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Research Article

Sustainable Building Construction for Quality Project Delivery in Nigeria

*Solomon, Sulisumen Simon [1], Usman, Napoleon Daniel [2], Goro, Solomon Ahmed [3], Sunday Ayuba Watu [4]

[1,3]Department of Building, School of Environmental Sciences, Adamawa State Polytechnic, Yola – Nigeria.
[2]Department of Building, Modibbo Adama University, Yola – Nigeria.
[4]Department of Civil Engineering Technology, Adamawa State Polytechnic, Yola- Nigeria.

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***Corresponding author: Solomon, Sulisumen Simon**
Department of Building, School of Environmental Sciences, Adamawa State Polytechnic, Yola – Nigeria.

Abstract

Sustainable construction is a rising concept that aims to incorporate the general principles of sustainability current practice of the construction industry but the reasons for the current unsustainable practice are not yet explored in Nigeria. This study "Sustainable Building Construction for quality Project Delivery" assessed level of awareness of benefit of Sustainable Construction practices and identified the current barriers to sustainable construction practices. This study is survey research that made use of structured questionnaires administered to purposively drawn sample from building construction stakeholders (clients, contractors and professionals/consultants). A total of 150 closed ended structured questionnaires were disseminated to the construction stakeholders in the construction industry based in Yola, Nigeria. 80 questionnaires were retrieved and analyzed using statistical package for social science (SPSS). The data generated from the survey were subjected to descriptive and quantitative analyses. It found that there was a significant difference in the awareness level of benefits of sustainable construction practices between building stakeholders. It has recommended that efforts should be made toward improving construction processes through sustainable construction practices awareness.

Keywords: *construction industry, quality project delivery, sustainable building, unsustainable practice.*

Introduction

According to the UN, the world's population is projected to grow from 7.7 billion people in 2019 to 9.7 billion in 2050 (Zhang et. al., 2020). The percentage of people living in urban areas is projected to grow from 55% in 2018 to 68% in 2050 (Zhang et. al., 2020). There is a broad discussion about what cities must be able to achieve in the future in order to enable good and decent ways of living together and meet sustainability goals and which technical and functional prerequisites must be fulfilled in order to achieve them (Zhang et. al., 2020). The challenge is to safeguard and reconcile requirements of environmental sustainability, technical functionality, and social quality, such as quality of life and user-friendliness of buildings, especially against the background of climate change, environmental crisis, and a growing world population.

The goal of sustainability is to meet people's basic needs and improve their quality of life while simultaneously ensuring that natural systems, resources, and diversity upon which they depend are maintained and enhanced, both today and for future generations (Ahn & Kim, 2014). Sustainable construction is a rising concept that aims to incorporate the general principles of sustainability current practice of the construction industry. Sustainability means that lifecycle (social, economic and the environment) is the primary criterion guiding the process of creation and management of the built environment (UNEP Report, 2002). This includes but is not limited to new environmentally orientated construction designs, new environmentally friendly operation and maintenance procedures. Sustainable construction practices present a lot of benefits to the humanity and earth resources by integrating sustainable construction technique in construction project management (Atombo et al., 2015; Kibert, 2016).

It is axiomatic that the construction industry has significant impact on the environment. For instance, buildings produce waste that significantly pollute the natural environment during their construction and use (Albino and Beradi,

2012). While the call for sustainable practice in the built environment sector has received much attention from clients, contractors, small and medium scale companies, researchers, social enterprises, Government and its regulatory bodies in countries such as the UK, USA, New Zealand, Australia among others (Upstill-Goddard *et al*., 2016; Bond and Parrett, 2012). However, very little is known about sustainable construction practice in developing countries, such as Nigeria (Dania *et al*., 2014). Dania *et al*., (2014) and Dahiru *et al*., (2010) observed that sustainable practice is still an emerging concept in the Nigeria construction industry.

In Nigeria, Mbamali and Okotie (2012) and Dahiru, *et al*., (2010) assert that not until 2006 when discussions for the National Building Code started, the Nigerian construction industry was without uniform regulations, guidelines and standards for the design, construction and operation/maintenance of buildings. Dahiru *et al*., (2010) noted that while it is true that the situation in the Nigerian Building industry has greatly improved in some aspect there is no adequate consideration for sustainability in the National Building Code (2006) and within the current practice in the construction sector. However, the reasons for the current unsustainable practice are not yet explored in Nigeria. According to Wilson and Rezgui (2013), the construction industry is characterized by a complex socio-cultural, contextual, structural issues as reflected by its endemic resistance to change. While there is considerable need to migrate from the conventional construction system to sustainable construction practice in Nigeria, there is lack of authoritative research to understand the current barriers to sustainable construction practice in the Nigeria through the lens of stakeholders.

