RESEARCH ARTICLE OPEN ACCESS

Feasibility for Adoption of Green Building Rating system in Nigeria: Stakeholders' Views

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ABSTRACT
Despite the documented evidence of benefits of sustainable construction practices, Nigeria still lags behind in adopting the concept. Several scholars and proponents of sustainability studies have argued for and against the adoption of foreign-based sustainable construction practices in developing countries. This study was conducted to assess the views of stakeholders regarding the feasibility of adopting a unique building rating system for Nigeria. Data for the study were collected through focus group discussions as well as a structured survey questionnaire. Data analysis involved both descriptive and inferential statistics. The findings revealed that the focus group professionals were very familiar with the concepts and practices of green building. However, most survey respondents who were educational institutional employees appeared to be less knowledgeable about green buildings. Further analysis of findings suggests that non-significant differences in opinion exist among the users of conventional buildings regarding the growth and development potential of green buildings in Nigeria.

***Keywords*:** Green building, LEED, Rating system, Sustainability, Sustainable construction.

Date of Submission: 13-10-2022 Date of Acceptance: 28-10-2022

I. INTRODUCTION

Environmental sustainability continues to be an on-going global issue. In fact, it has become a global phenomenon that has attracted so much attention not only in the developed countries, but also among developing countries as well. It is so popular that its movement is considered to be one of the most successful movements of our time. Nowhere has it become so pronounced than in the construction industry. When sustainability concept is applied within the built environment, it can be viewed in the context of high performance, green or environmentally sensitive construction practices [1]. Based on the magnitude of global interest, one can consider sustainable construction a trend or revolution. One

major environmental area of concern is global warming due to climate change. To a large extent, buildings contribute to global warming. To address this problem, professionals within the built environment have explored the concept of sustainable construction practices. These practices have been implemented in the construction of various buildings where results have translated into healthy living environment.

Despite the documented evidence of benefits of sustainable construction practices across the globe, many developing countries still lag behind in adopting the concept. Scholars and proponents of environmental sustainability studies have argued for and against the adoption of foreign-based sustainable construction practices in developing countries. One issue is whether sustainable construction practices can be successfully adopted in developing countries without adequate consideration of their economic, environmental, social, and political imperatives. In addition, many developing countries do not have an established rating standards to judge the merits of any green buildings.

Sustainable construction, in form of green buildings contribute less to global warming than conventional buildings. Resource-conscious design is critical to sustainable construction, whose aim is to minimize consumption of natural resources and its impacts on ecosystem. This is where green building rating comes into play. Green buildings have higher attributes infused into them. The idea behind this study was to identify these attributes that Nigerian professional designers can infuse into their designs to make their buildings sustainable.

The rating of green buildings starts by identifying which attributes or factors enable the buildings function most effectively by minimizing energy usage as well as engaging in rational use of water, and other natural resources. These attributes

are then ranked to give an empirically valid assessment of which building is 'green.' The scoring of these attributes and assessment of the building is known as 'rating' or 'certification.' Green rating system can be applied to new building construction as well as to reinvigorate an existing building to make it function better as a 'green building." Preliminary investigation by the researcher showed that there is no known green building rating system in Nigeria. Thus, this comprehensive study was focused on developing a working model around which a practical rating system could be developed for green buildings in Nigeria.

Purpose of the Study

This comprehensive study was conducted to develop a working model for green building rating system in Nigeria. This paper addresses a portion of the study findings involving the perceptions of stakeholders regarding the feasibility of adopting a green building rating system for Nigeria.

Historical Background

Sustainable design agenda became popular in early 1990's at the establishment of the Building Research Establishment Environmental Assessment Method (BREEAM). It was the first recorded attempt at creating a rating system. The BREEAM pioneering effort at rating a green building was established in the United Kingdom. The US Green Building Council (USGBC) was later developed and enhanced the criteria for assessing or calibrating Green Buildings in 2000. The US system for rating green-buildings was implemented through the establishment of Leadership in Energy and Environmental Design (LEED). The first ever LEED attempt at a rating scale was designed for new building construction. Rating systems for existing buildings and whole neighborhoods were later developed by LEED[2]. In May 2010, the Green Building Council for Africa was inaugurated. Countries represented at the event include Kenya and Nigeria. The event witnessed the formal commencement of the operations of the GreenBuildingCouncilofNigeria.

