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Perception of Implementing a Green Building Rating System for Energy Savings in Nigeria's Construction Projects Industry

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Abstract:

A green building rating system is an evaluation tool that assesses a building's environmental performance throughout its life cycle. It includes criteria addressing various aspects of design, construction, and operation. This study reviews existing research on green building rating systems, aiming to establish their applicability for energy saving in Nigeria, identify obstacles to implementation, and determine the necessary factors for successful adoption. The study is analytical, relying on secondary data sources such as published articles, books, and websites. Additionally, the paper highlights the potential benefits for Nigeria in developing its own green building rating system. By doing so, Nigeria can align with global efforts to create sustainable built environments and develop effective strategies for energy efficiency and environmental stewardship. The study recommends awareness programs, educational talks, and government policies to promote the implementation of green building rating systems in Nigeria based on the analysis conducted.

Keywords: Green building, energy savings, industry, perception, projects

1. Introduction

Energy costs and environmental concerns have heightened the need to reduce energy consumption. As energy use continues to rise, awareness of improving energy efficiency in the built environment has also increased, benefiting both the environment and building occupants (Ayanniyi, Ikudayisi & Adegbehingbe, 2018). The building sector accounts for over 40% of total primary energy consumption worldwide and nearly 30% of global Carbon Dioxide (CO₂) emissions. Consequently, it plays a crucial role in addressing global energy and climate change challenges (United States Environmental Protection Agency, 2023), as cited in Adewolu (2023a).

As a result, human activities associated with industrialization will bring about changes at the local, regional, and global levels that are unprecedented in both scale and magnitude, resulting in a constant change in city outlooks (Okunlola *et al.*, 2022). These issues have raised concerns about development and practices that would mitigate the negative effect of buildings on the natural environment (Nduka & Ogunsanm, 2015; Adewolu, 2023b). Therefore, integrating Green principles into newer buildings and retrofitting existing structures is the most viable approach to responding to environmental issues and sustainability concerns (Jat & Mane, 2019).

Saliu & Achimugu (2016) and Ayanniyi *et al.* (2018) assert that reversing this trend requires managing resources sustainably — economically, environmentally, and socio-culturally — thus advocating for "green buildings." The vanguard of this advocacy is the World Green Building Council (WGBC), a network of national Green Building Councils (GBC) from around the world. Agreeing with the above assertion, Idowu, Humphrey, Luka (2018), and Adewolu (2023a) pointed out that the sustainability of social life can be guaranteed through green practices in the construction industry. Recent studies by Adewolu (2023b) revealed that sustainable building evaluation mechanisms serve as an option for responding to these issues to promote green construction methods and lessen the negative ecological effect of construction projects. In other words, the desired end state of the building sector is to make sure that the market demands buildings that are high-performance or sustainable.

Over the past decade, green technologies have been integrated into the construction of new buildings and the renovation of existing ones. This shift has emphasized the establishment of green building councils and the creation of certification systems to assess and document the environmental performance of buildings (Çiner & Doan-Salamtimur, 2019). Due to the absence of globally recognized performance goals for green buildings, several countries have developed their own assessment tools and systems. These systems, known as building environmental assessment methods (BEAM), rate a building as green if it meets specific performance targets set by the accepted green rating system (Çiner *et al.*, 2019). This localized approach ensures that best practices are tailored to regional needs and conditions.

As posited by Adegbile (2013) and Akinyemi, Adekunle, Joseph, Anthony, and Dabara (2017), Nigeria is not left out of all the above experiences. Recent studies reveal that the nation is now faced with the challenge of evolving performance standards, systems, codes, and other regulatory means to mitigate, forestall, and develop the built environment.

Developing an environmentally conscious standard and roadmap for building design is essential for sustainability in Nigeria's built environment. Selecting an appropriate Green Building Rating System (GBRS) is crucial, as the system is designed to be voluntary and motivational in its application.

Perception is not new in the world of architecture and design (Ejeh, Adedire & Salihu, 2016). It has to do with how the users or occupants of a space perceive or feel about the space they are in. Perception is the process of using the senses to understand, acquire and mentally interpret information about the surrounding environment and situation. The consideration of the users' perception of the building is a very crucial component in obtaining a good design. As averred by Haruna, Muhammad and Oraegbune (2018), it is an active process which takes place between the organism and the environment. This suggests that information is central to an organism's survival and essential in making sense of the environment to which perception is assumed to be oriented. Perception of our environment helps us to understand and react to our environment. Adewolu (2023a) suggests that environmentally-friendly grading systems are a viable solution to promote green building practices and mitigate buildings' environmental impacts. Despite their benefits, Nigeria remains hesitant to implement these green building grading systems.

