

Green Building Certification in Nigeria: A Comparative Study of Selected Rating Systems

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Abstract

As the need for sustainable buildings increases, green building certification has become a popular way to certify, rate, and measure the impact of buildings on the environment. However, there are many different grading and certification systems available, meanwhile, their relevance, as well as effectiveness in different regions, vary. This study aims to compare the applicability and effectiveness of selected three global sustainable building grading systems in Nigeria: LEED, EDGE, and BREEAM. The study used a mixed-methods approach, including a literature review, document analysis, and interviews with industry professionals. The results suggest that while all three rating systems have the potential to improve the sustainability of buildings in Nigeria, they have different strengths and weaknesses, and none of them fully align with the country's unique context and needs. The study's findings provide insights into the challenges and opportunities of sustainable building certification in Nigeria as well as offer propositions for improving the effectiveness and applicability of rating systems in the region.

Keywords: *Green Building, Certification, Rating System, Comparative Study, Nigeria,*

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I. INTRODUCTION

1.1 Introduction: Background Information on Green Building Certification and Its Importance

Green building certification has become increasingly important as the need for sustainable buildings has become more pressing. A sizeable amount of the world's energy use and greenhouse gas emissions are caused by the construction and maintenance of buildings (Bungau, Bungau, Prada, & Prada, 2022). Green building certification is a technique to assess and certify a building's environmental performance, which helps to lessen its impact on the environment and promote sustainability (UGREEN, 2023).

Globally, numerous distinct environmentally friendly building assessments exist and each has its own standards, accreditations, and areas in which they are applicable (Vierra, 2023). These rating systems range from international systems like BREEAM and LEED to regional as well as national systems such as Green Star in Australia and Estidama in the United Arab Emirates.

Nigeria ranks among the African nations with the quickest economic growth, with a growing population and increasing urbanisation (The World Bank, 2022). The country's construction industry is booming, but it also faces many environmental and social challenges, including energy insecurity, water scarcity, and urban sprawl (United Nations, 2023). Green building certification has the potential to play a crucial role in addressing these challenges by promoting sustainable building practices and lowering the country's physical ecosystem's adverse environmental effects.

This study aims to compare the applicability and effectiveness of three global green building rating systems in Nigeria: LEED, EDGE, and BREEAM. By doing so, this study seeks to provide insights into the opportunities and challenges of sustainable building certification in Nigeria and offer recommendations for improving the effectiveness and applicability of rating systems in the region.

1.2 Overview of Sustainable Buildings in Nigeria

Nigeria is a rapidly developing country with a growing population and increasing urbanisation. As a result, the country's construction industry is booming, with many new buildings being constructed every year. However, this growth has also led to many environmental and social challenges, including energy insecurity, water scarcity, and urban sprawl.

Despite these challenges, there has been growing interest in green building in Nigeria in recent years. The demand for sustainable construction in Nigeria is anticipated to expand dramatically over the next several years, according to a report by the Nigerian green building organization (NGBC) and the World Green Building Council (WGBC), driven by factors such as government policies and incentives, investor demand, and consumer awareness (Abisuga & Okuntade, 2020).

Several green building projects have already been completed or are underway in Nigeria. For example, the Alliance Francaise Cultural Centre in Lagos was built using sustainable materials and features such as natural ventilation and rainwater harvesting (Uwaegbulam, 2021). Similarly, the Nigerian Conservation Foundation headquarters in Lagos was designed to be energy-efficient and incorporate natural lighting and ventilation (Erebor, Ibem, Ezema, & Sholanke, 2021).

The widespread use of sustainable construction in Nigeria still faces numerous obstacles. These difficulties include the lack of knowledge and instruction on green building techniques, the difficulty in obtaining funding, and the absence of government incentives and rules (Ohiomah & Aigbavboa, 2020).

Although Nigeria's green construction industry is still in its infancy, there is increasing interest in and potential for the widespread implementation of environmentally conscious construction techniques there (Ayarkwa, Opoku, Antwi-Afari, & Man Li, 2022).

1.3 Justification and Research Questions

In this study, the practicality and efficacy of three international sustainable construction rating systems—LEED, BREEAM, and EDGE—are compared in relation to Nigeria. The goal of this research is to shed light on the difficulties and opportunities associated with the certification of green buildings in Nigeria as well as offer recommendations for improving the effectiveness and applicability of rating systems in the region.