In order to endorse and drive the agenda for sustainable construction in Nigeria, the barriers that hinder these practices must first be identified from the stakeholders' perspective. Previous studies on sustainable construction in Nigeria focused on understanding capabilities of construction firms on sustainable construction practice (Dania *et al*., 2014); barriers to sustainable construction practice in Nigeria (Daniel, Oshineye & Oshodi, 2018); sustainable health and safety practice in construction (Okoye and Okelie, 2013); prospect of green practice (Dahiru *et al*., 2014) and prioritization of sustainable construction attributes (Nwokoro and Onukwube, 2011). None of this study focuses on prioritizing the sustainable building construction for quality project delivery in Nigeria. However, this study assessed level of awareness of benefit of Sustainable Construction practices and identified the current barriers to sustainable construction practices. An understanding of benefits of sustainable construction practice would aid the development of strategies to ease its implementation not only in Nigeria but also in other developing countries as well. The outcome of this study provides insights on measures to improve sustainable building construction practices for quality project delivery in developing countries in general.

LITERATURE REVIEW

Sustainable Building Construction

The construction industry and its products are major contributors of greenhouse gas (GHG) emissions to the environment. Several authors (Shi *et al*., 2013) have shown that the adoption of sustainable practice would reduce the adverse impact of the construction sector on the environment. In addition, research has shown that the use of components, such as precast concrete components (Mao *et al*., 2013) and green roof systems (Kumar and Kaushik, 2005), results in significant reduction of GHG emissions from construction projects. Similarly, evidence suggests that the demand for eco-friendly products have been on an increase (Dania, 2016; Kumar *et al*., 2011). Based on the foregoing, it is evident that the adoption of sustainable construction practices would be beneficial for construction business in terms of business performance and client satisfaction, amongst others. However, the adoption of sustainable construction practices still remains as a challenge, especially in developing countries like Nigeria

The concept of sustainable building construction (a subset of sustainable development) concerns the responsibility of the construction sector of creating the built environment in a sustainable manner (Pearce et al, 2012). That is, in a way that is environmentally friendly, socially responsible and economically supportive. Sustainable building construction is centered on the economic, social, and environmental impact of creating a usable structure. In other words, it requires all stakeholders (designers, professionals, contractors and the clients) to imbibe construction practices that will minimize the damages done to the environment. Constructing sustainable buildings reduces the use of raw materials and land, minimizes the consumption of energy and water. It also reduces emissions, waste and pollution in the environment (McMahon *et al*., 2015).

Du Plessis (2002) describes sustainable building construction as "a holistic process aiming to restore and maintain harmony between the natural and the built environment, and create settlements that affirm human dignity and encourages economic equity" From the foregoing definitions and noting the basic definition of sustainability which According to Brundtland Commission (1999) is "meeting the needs of the present without compromising the ability of future generations to meet their own needs". It therefore follows that human, natural and economic systems are interconnected and that the present generations are indebted to the future generations in terms of earth's resources (Kibert, 2005).

Abolore (2012) notes that despite an overall increase in consciousness and efforts to pursue sustainability through increasing public awareness, the general scenario appears to be increasing commitment by a small group of supporters instead of emergence of a renovated mass culture. Onwueme & Borsari (2007) attributed this situation to difficulty in understanding the philosophical underpinnings of sustainability by the stakeholders. Sustainability creation and awareness, according to Abolore (2012), depend on the understanding of the consequences of individual actions, quest for knowledge and absolute involvement and commitment to the principle. Abidin (2010) also agrees that the pace of actions towards sustainable application depends on awareness, knowledge and understanding of the consequences of individual actions.