This paper emphasizes the importance of research on green buildings by proposing a sustainable implementation of the Nigeria Green Building concept. It addresses a gap in the literature by investigating green building rating systems for energy saving in Nigeria's construction industry, aiming to develop a sustainable implementation plan. The objectives are:

- To establish the applicability of green building rating systems for energy saving in Nigeria,
- To examine the obstacles hindering the implementation of these systems, and
- To identify the factors required for their successful implementation.

By addressing these objectives, the paper aims to advance the adoption of energy-efficient practices in Nigeria's construction sector.

2. Review of Literature

The review section of this study is divided into four sub-sections to highlight the relationships between key concepts: the building construction industry, an overview of green building rating systems for energy saving, the benefits of these systems in the construction industry, obstacles hindering their implementation, and the factors required for their successful implementation. These are further discussed in section four, and thereafter, the conclusion is drawn, and some recommendations are suggested.

2.1. Building Construction Industry

The building construction industry is as old as human civilization itself. The history of the industry evolves with the evolution of human settlement and culture. It has different features in each age of human existence: agrarian, industrial and information ages. As such, the building construction industry has, over time, in an attempt to overcome evolving challenges as a result of the increasing complexity of human settlement (town, country, city, megacity), culminated into a specialization that seeks to enhance efficiency and economical service delivery in the industry. This development, however, has created confusion and a mixed-up impression to members of the public who are expected to be serviced by the industry.

Construction, from the Latin "constructionem" (come "together" and *struere* "to pile up"), is defined as the art and science of forming material or immaterial objects, systems, or organizations (Chigozie & Jide, 2015). According to Owolabi and Olatunji (2014) and Hamma-Adama & Kouider (2017), construction is considered among the world's biggest industries, and its activities are vital aspects of a nation's economy, as a large proportion of the country's resources are usually used in the construction and maintenance of the building.

In recent years, Nigeria has faced environmental challenges such as land degradation, erosion, deforestation, climate change, and water and air pollution, prompting heightened awareness of the need for environmentally sustainable development (Adewolu, 2023b). In response, green building rating systems have been introduced to promote environmentally friendly construction practices. Despite their clear benefits, Nigeria remains cautious about adopting these systems (Adewolu, 2023a).

2.2. Green Building Rating System (GBRS) for Energy Saving: An Overview

A green building rating system is a tool for evaluating the sustainability of buildings by assessing their environmental performance, including energy efficiency, water conservation, and sustainable material use (Adewolu, 2023a). According to UN-HABITAT (2010), these rating tools aid designers and users in understanding and mitigating the environmental impacts of development. They also serve as a roadmap for documenting and measuring the environmental sustainability of buildings. They often use different evaluation criteria, methods, and procedures, ranging from scoring to categorization. Also, by rewarding exemplary building performance, these rating tools provide an incentive for building owners to go above what is required by government building codes, which define the baseline level of performance to be a legal building. Owners can use the ratings to demonstrate the quality of their buildings to a variety of interested stakeholders, including occupants, investors and the public.

Globally, prominent green building rating systems (Table 1) include Leadership in Energy and Environmental Design (LEED) from the United States (2000), Building Research Establishment Environmental Assessment Method (BREEAM) from the United Kingdom (1990), Deutsche Gesellschaft für Nachhaltiges Bauen (DGNB) from Germany (2007), Green Globes (GB) from Canada (2000), Green Star (GS) from Australia, BCA Green Mark Scheme from Singapore (2005), Assessment Standard for Green Building (ASGB) from China (2006), and others such as Pearl Rating System for Estidama

in UAE (2008), Green ship (GS) in Indonesia (2010), South Korea Green Building Certification Criteria (KGBCC) (2001), Green Rating for Integrated Habitat Assessment (GRIHA) in India (2007), Comprehensive Assessment System for Building Environmental Efficiency (CASBEE) in Japan (2001), Hong Kong Building Environmental Assessment Method (HKBEAM), and Green Building Index in Malaysia. These systems, established over various years and countries, provide frameworks for evaluating and promoting environmental sustainability in building practices (Umar et al., 2013; Bahaudin et al., 2014; Akinyemi et al., 2017; Ahmed et al., 2018; Ciner et al., 2019; Adewolu, 2023a).