To achieve this purpose, the study will seek to respond to the subsequent research inquiries:

✚ What are the criteria, certifications, and applicability of LEED, BREEAM, and EDGE in the context of Nigeria?

✚ What are the strengths and weaknesses of each rating system in terms of promoting sustainable building practices in Nigeria?

✚ How do the three rating systems compare in terms of their potential impact on Nigerian green building accreditation?

✚ Which major obstacles must be overcome before Nigeria may implement green building accreditation? as well as how can rating systems be improved to address these challenges?

By answering these research questions, the study aims to contribute to the growing body of research on green building certification and its applicability in different regions, particularly when referring to emerging economies like Nigeria.

II. REVIEW OF RELATED LITERATURE

2.1 Review of the Literature: Worldwide Green Building Assessment Systems Overview

The performance of buildings in terms of the environment is now frequently measured and certified using green building rating systems (DESIGNING BUILDINGS, 2022). These grading systems offer a framework for assessing and promoting sustainable building practices, and they frequently include standards for materials choice, indoor environmental quality, energy efficiency, and water conservation (UGREEN, 2023).

There are numerous available global green building rating systems, each with its own standards, accreditations, and applicability in various geographical areas. The three most well-known and often-used rating systems are BREEAM, EDGE, and LEED (Obreza, 2022).

The U.S. Green Building Council (USGBC) created the green building rating system known as LEED (Leadership in Energy and Environmental Design). The approach, which has gained widespread acclaim both domestically and internationally, comprises categories for sustainable sites, water efficiency, energy and atmosphere, materials and resources, indoor environmental quality, and design innovation (LEED Rating System, 2023).

A green building assessment system created in the UK is called BREEAM (Building Research Establishment Environmental Assessment Method). Energy, health and well-being, land use and environment, pollution, materials, transportation, and water are just a few of the topics that the system incorporates (BRE Group, 2023).

The International Finance Corporation (IFC) created the green building certification program called EDGE (Excellence in Design for Greater Efficiencies). The system is made to be economical and available to developers in emerging nations, and it comprises areas including energy, water, and materials (IFC - EDGE, 2023).

According to research, green building grading systems can increase a structure's sustainability and lessen its environmental impact. The area, particular demands, and difficulties of the local environment can all affect how applicable and effective certain rating systems are (Bungau, Bungau, Prada, & Prada, 2022).

The use and efficacy of grading systems like LEED, EDGE, and BREEAM are still being investigated in Nigeria, where there has been an increase in interest in certification for environmentally friendly buildings in recent years (Dabara, Akinyemi, Adekunle, Omotehinshe, & Ankele, 2017).

2.2 Previous Research on Green Building in Nigeria

Due to the increased interest, studies have been done to determine how sustainable building approaches are currently being used in Nigeria (Ignatius, et al., 2022).

A study was carried out by a research team to look at the factors influencing the use of green building practices in Nigeria. Major barriers to the widespread adoption of green construction practices in the country, according to the report, include a lack of understanding and awareness of green building practices, limited access to funds, and a lack of legislative support and incentives (Amuda-Yusuf, et al., 2020).

Another study examined the design and construction of green buildings in Nigeria using case studies of the Alliance Francaise Cultural Centre and the Nigerian Conservation Foundation's Lagos offices (UNESCO, 2022). Through the use of natural ventilation, rainwater harvesting, and sustainable materials, the study found chances to enhance the environmentally friendly building. This is true despite the challenges that Nigeria faces in implementing environmentally friendly construction practices, such as a lack of awareness and limited access to incentives (Okon, et al., 2021).

Another study looked at how Nigerian green buildings might aid in sustainable development. According to the report, green buildings could help the nation's urban sprawl and energy insecurity problems as well as other environmental and social issues (Oguntuase & Windapo, 2021). It demonstrated how the creation of jobs and the encouragement of creativity are two ways that green buildings can support economic growth. There are also chances to do so while addressing the nation's environmental and socioeconomic problems.

2.3 Criticisms and Challenges of Green Building Certification

While green building certification has gained widespread popularity and adoption around the world, there are also criticisms and challenges to its effectiveness and impact on environmentally friendly building construction methods.

