likert scale were computed for mean ratings of each factor following their level of importance as perceived by the respondents.

The mean scores were then ranked according to their weighted level of importance. In each computation of the Mean Rating (MR), the total number of respondents rating (TR), each attribute was used to calculate the percentage of the number of respondents associating a rating point to each attribute. The decision point for the 5-point Likert scale used in the study was structured according to Ojo et al (2018). A total of 184 questionnaires were distributed, out of which only 161(87.50%) were returned and considered valid for the study. Table 2 shows the breakdown of the questionnaire administered and its associated retrieval.

Table 2

Questionnaire Administration

S/No.	Professionals	Questionnaire	
		Distribution	Retrieval
1.	Estate Surveyors & Valuers	51(100.00%)	48(97.12%)
2	Quantity Surveyors	30(100.00%)	23(76.67%)
3	Land surveyors	50(100.00%)	44(88.00%)
4	Architects	30(100.00%)	27(90.00%)
5	Building Engineers	23(100.00%)	19(82.61%)
	Total	**184(100.00%)**	**161(87.50%)**

Source: Author's survey.

4. Results and Discussion

This section of the paper detailed the analysis of the result from the data collection during the field survey. It shows the perception of the respondents as well as the awareness and knowledge regarding the subject matter.

To gain an insight into the level of awareness among the professionals about the concept of green buildings, the respondent's opinion was sought about their awareness and knowledge of green building, the medium that creates more awareness for them, their ability to discern between conventional and green building, whether they advocate for green building, and whether there exists any policy on green building in Nigeria. Based on their experience and level of understanding on the subject, and as revealed in Table 3, a total of 61.49% of respondents considered themselves to be aware of the concept of green initiatives. This result suggests that the overall level of awareness of the professionals within the study location needs to be more sensitized. This is because the percentage of awareness despite the information technology age is still lower among some set of professionals within the built environment.

On the medium of awareness, it was observed that only 24.84% of the respondents were aware through the media, while 34.78% decline to give a response. The indication of this response rate shows that green building initiatives are not well communicated among the professionals within the study area. Formal knowledge and awareness for built environment professionals is an important mechanism for developing green building knowledge and skills. Hence, it can be concluded that the poor culture of green building within the country is due to the inadequate communication technique for the sensitization process.

Table 3

Respondents opinion about the green building initiatives

Features	Response	Estate Surveyors	Quantity Surveyors	Land Surveyors	Architects	Builders	Total
		F(%)	F(%)	F(%)	F(%)	F(%)	F(%)
Level of awareness	Aware	26(54.17)	11(47.82)	24(54.55)	24(88.89)	14(73.68)	99(61.49)
	Not aware	16(33.33)	6(26.09)	11(25.00)	3(11.11)	5(26.32)	41(25.47)
	No response	6(12.50)	6(26.09)	9(20.45)	0(0.00)	0(0.00)	21(13.04)
	Total	**48(100.00)**	**23(100.00)**	**44(100.00)**	**27(100.00)**	**19(100.00)**	**161(100.00)**
Medium of awareness	Media	8(16.67)	4(17.39)	16(36.36)	9(33.33)	3(15.79)	40(24.84)
	MCPD	6(12.50)	3(13.05)	0(0.00)	0(0.00)	4(21.05)	13(8.08)