Challenges of Sustainable Building Construction

Barriers to sustainable building construction practices were identified by Williams and Dair (2007) to include perceived cost implications, stakeholders' lack of consideration of sustainability, inadequate expertise in sustainable designs, clients' reluctance, a lack of the right information, non-availability of sustainable construction materials, and inadequate capacity for execution of sustainable construction projects. Zhou and Lowe (2003) assert that, sustainable construction is faced with other barriers such as the ignorance of its economic benefits, absence of appropriate building regulations and planning policies that enforce sustainable construction. Perceived higher cost of sustainable building construction compared with traditional approach in terms of capital has been further argued as one of the major barriers to the implementation of sustainable construction (Hakkinen and Belloni, 2011). The wrong perception that sustainable building construction will cost more reduces investors and construction organizations' interest (Zhou and Lowe, 2003). However, the perception that sustainable buildings cost more is actually not true. The issue of higher cost involvement in sustainable construction is addressed with the adoption of whole life cycle costing technique which emphasizes long term perspective of cost rather than short; and prioritizes value over cost (Al-Yami and Price, 2006). On the long run, the whole life cost of such building is cheaper.

Methodology

This study is survey research that made use of structured questionnaires administered to the building construction stakeholders (clients, contractors and professionals/consultants). The research instrument used was a closed ended structured questionnaire. The questionnaire was divided into three parts. Part 1 captures respondents' background information. Part 2 contains 6 variables on the benefits of sustainable building construction practices.

Face validity as suggested by Bryman (2016) was used to ensure that the survey instrument sufficiently measure the challenges to sustainable building construction project in Nigeria. Accordingly, two construction management experts in the academia and two senior construction managers based in Yola, Nigeria validated the research instrument. The initial survey instrument was modified based on the recommendations and suggestions from these experts. Additionally, the survey instrument was piloted with two clients, two contractors and two consultants, this was done to identify and minimize any form of ambiguity with the survey instrument.

The population of this study includes all clients, building developers/owners, contractors and professionals in Yola metropolis, Adamawa State, Nigeria. In this case, the actual population is not entirely known. Taherdoost (2016) states that the absolute size of the sample selected should be relative to the complexity of the population, the aim of the researcher and the kinds of statistical manipulation that will be used in data analysis. The sample for the study was purposively drawn from building construction stakeholders (clients, contractors and professionals/consultants). This approach ensures the view of the designers, the contractors, the professional bodies and statutory agencies on the challenges to sustainable construction practice is sought. The invited participant in the study has over 5 years' experience within the Nigeria construction industry. This means their response could be relied on.

A total of 150 questionnaires were disseminated to major stakeholders in the construction industry based in Yola, Nigeria. The questionnaires were distributed to the respondents through self-administration and online post via established mail contacts. The objectives of the study were clearly stated in the consent letter attached to the questionnaire. Out of the 150 questionnaires administered, 80 questionnaires were retrieved and analyzed using statistical package for social science (SPSS).

The data generated from the survey were subjected to descriptive and quantitative analyses. Mean Score Index (MSI) and Relative Importance Index (RII) were computed to determine and rank the level of awareness of the benefits of sustainable construction practices and strategies for optimizing awareness of benefits of sustainable construction practices respectively. Mann–Whitney U Test statistic was employed to determine the significant difference in the level of awareness of benefits of sustainable construction practices among the construction stakeholders based on the professionals/non-professionals' grouping. The level of importance of the strategies was determined based on the five importance levels transformed from RII values according to Akadiri (2011), where high (H) = ($0.8 \leq RII \leq 1$), high-

medium (H-M) = (0.6 ≤ RII ≤ 0.8), medium (M) = (0.4 ≤ RII ≤ 0.6), medium-low (M-L) = (0.2 ≤ RII ≤ 0.4) and low (L) = (0 ≤ RII ≤ 0.2).

Results And Discussion

Table 1 shows the background information of the respondents. The table reveals that 41.3% of the respondents are professionals while 58.7% are non-professionals. While on the professional affiliation of the respondents; it reveals that 41.3% are professionals in the building industry while more than half 58.7% are non-professionals in the building industry who make up the bulk of building developers/clients and contractors. Expectedly, these professionals belong to different professional groups as shown in Table 1. Meanwhile, all the respondents had 5 years and more work experience in building construction. This implies that the respondents were experienced and gave out response out of experience.