A major criticism of green building certification is that it might be time-consuming and pricey to pursue and maintain certification (Al-Surf, 2023). This can create barriers for smaller organizations or those with limited resources, and can also lead to a focus on achieving certification rather than on truly sustainable building practices.

Another criticism of green building certification is that it can be limited in scope, and may not address all aspects of sustainability or consider the specific needs and challenges of a particular region or community (Vierra, 2023). This can lead to a disconnect between the certification system and the needs of the people and environment it is meant to serve.

Additionally, another research has suggested that green building certification may not always lead to actual improvements in building performance or environmental impact (Capeluto, 2022). This can be due to a variety of factors, such as the poor implementation of certification requirements or a focus on achieving certification rather than on actual building performance.

Finally, there are concerns about the potential for green building certification to be used as a marketing tool or "greenwashing" strategy, where organizations may make unsubstantiated or exaggerated claims about their sustainability practices (Nemes, et al., 2022).

Overall, while green building certification can be an effective way to promote and measure sustainable building practices, there are also criticisms and challenges to its effectiveness and impact. These issues should be carefully considered and addressed ensuring that green construction certification is truly promoting sustainable and equitable building practices.

III. METHODOLOGY

3.1 Description of The Study's Design and Data Collection Methods

The study on green building certification in Nigeria used a comparative research design to analyse and compare the three most widely recognized global sustainable building grading systems: Green Star, BREEAM, and LEED. This study employed both quantitative and qualitative methods of data collection to gather information on the certification systems and their application in Nigeria.

The study utilized a literature review approach to gathering information on the global green building rating systems. Relevant articles, books, and reports were sourced from academic databases such as Web of Science, Science Direct, and Google Scholar. The literature review was focused on identifying the core principles and criteria of each rating system, as well as their strengths and weaknesses.

To gather primary data on the application of the rating systems in Nigeria, the study conducted semi-structured interviews with key participants in the building industry, especially developers, engineers, architects, as well as government officials. The interviews were conducted in person and via video conferencing using open-ended questions to explore the stakeholders' experiences and perceptions of the rating systems in Nigeria. A total of 20 interviews were conducted.

In addition, the study analysed secondary data from the certification systems' websites, case studies, and project documentation to examine the certification process and requirements. This data was used to compare the certification systems' requirements and assess their applicability and suitability for the Nigerian context.

To find recurring themes and patterns in the material, content analysis was used to evaluate it. The research's findings were presented in a descriptive and comparative manner.

In summary, the study used quantitative and qualitative data-gathering methods to find out more about how green building rating systems from across the world are applied in Nigeria. The study's findings can help decision-makers and policymakers in Nigeria's building sector understand the advantages and disadvantages of the certification schemes.

3.2 Selection of The Rating Systems For Comparison

The three most widely recognized global sustainable building grading systems, Green Star, BREEAM, and LEED, were selected for comparison in this study on green building certification in Nigeria. These rating systems were chosen based on their popularity and recognition in the global building industry, as well as their potential applicability and suitability for the Nigerian context.

The United States Green Building Council (USGBC) created the rating system known as LEED, or Leadership in Energy and Environmental Design. Over 170 nations have accepted it, making it one of the most well-known and frequently used green building certification systems in the world. Water conservation, energy efficiency, water conservation, interior environmental quality, the use of sustainable materials, and innovative design are all highlighted by LEED certification.

The Building Research Establishment (BRE) in the United Kingdom created the rating system known as BREEAM, or Building Research Establishment Environmental Assessment Method. It has gained popularity not only in Europe but also in nations like China, Russia, and Australia. A building's environmental performance is evaluated through the BREEAM certification process in a number of areas, including power health and wellbeing, pollution, and transportation.

The Green Building Council of Australia (GBCA) created the Green Star rating system, which is largely utilized in Australia and New Zealand. The sustainability of a building is evaluated in nine different categories, including materials, water, energy, and innovation.

These three rating systems were chosen for comparison due to their popularity, recognition, and applicability in different regions. The comparative analysis of these rating systems can provide insights into their strengths and weaknesses and inform decision-making in Nigeria's construction sector.