Country	Measurement System	Country	Measurement System
Australia	Nabers / Green Star	China	GBAS
Brazil	Brazil AQUA / LEED	Finland	Promise
Hong Kong	HKBEAM	Japan	CASBEE
Netherlands	BREEAM Netherlands	Germany	DGNB / CEPHEUS
New Zealand	Green Star NZ	France	HQE
Jordan	EDAMA	Portugal	Lider A
Singapore	Green Mark	Spain	VERDE
Republic of China (Taiwan)	Green Building Label	South Africa	Green Star SA
Korea	KGBC	United Arab Emirates	Estidama
Switzerland	Minergie	Mexico	LEED Mexico
United Kingdom	BREEAM	Czech Republic	SBToolCZ
Malaysia	GBI Malaysia		
India	Indian Green Building Council (IGBC) / GRIHA	Italy	ProtocolloItaca / Green Building Council Italia
Pakistan	Institute of Architecture Pakistan Green Sustainable Architecture	Philippines	BERDE / Philippine Green Building Council
United States	LEED / Living Building Challenge / Green Globes / Build it Green / NAHB GBS / International Green Construction Code (IGCC)	Canada	LEED Canada / Green Globes / Built Green Canada

Table 1: Countries That Have Developed a GBRS

Source: Collated From Bahaudin Et Al. (2014), Ahmed Et Al., (2018) Ciner, Et Al. (2019)

2.2.1. Benefits of Green Building Rating in the Construction Projects Industry

Several authors (Akinyemi et al., 2017; Ahmed et al., 2018; Ayanniyi et al., 2018; Idowu et al., 2018; Adewolu, 2023a) suggest that green building rating systems can enhance local practitioners' commitment to sustainable development. Governments should lead by example in implementing these systems, while private property owners can integrate sustainable strategies into their projects. Green buildings offer distinct advantages over conventional buildings in terms of design and construction.

2.2.1.1. Environmental Benefits

- Biodiversity and ecosystems protection
- Improved air and water quality
- Reduced waste streams
- Conservation and restoration of natural resources

2.2.1.2. Economic Benefits

- Lower operating costs
- Increased market opportunities for green products and services
- Enhanced occupant productivity
- Improved economic performance over the life cycle
- Job creation opportunities

2.2.1.3. Social Benefits

- Enhanced occupant comfort and health
- Improved aesthetic qualities in the neighborhood
- Reduced strain on local infrastructure
- Enhanced quality of life

Furthermore, in the context of institutions of higher education (IHE), green buildings can serve as educational tools, set examples, showcase technology, and communicate the advantages of sustainable buildings to students and the broader community.

2.3. Obstacles to the Implementation of Green Building Rating System for Energy-Saving

Studies by Nduka et al. (2015), Akinyemi et al. (2017), Ahmed et al. (2018), and Adewolu (2023a) have identified barriers that hinder the implementation of green building rating systems for energy savings in the country.

2.3.1. Insufficient Knowledge and Materials Market on Green Building Technologies

Nduka et al. (2015) and Adewolu (2023a) suggest that investing in green buildings not only expands markets for green products and services but also creates business opportunities for architects, developers, contractors, and other stakeholders in the built environment.

2.3.2. High Installation Cost and Use of Adaptable Rating Systems

Adewolu (2023a) notes that the installation costs of green building rating systems are often prohibitive for building owners and developers, exacerbated by current economic challenges. Furthermore, developers face uncertainty regarding financial incentives or government subsidies, which complicates the implementation of these systems.

2.3.3. Lack of Professional Capacity and Technical Skills

The absence of professional capacity and knowledge to adopt and uphold green building grading systems is another issue. This is particularly true for smaller building projects that may not have the necessary resources or expertise to manage the implementation of these systems effectively Adewolu, (2023a)

2.3.4. Absence of Drivers-Government Policies/Laws in Support of Environmental Ethics

Due to the absence of law enforcement, it is challenging to compel building developers and property owners responsible for implementing these processes, which reduces their efficacy.

2.3.5. Dearth of Information on the Effectiveness of Green Building Rating System

Stakeholders lack sufficient information on the effectiveness of green building rating systems, hindering their ability to assess and decide on adoption and implementation.

2.4. Factors Required in Implementing Green Building Rating System

Studies by Adegbile (2013), Akinyemi et al. (2017), Ayanniyi et al. (2018), and Adewolu (2023a) propose strategies for implementing green building rating systems in residential, commercial, and institutional areas of Nigeria. These strategies aim to foster sustainable development among local practitioners.

2.4.1. Green Construction Policies

Government-led policies should mandate greening construction and buildings, focusing on energy and water efficiency, environmental quality of building materials and resources, indoor environmental quality, and innovative design.

2.4.2. Established Government Laws and Policies in Support of Environmental Ethics

Green buildings are eco-friendly construction practices that save energy, reduce emissions, and reuse and recycle materials and resources. Implementing GBRS techniques for pollution reduction minimizes cost.

2.4.3. Funding and Government Support

The government's support, such as promulgating relevant laws and policies and providing financial incentives, is critical in promoting the Green Building Concept in Nigeria. Legislators and different levels of government (e.g., federal, state, and local) employ varying regulatory approaches to develop green buildings.

2.4.4. Creating More Awareness Strategies

Building public confidence and creating a forum where the exchange of ideas on reliable GBRS information and feedback from stakeholders is attained ensures full acceptance. Certainly, there will be doubts, disagreements and disputes at the initial stage from stakeholders due to various interpretations.