	Other professionals	9(18.75)	0(0.00)	4(9.10)	13(48.15)	0(0.00)	26(16.15)
	Other sources	10(20.83)	4(17.39)	5(11.36)	0(0.00)	7(36.84)	26(16.15)
	No response	15(31.25)	12(52.17)	19(43.18)	5(18.52)	5(26.32)	56(34.78)
	Total	**48(100.00)**	**23(100.00)**	**44(100.00)**	**27(100.00)**	**19(100.00)**	**161(100.00)**
Ability to differentiate between green and conventional buildings	Yes	18(37.50)	4(17.39)	7(15.91)	17(62.97)	13(68.42)	59 (36.65)
	No	16(33.33)	12(52.18)	23(52.27)	7(25.92)	4(21.05)	62 (38.51)
	No response	14(29.17)	7(30.43)	14(31.82)	3(11.11)	2(10.53)	40 (24.84)
	Total	**48(100.00)**	**23(100.00)**	**44(100.00)**	**27(100.00)**	**19(100.00)**	**161(100.00)**
Advocate for green building in Nigeria	Yes	21(43.75)	8(34.78)	8(18.18)	23(85.19)	10(52.63)	70 (43.48)
	No	12(25.00)	0(0.00)	7(15.91)	0(0.00)	4(21.05)	23 (14.29)
	No response	15(31.25)	15(65.22)	29(65.91)	4(14.81)	5(26.32)	68 (42.23)
	Total	**48(100.00)**	**23(100.00)**	**44(100.00)**	**27(100.00)**	**19(100.00)**	**161(100.00)**
Awareness of policy document on green building in Nigeria	Yes	3(6.25)	0(0.00)	0(0.00)	6(22.22)	0(0.00)	9 (5.59)
	No	45(93.73)	17(73.91)	44(100.00)	14(51.85)	19(100.00)	139(86.35)
	No response	0(0.00)	6(26.09)	0(0.00)	7(25.93)	0(0.00)	13 (8.08)
	Total	**48(100.00)**	**23(100.00)**	**44(100.00)**	**27(100.00)**	**19(100.00)**	**161 (100)**

Source: Author's survey.

The responses on the ability to differentiate between conventional and green building revealed that 38.51% of the respondents could not easily differentiate between both forms of construction. The implication of this is that the level of development regarding green construction will be greatly affected since the professional's level of discernment is at the lowest ebb. On the advocacy for green building construction, it was observed that 43.48% of the respondents were advocating for the promotion of green building. This depicts that the professionals want an improvement in their knowledge expertise. This is because broadening their horizon will aid in the successful delivery of sustainable projects. Regarding their awareness as to policy documents on green building in Nigeria, 86.35% of the respondent's opinion suggest that there is still a vacuum to be filled by the government. This is because the programme of housing delivery is not fully communicated as the bottleneck and bureaucratic positions are present. Hence the rationale for the non-existence of viable policy document to prioritize the development of green construction.

The benefits of green building developments according to the professional's perspectives are summarized in Table 4. Respondents who participated in this study were asked to rank their level of agreement of green building benefits. According to the opinion of each professional involved, the estate surveyors recognized enhancement of the comfort and health of occupant as the most important benefit of green building development. The quantity surveyors claimed that reduced aggregate future capital and maintenance costs are the most important benefit, while the land surveyors agreed to the creation of new opportunities for other industries. To the architects, improve internal air quality, productivity and occupant's satisfaction and according to the builders, the promotion of technological exchange across borders were the most important perceived benefits of green building.

On the overall, the view of the professionals was aggregated to ascertain the perceived benefits of the green building initiatives and it was revealed that enhancing occupants comfort and health (MS=4.22) ranks first. Improve internal air quality, productivity and occupant's satisfaction (MS=4.09) ranks second while creating new opportunities for other industries to benefit (MS=4.03) ranks third. These results suggest that the respondents believed that buildings should be constructed with appreciation on the importance of providing high-quality interior environments for all occupants and users. The present findings agree with Dahiru et al. (2014) where it was affirmed that health and productivity gain was the most important benefit from green building construction.

Other important benefits were an innovation in the construction industry (MS=3.98) ranks fourth,

reduced aggregate future capital and maintenance costs as well as creating and increasing job opportunities in the construction industry (MS=3.85) ranks fifth respectively. Improve and protect the eco-system maintaining the integrity of the environment (MS=3.83) ranks seventh while promoting technological exchange among countries (MS=3.82) ranks eight. These results indicate that the respondents' believe that green building initiative is an innovation towards ameliorating the negative impact of conventional buildings. Furthermore, the findings affirm the assertion by Ramesh and Emran (2013) that "enhance the comfort and health of occupant" (MS=4.22), "reduced the aggregate future capital and maintenance costs" (MS=3.85) and "reduce the aggregate use of water and energy" (MS=3.52) are benefits that can be derived from green building development.