Green Buildings and Perspectives on Sustainability**.**

Depending on the perspective of the individual, sustainability could be defined in many ways. Despite the variety of possible interpretations, there are certain issues that remain constant and are not negotiable. They constitute the emphasis that sustainability is anchored upon. These include but are not limited to "activities that are proven ecologically, sound socially, with strong economic and humane basis such that they remain viable and promising for the foreseeable future" [3] [4]. Section 19(l) of the U.S. Executive Order 13514 dated October 5, 2009 states that "sustainability" and "sustainable" can be said "to establish and create conditions of peaceful co-existence between nature and humans in balanced, fruitful harmony, to encourage fulfilment of the social, economic, and other essential requirements for the foreseeable future" [5].

From the development perspective, a report of the WorldCommissiononEnvironmentandDevelopment describes sustainable development as "development-that meets the needs of the present withoutcompromisingtheabilityof future generations to meettheirownneeds" [6].The Development Assistance Committee (DAC) of the Organization for Economic Co-operation and Development (OECD) stated that "sustainable development implies integrating the economic, social and environmental aspirations of society for the purpose of maximizing human well-being in the present time without compromising the ability of future generations to meet their needs" [7].

Sustainability criterion is defined by Tietenberg as "baseline which defines what is fair and the justness of how resources are allocated among different epochs, and generally insists that resource consumption by any generation, or civilization, should not exceed a level that would prevent future civilizations from attaining a similar level of comfort or well-being of similar greatness." [8]. In regard to the built environment, this pertains to resources such as occupant comfort, health, productivity that impact the society's well-being either directly or indirectly due to the existence of a building or buildings. Along the same line of thought, Elkington [9] developed the triple bottom line (TBL) approach in early 1980s as a basis to report and standardize organizational performance in respect of the three indices of sustainability: economic, environmental, and social. Schultz [10]also argues that a sustainable solution must be economically viable, environmentally bearable, and socially equitable. The TBL concept is illustrated in Fig. 1, and it implies that a sustainable building is required to be viable economically and environmentally; be environmentally and socially bearable; as well as be economically and socially equitable.

The Need for Sustainable Buildings

It has been established that buildings across the world emit 40% of all global carbon dioxide(C02) emissions into the atmosphere. This

constitutes one of the main components for the phenomenon of global warming [11]. The realization that most of the materials used in construction are procured from

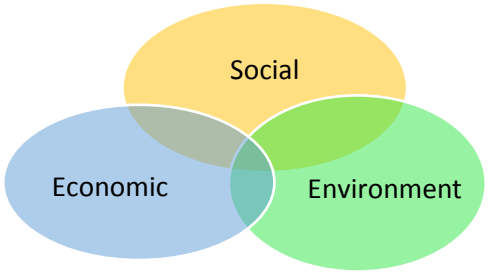

Figure 1.Triple bottom line of sustainability
Source: Author's Field note.

from distant places adds to the ecological footprint of the building because of the transportation involved. Globally, buildings account for over ten percent (10%) of the freshwater consumption, 25% of its harvested wood, as well as forty-per-cent 40% of energy and material flows [12]. Also, it has been shown that the building construction sector produces 8 - 20% of the entire urban domestic, non-toxic waste [13]. This amount of waste is beside those from construction that end up in landfills causing potential destruction to the environment surrounding the landfill area. In the United States for example, buildings and residential properties account for 39% of the total energy use, 72% of electrical use, 38% of all CO2 emissions, use of 40% raw materials, generates 30% of waste, as well as 14% of potable water use [14].

Addressing sustainability or green-building practices would help reduce the growing list of problems associated with the footprint of conventional buildings. The US Green Building Council (USGBC) insists that greenbuildings can aid to minimize this unpleasant impact on the environment, and improve occupant health and productivity. For example, green building advocates for making the building more energy efficient, thereby reducing the energy consumption. It further advocates for a more energy-efficient building, the use of clean renewable energy like solar and windfarm instead of conventional, non-renewableenergy sources like fossil fuels and coal. Benefits of this include reducing the building's dependence on the grid, and overall promotion of an eco-friendly built environment [15]. In simple terms, sustainable or green building is a method of enhancing the effectiveness wherein "buildings on their sites use energy, water, as well as materials. The process minimizes negative building effects on human health and the environment through strategic location, design, construction, operation, maintenance, and transfer to the end of the life-cycle of the building" [16].