3. Research Methodology

This study is largely based on literature on green building rating systems and perception studies. This review included studies published in academic (peer-reviewed) journals, conference papers, textbooks, unpublished research articles and internet data. To retrieve relevant articles for this study, a systematic literature search was conducted using the Scopus and Google Scholar search engines. Prior studies have been used in similar reviews (Ayanniyi *et al.*, 2018), and

it has also been adjudged as the most effective search engine for conducting a review of a topic. Key search terms used include "Construction projects industry," "Green building rating systems," "Green building rating systems for energy saving," and "Perception." The initial search resulted in the identification of a total number of 105+ articles. Therefore, it was necessary to filter out unrelated articles, hence, a brief review of the abstracts. After filtering, 35 articles were found to be most relevant and considered valid for further analysis. The 35 relevant articles are reviewed, presented and discussed in the next section of the paper.

4. Discussion of Findings

4.1. Linking Construction Projects Industry, Implementing a Green Building Rating System for Energy Savings and Government's Role

This study integrates the perspectives of various researchers to elucidate the connections among the construction projects industry, green building rating systems for energy saving, and government involvement. The theoretical framework also addresses the challenges associated with the non-implementation of these systems in Nigeria's construction sector. Recommendations include strategies for implementing government laws and policies to support green building rating mechanisms and proposing solutions to enhance adoption rates. Based on previous discussions, especially findings by Akinyemi et al. (2017) and Adewolu (2023a), it is evident that built environment professionals and government play crucial roles in achieving Sustainable Development Goals by implementing rating systems for environmentally-friendly buildings in Nigeria, thereby enhancing energy efficiency in our built environment.

First and foremost, to achieve sustainable development and green construction practices, there is a need for collaboration among the built environment professions, other relevant professionals, policymakers and regulatory bodies to ensure the implementation of sustainable practices within the urban built environment. Second, government agencies should introduce and conduct research on more environmentally friendly practices that are cost-effective and attainable given the current economic situation in the country. Lastly, as averred by Allu and Elimisiemon (2017), the architect is expected to identify best practices within the profession to determine what specific green building rating systems are sustainable and peculiar to the Nigerian urban built environment.

In summary, since the main concerns for sustainability in the construction projects industry are adherence to standards, reduction of energy and resource demand associated with construction, and use of sustainable building materials, it is necessary for built environment professionals and stakeholders to be aware that any unstable design consideration would be damaging to the urban environment.

5. Conclusion

It is evident that sustaining the environment in which we live is very crucial to the survival of man on earth. Hence, promulgating relevant laws and environmental friendly policies, by government and built environment professionals would mitigate emission levels. Reviewing the literature on green building benefits conclusively shows that green building rating systems for energy saving offer superior performance compared to conventional buildings across all aspects. Implementing such systems in local construction projects would not only advance the country's green initiatives but also set a precedent for other West African nations.

6. Recommendations

Based on the study's findings, the following recommendations are proposed:

- The government should actively participate in adopting and facilitating the establishment of green building rating systems in Nigeria. This can include providing training and technical assistance to interested parties in both the public and private sectors on the implementation and upkeep of these systems.
- Government policies should introduce incentives and supportive regulations to promote the adoption of green building practices nationwide.
- There is a need to increase public awareness campaigns and education talks to inform the general population about the advantages of green practices and encourage building developers and property owners to adopt them.
- There is a need to set up an African network to foster exchange between experts, professionals, decision-makers and the private sector and to assist emerging green building councils in the region.
- There is a need to introduce green building practices in the curriculum of the education sector to increase knowledge and skills to spread green practices.

7. Contribution to Knowledge

This study aimed to investigate a green building rating system for energy saving in Nigeria's construction projects industry with a view to developing a sustainable implementation plan for Nigeria. It offers a significant contribution to knowledge in the area of research at academic and non-academic levels.

Academically, it has highlighted the benefits and obstacles of implementing green building rating systems for energy savings and proposed strategies to overcome these obstacles.

At the practical level, given the cooperation of the Nigerian government, it will stimulate growth and evaluate processes that may be modified and adapted for use in the Nigerian setting by built environment professionals and stakeholders alike.

Achieving the Sustainable Development Goals (SDGs) demands collaborative efforts and engagement from all stakeholders. Established by the United Nations General Assembly in 2015, these goals encompass 17 global objectives

aimed at being achieved by 2030. The intention is to solve issues such as affordable and clean energy, sustainable cities and communities, climate action, good health and well-being, industry, innovation, infrastructure, etc.

The findings from this study also present a valuable understanding of the Nigerian construction projects industry, which will, therefore, positively impact knowledge both academically and practically.

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