Table 1: Respondent's Background Information

Variable	No. of Responses	% of Responses
Category of Respondents		
Professional	33	41.3
Non-Professional	47	58.7
Professional affiliation		
Building	9	11.3
Architecture	8	10
Engineering	5	6.3
Quantity surveying	6	7.5
Estate management	5	6.2
None/Others	47	58.7
Years of work Experience		
5-7 years	49	61.3
8-10 years	11	13.7
11-13 years	20	25

Source: Field Survey, 2023

Table 2 shows the result of benefits of sustainable building construction practices of construction stakeholders based on MSI values. The result reveals that the average benefit among the professional stakeholders (MSI = 4.21) is higher than that of the non-professional stakeholders (MSI = 3.06). However, the overall average benefit is moderately high (MSI = 3.55). Out of the 6 variables considered as benefits, five most popular benefits among professional stakeholders are: Increases profitable and competitive advantage (MSI = 4.94), Reduces operational and maintenance cost (MSI = 4.91), Minimizes material waste (MSI = 4.76), Reduces global warming and climate change (MSI = 4.70) and Improves Return on Investments (ROI) (MSI = 4.61). Whereas, three most popular benefits among non-professional stakeholders are: Minimizes material waste (MSI = 4.11), Increases profitable and competitive advantage (MSI = 4.03), Reduces global warming and climate change (MSI = 4.02).

Overall, the five most popular benefits among construction stakeholders are: Increases profitable and competitive advantage (MSI = 4.42), minimizes material waste (MSI = 4.39), Reduces global warming and climate change (MSI = 4.31), Reduces operational and maintenance cost (MSI = 4.07) and improves indoor environmental quality (MSI = 3.97). The result shows that the stakeholders are mostly aware of the environmental and economic benefits of sustainable construction practices. Significantly, the result suggests that the stakeholders have not seen sustainable construction practices as a major agent of cost reduction in construction project or a means of social and cultural sustainability rather more of environmental benefits.

Table 2: Benefits of sustainable building constructions

Benefits	Professional		Non-Professional		AV. MSI	Overall Rank
	MSI	Rank	MSI	Rank		
Increases profitable and competitive advantage	4.94	1	4.03	2	4.48	1
Reduces operational and maintenance cost	4.91	2	3.25	6	4.08	5
minimizes material waste	4.76	3	4.11	1	4.43	2
Reduces global warming and climate change	4.70	4	4.02	3	4.36	3
Improves Return on Investments (ROI)	4.61	5	3.71	4	4.16	4
Prevents environmental degradation	4.57	6	3.46	5	4.01	6

Source: Field Survey, 2023

Discussion

Fundamentally, the objectives of this study were to determine the benefits of sustainable construction practices between building construction professionals and non-professionals and to examine the challenges of sustainable building construction, therefore, revealed that there was greater awareness among the professional groups than the non-professional groups in the building construction on the benefits of sustainable building construction.

According to this study, the differences could be as a result of difference in the backgrounds of the professionals and non-professionals. That is to say that professionals have many opportunities of learning more about sustainable construction and its benefits through their training at higher institutions, conferences, workshops and seminars organized by different professional associations, social media, etc.; whereas non-professional have limited means principally because they are outside the professional circles in the building industry and only very few have interest and access to such events as conferences, workshops and seminars organized by different professional associations. Furthermore, while the bulk of learning is done through education at higher education institutions and professional mandatory training and development, non-professionals ordinarily would not have had such training opportunities. This result supports that of Komolafe and Oyewole (2018) and Ibrahim and Raji (2018) who found a low level of awareness of the benefits of sustainable construction among building users and clients (non-professionals), respectively. It also aligned with such studies as Ifije and Aigbavboa (2020), Nduka and Sotunbo (2014) that recognized the increasing awareness level among construction stakeholders.

Conclusion

The implementation of sustainable construction practices has been slow and challenging due to a low level of awareness of its benefits among some key construction stakeholders. Awareness of the benefits of sustainable construction practices has, therefore, been acknowledged as the bedrock of implementation of sustainable construction practices. The present study examined the awareness level of benefits of sustainable construction practices among building construction stakeholders and the strategies for optimizing the awareness level of the stakeholders. It found that in spite of the general moderate high level of awareness there was a significant difference in the awareness level of benefits of sustainable construction practices between building professionals and non-professionals as a result of differences in the training background and experience of the professionals and non-professionals. As construction activities continue to yield undesirable results to the society, environment and economy, efforts should be made toward improving construction processes through sustainable construction practices.

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