According to Winchip, sustainable design is "design that focuses on products and processes that protect the environment while conserving energy for future generations." [17]. A survey conducted by Shelbourn et al. showed that the ability to introduce sustainability into any design process encourages sustainability in the attitude of the project clients, contractor, as well as end-users [18]. Augenbroe and Pearce [19]argue that, based on sustainability demands from end users and a continuous awareness of its effects on the environment, the construction industry is increasingly challenged to demonstrate its commitment to the environment. Thus, the industry stakeholders across all nations need to embrace sustainability.

Kibert [20]argues that sustainable built environment involves "enabling as well as managing a built-environment that is healthy on the principles of resource-efficiency and ecological-balance." Beyond reducing any negative environmental impact of human habitation on this planet, more radical efforts at sustainability are necessary. This would enhance a positive human intervention towards a net benefit for the planet. It would also enable a stable society by creating buildings that are net producers of energy. Together, the resultant effect is to serve the environment by incorporating strategies such as minimizing demolition and waste by making building parts that can be re-used in different configurations as needs change [21].

II. METHODOLOGY

This study was conducted to assess the perceptions of stakeholders regarding the feasibility of adopting a green building rating system for Nigeria. Structured questionnaires developed by the researcher were distributed to a total of 360 randomly selected participants. Participants were asked to complete a series of questions on their experience and familiarity with green buildings. Respondents were staff of the selected institutions. Of the 360 questionnaires distributed, 238 were received, accounting for 66.11% return rate.

In addition to the survey, a Focus Group was constituted as a body of knowledgeable individuals with a vast knowledge of the subject matter. The 15-member Focus Group comprising of registered architects, builders, surveyors, planners, senior academicians, and other building professionals were chosen based on their knowledge of green building construction practices

and their familiarity with LEED rating criteria. The group was asked to express their views and opinions on series of questions regarding green buildings and the potential for developing a rating system for Nigerian building industry. Members of the Focus Group were also interviewed about green energy and sustainable buildings in Nigeria. Their views and opinions helped in understanding the present scale of user-consciousness of sustainable buildings and renewable building practices in the study area.

Research Questions and Hypothesis

This study was guided by three research questions and one hypothesis as follows:

1. To what extent can the building rating system be accepted in South-Western Nigeria?
2. To what extent can green building concepts be adopted by professionals in the study area?

3. What are the factors affecting the development of green buildings inthe study area as perceived by the professional Focus Group?

Hypothesis

Ho: There are no significant differences in opinions among the users of conventional buildings regarding factors influencing the growth and development of green buildings in Nigeria and the level at which each of the factors contribute to green building practices.

H1: There are significant differences in opinions among the users of conventional buildings regarding factors influencing the growth and development of green buildings in Nigeria and the level at which each of the factors contribute to green building practices.

III. FINDINGS AND DISCUSSION

Demographic Information

Of the 238 total number of respondents, 182 were males while 56 were females. Fig. 2 shows the gender distribution of the participants. Age distribution of respondents (TABLE 1) shows that approximately 36% are in the 30-44 year range, 29% are in the 50-60 year age bracket while about 16%% are between 45 and 49 years age bracket. Three percent of the respondents did not indicate their age. Data on sex distribution reveals that 76 males (66%) responded to the study questionnaire while 37 females (32%) responded. To know their work history, respondents were asked to indicate their length of service with their employers. Respondents who have worked for less than 10 years account for 49% of the total respondents, followed by those who have worked for 10-14 years at 32%; 15-24 years constitute 16%, while those with over 25 years in service constitute 17% (TABLE2).

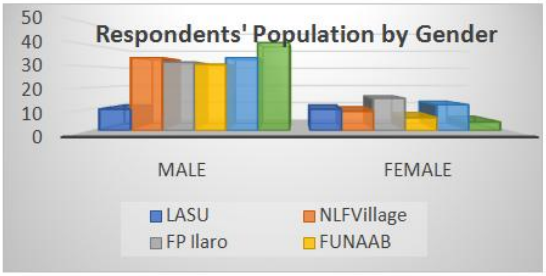

Figure 2. Respondents' population by gender

Table 1. Age distribution of the survey Respondents.