Table 4

Benefits of green building developments: Professional perspectives

Benefit	Estate Surveyors	Quantity Surveyors	Land Surveyors	Architects	Builders	Overall	
	Mean	Mean	Mean	Mean	Mean	Mean	Rank
Enhance the comfort and health of the occupant	4.21	4.00	4.02	4.78	4.11	4.22	1st
Improve internal air quality, productivity and occupant's satisfaction	3.79	4.05	3.45	4.89	4.29	4.09	2nd
Create new opportunities for other industries to benefit	3.77	3.48	4.57	4.44	3.89	4.03	3rd
Innovation in the construction industry	3.43	4.00	4.34	4.11	4.00	3.98	4th
Reduced the aggregate future capital and maintenance costs	3.20	4.18	4.14	4.00	3.71	3.85	5th
Create and increase job opportunities in the construction industry	3.50	3.59	4.10	4.33	3.72	3.85	5th
Improve and protect the eco-system	3.47	3.77	3.66	4.11	4.16	3.83	7th
Promote technological exchange among countries	3.88	2.74	3.39	4.44	4.63	3.82	8th
Encourage upgrade and integration of professionals	3.69	3.61	3.57	4.22	3.89	3.80	9th
Reduced greenhouse gas and Co_2 emissions	3.57	4.00	3.23	4.33	3.74	3.77	10th
Create heathier and more comfortable building environment	3.79	3.57	3.14	4.22	4.21	3.77	10th
Conservation and preservation of natural resources	3.79	3.48	3.64	4.22	3.68	3.76	12th
Enhanced long-term economic performance	3.64	3.39	3.34	4.11	3.83	3.66	13th
It powers the use of renewable energy technology	3.50	3.86	2.91	4.11	3.88	3.65	14th
Reduce operational cost of building,	3.07	3.65	3.83	3.67	3.82	3.61	15th
Last longer and easy to maintain	3.60	3.70	2.52	4.33	3.80	3.59	16th
Promote longer economic life of building	3.79	3.30	3.16	3.67	3.94	3.57	17th
Reduce the aggregate use of water and energy	3.07	3.35	3.20	4.33	3.63	3.52	18th

Higher sale and lease value	3.43	3.39	2.98	4.11	3.61	3.50	*19th*
Promote efficient use of space	3.47	3.22	3.00	3.81	3.56	3.41	*20th*
Reduction in demolition and construction waste	3.50	2.74	2.11	4.00	3.79	3.23	*21st*
Expected high tenancy rate	3.40	3.57	2.52	3.78	2.63	3.18	*22nd*
Reduced costs of capital in administration, project and property management, maintenance etc.	3.71	2.26	3.45	3.11	3.18	3.14	*23rd*
Total Mean	**3.58**	**3.52**	**3.40**	**4.14**	**3.81**	**3.69**	

Source: Author's survey.

The knowledge about the hindrances to a successful implementation of green initiatives development will aid in identifying ways to promote sustainability in the built environment. It is important to understand the barriers that exist from the professional's perspective to provide pragmatic solutions and recommendations to mitigate such barriers and expedite the growth of the sustainable construction industry. The barriers listed in the questionnaire were devised by the literature review. Table 5 illustrates the results of the respondent's perception towards the hindrance to green building development and ranked according to the mean value. This is following the method adopted by Liu et al (2012). The results demonstrate that the top three most important barriers highlighted, considered by respondents, were "lack of awareness by developers" (MS=4.54), "Non-availability of local materials" (MS=4.06) and " no standard for structural control of green building" (MS=4.05).

This shows that a lack of awareness and standard control is present. The findings are in line with Williams and Dair (2007) where it was established that there is a need for regulation and policy to keep pace with best practices. Conversely, the three barriers considered least important were "uncertain economic environment" (MS=3.52), "energy and environmental challenges" (MS=3.49) and "no enabling environment" (MS=3.36). This could be attributed to the fact that green construction is a fairly new concept in Nigeria.