Age Range (Years)	Frequency	Percent	Valid Percent	Cumulative Percent
18 - 29	18	15.7	16.1	16.1
30 - 44	42	36.5	37.5	53.6
45 - 49	18	15.7	16.1	69.6
50 - 60	34	29.6	30.4	100.0

Table 2. Length of employment of respondents

Length of Employment (Yrs.)	Frequency	Percent	Valid Percent	Cumu. Percent
Less than 10	49	42.6	43.0	43.0
10 - 14	32	27.8	28.1	71.1
15 - 24	16	13.9	14.0	85.1
Over 25	17	14.8	14.9	100.0
Total	114	99.1	100.0	

Analysis of Research Questions

Three research questions and one hypothesis were postulated for this study. The first research question asks; "*To what extent can the building rating system be accepted in South-Western Nigeria*?" To answer this question, respondents were presented with series of questions on the potential for developing green building rating system for south-western part of Nigeria. Data analysis involving descriptive statistics as well as Factor Analysis shows that respondents were keen to accept green building practices. The second research question sought to understand the "*extent to which green building concepts can be*

adopted by professionals in the study area?". The data from this question were obtained from the focus group responses. An overwhelming majority (80%) of respondents believed that building professionals would embrace green building concepts, and in fact support its implementation in the country. When the focus group was asked to render opinions on the possibility of federal government embracing sustainable construction practices in Nigeria, about 40% of the participants indicated that little or no concerted efforts have been madeby the government while 60% of the group members declared that more needs to be done by the government. Also, an overwhelming majority (75%) of the focus group members believed that there is low demand for sustainable buildings by project owners. Overall, about 67% of the focus group believed that it is important to integrate sustainable construction practices in the Nigerian construction industry.

The third research question sought to understand the *"factors affecting the development of green buildings in the study area as perceived by the professional focus group."*From responses garnered from the focus group, the following are common factors espoused by the group: lack of awareness by some building professionals and project owners; lack of interest by the government; difficulty in adopting foreign building rating system; and inadequate education and training on sustainable construction practices.

Analysis of Hypothesis

Ho: There are no significant differences in opinions among the users of conventional
buildings regarding factors influencing the growth and development of green buildings in Nigeria and the level at which each of the factors contribute to green building practices.

H1: There are significant differences in opinions among the users of conventional buildings regarding factors influencing the growth and development of green buildings in Nigeria and the level at which each of the factors contribute to green building practices.

The mean responses on legal and social attribute questions, which addressed the growth and development potentials of green buildings in Nigeria were recorded. To examine if any significant differences exist in perceptions among the users of conventional buildings, a One-Way Analysis of Variance (One-Way ANOVA) was performed. TABLE3 presents the result of the test. The F value of 13.06 was found to be non-significant (p = 0.225), suggesting that non-significant differences in opinion exist among the users of conventional buildings regarding the growth and development potential of green buildings in Nigeria.

IV.CONCLUSIONS

The primary objective of this study was to assess the feasibility for adoption of green building rating system in Nigeria as perceived by stakeholders. The paper represents first phase of a larger study involving the development of a green building rating model that could be used to evaluate green buildings in Nigeria. It is hoped that the findings of the study wouldaid the designers, architects, and planners with empirically valid tool that could be used to design sustainable green buildings that would not only lead to energy conservation and provide healthy and comfortable indoor environment, but also contribute less to the problem of global warming throughout the life of the building.

Based data analysis of the research questions, it could be concluded that there is little to no awareness of sustainable building practices among project owners. Findings also revealed that an overwhelming 70% of respondents are dissatisfied with stakeholders' awareness of green buildings as a system in Nigeria. Education and training about sustainable construction practices are also lacking in major higher institutions in Nigeria. Many undergraduate curricula in

Table 3. One-Way ANOVA on growth and development of green building in Nigeria

Source	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	3.178	1	3.178	13.06	.0225
Within Groups	9.732	4	2.433		
Total	12.91	5			

Architecture and construction do not address sustainable construction practices. This void could be filled by providing formal educational training to building professionals as well as a continuing education for building contractors and design professionals.

There were no significant differences in opinions among the users of conventional buildings regarding factors influencing the growth and development of green buildings in Nigeria and the level at which each of the factors contribute to green building practices.

It is believed that the growth and development potential of green buildings in Nigeria are more likely to be of interest to users of

conventional buildings in the study areas considering the several benefits of green buildings.

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