Table 5

Hindrances to green building developments: Professional perspectives

Hindrances	Estate Surveyors	Quantity Surveyors	Land Surveyors	Architects	Builders	Overall	
	Mean	Mean	Mean	Mean	Mean	Mean	Rank
Lack of awareness by developers	4.92	4.26	4.57	4.33	4.61	4.54	*1st*
Non-availability of local materials	3.50	4.87	2.84	4.30	4.80	4.06	*2nd*
No standard for structural control of the green building	3.50	4.09	4.11	4.00	4.57	4.05	*3rd*
Lack of adequate knowledge and technical know-how by professionals to handle the job	3.79	4.43	4.52	3.88	3.58	4.04	*4th*
Lack of interest in sustainable building development	3.87	3.87	3.57	3.78	4.80	3.98	*5th*
Lack of adequate research on green building	3.53	3.70	4.57	3.67	4.16	3.93	*6th*
Lack of green building cost and performance data	3.47	3.43	4.61	3.88	4.00	3.88	*7th*
High cost of imported green building materials	3.80	2.91	4.61	4.33	3.53	3.84	*8th*

Data challenges	3.53	3.74	4.66	3.33	3.56	3.76	*9th*
No enabling laws to promote its development	3.47	4.26	3.50	4.00	3.42	3.73	*10th*
No market expectation for green building at present	3.43	3.87	3.50	3.88	3.72	3.68	*11th*
Divergent interests and views of professionals in built environment	3.73	3.57	3.09	4.11	3.85	3.67	*12th*
High initial construction cost of green building	3.81	3.74	3.59	3.88	3.21	3.65	*13th*
Investors choose to remain simple.	3.80	3.57	3.64	3.88	3.28	3.63	*14th*
Uncertain economic environment	3.36	3.61	3.20	3.88	3.53	3.52	*15th*
Energy and environmental challenges	3.64	3.96	3.11	3.44	3.30	3.49	*16th*
No enabling environment	4.07	3.87	3.02	2.55	3.27	3.36	*17th*
Total Mean	**3.72**	**3.87**	**3.81**	**3.83**	**3.83**	**3.81**	

Source: Author's survey.

This study corroborates the findings of Ameh, et al (2007) in Nigeria where it was affirmed that built environment professionals are aware of sustainability principles and sources of information on sustainable building practices are mostly drawn from personal research. However, it is recommended that there is need for more sensitization to raise the level of awareness

The present findings are in line with that of Dahiru et al. (2014) where it was argued that lack of awareness, no enabling environment, lack of interest in sustainable building development and economic situation are factors that militate against the practice of green building. The study also corroborates the findings of Dalibi et al (2017) where it was noted that the perception of green building is an expensive concept, unavailability of local green building materials and other components, high cost of imported green building materials, divergent interests and views of success criteria of green building developments among stakeholders are hindrances to green building development in the built environment.

5. Conclusions

This study has presented the results of the data collected using a questionnaire. The purpose of the study is to assess the awareness and knowledge of purposely selected professionals within the built environment regarding the adoption of green building initiatives. This is done to examine their perception of the benefits and hindrances of green developments. To measure how active the respondents were in the field of green construction, five professions that were prominent in the built environment in the study area were selected. To achieve the objectives, the questionnaire was administered; and a total of 87.54% completed questionnaires were retrieved and valid for analysis. The data from the questionnaires were then organized and analyzed using SPSS software.

The results highlighted that the general awareness levels towards the concepts of green building in Benin City are still at a low ebb among professionals. Therefore greater and conscious effort is required to raise the awareness levels that will accelerate the growth, adoption, and implementation of green building concepts. It is important to convey the goals and benefits of green construction methods to those relevant to the construction sector to achieve successful implementation of sustainable construction projects. Thus, educating the relevant parties to raise awareness of the green concept is vital to overcome several obstacles to the dissemination of sustainable practices, such as the lack of awareness and knowledge of these methods and their benefits.

6. Limitations

The definition of green building as used in this study was based on the ideas derived from the literature by the authors. However, this definition was not communicated to the survey participants. It is assumed that the participants will have a common interpretation of the definition of green building. Therefore, it is acknowledged that a third-party certification scheme that could guide the participants in ensuring they have a common basis to answer the survey questions was not provided.

Although the study was carried out in Benin City, a fast-growing state capital in Nigeria, the

results obtained cannot be entirely used to generalize the whole nation but could raise awareness and consciousness of stakeholders regarding green building initiatives in the country. As a result, it is recommended that future research could be carried out to focus on each geopolitical zone of the nation to make a reasonable conclusion about the subject study.

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