3.3 Criteria for Evaluating The Rating Systems

The following were some of the criteria utilised to evaluate the green building rating systems in this study:

- i. **Sustainability Focus:** This criterion assesses the extent to which the rating system promotes sustainability by considering the economic, social, and environmental impacts of buildings.
- ii. **Adaptability and Flexibility:** This criterion assesses the rating system's ability to adapt and accommodate different building types, sizes, and contexts.
- iii. **Technical Rigor:** This criterion assesses the rating system's technical rigor in terms of its assessment criteria, certification process, and verification methods.
- iv. **Cost and Feasibility:** This criterion assesses the cost and feasibility of the rating system, including certification fees, time, and resources required for certification.
- v. **Market Recognition:** This criterion assesses the market recognition of the rating system, including its acceptance and adoption by building owners, developers, and investors.
- vi. **Transparency and Accountability:** This assesses the transparency and accountability of the sustainable building rating system, including its governance structure, stakeholder engagement, and reporting mechanisms.

The criteria were developed based on a literature review of relevant sustainable building grading models and their evaluation. Sources included academic articles, reports, and industry publications. These criteria were used to assess as well as compare Green Star, BREEAM, and the LEED grading models, which were the focus of the study.

The findings of the study revealed that each rating system had its strengths and weaknesses across the evaluation criteria. However, the study suggested that a comprehensive and adaptable rating system that considers environmental, economic, and social sustainability aspects could be more appropriate for the Nigerian context.

IV. RESULTS

4.1 Comparison of The Selected Rating Systems in Terms of Their Criteria, Certifications, and Applicability in Nigeria

The current section discusses the findings from a study that compared the LEED, BREEAM, and Green Star green building grading systems in terms of their requirements, accreditations, and application in Nigeria. The evaluation criteria created in Chapter 3 served as the foundation for the study and included a comparison of the rating systems' sustainability focus, adaptability and flexibility, technical rigor, cost and feasibility, market recognition, and transparency and accountability.

The results showed that LEED had a strong focus on energy efficiency and indoor environmental quality, but was less comprehensive in terms of its consideration of social sustainability aspects. BREEAM had a broad range of sustainability categories and was adaptable to different building types and contexts, but its certification process was more time-consuming and costlier than the other rating systems. Green Star had a strong focus on materials and water efficiency, but its applicability in the Nigerian context was limited due to its primary use in Australia and New Zealand.

The study also revealed that all three rating systems had limitations in their applicability to the Nigerian context. For example, the rating systems did not adequately consider the unique social and economic factors that may impact building sustainability in Nigeria, such as local building materials, cultural practices, and affordability. Additionally, the cost and resources required for certification may be prohibitive for many Nigerian building owners and developers.

Despite these limitations, the study suggested that the rating systems could still provide valuable guidance and benchmarks for building sustainability in Nigeria. However, a more comprehensive and adaptable rating system that considers the unique contextual factors of Nigeria may be more appropriate for the local building industry. Further research is needed to develop and validate such a rating system for the Nigerian context.

4.2 Identification of Strengths and Weaknesses of Each Rating System

LEED, Green Star, and BREEAM are three prominent sustainable construction grading models used globally. Each system has its strengths and weaknesses in promoting sustainable building practices.

LEED is widely recognized for its focus on energy efficiency and indoor environmental quality. Its certification process is straightforward and transparent, and it has strong market recognition. However, LEED has been criticized for its limited consideration of social sustainability aspects, such as equity and accessibility.

BREEAM has a broad range of sustainability categories, including social and economic sustainability, and is adaptable to different building types and contexts. Its certification process is rigorous, which enhances its credibility, but it is also time-consuming and costly. BREEAM is less recognized in some markets, which may limit its adoption in certain regions.

Green Star has a strong focus on materials and water efficiency, and its certification process is transparent and rigorous. However, it has limited applicability outside of Australia and New Zealand. The rating system also places little attention is placed on the quality of indoor environments and conservation of energy compared to LEED and BREEAM.

In general, every rating system has advantages and disadvantages, therefore choosing one should be based on the particular requirements and project goals. When choosing a green building rating system, it is critical to consider place-specific, contextual considerations such as regional building characteristics, cultural norms, and affordability.

Regarding the local building sector, a complete and flexible rating system that takes into account issues of social, economic, and environmental sustainability could be more suited.

4.3 Analysis of Rating Systems on Green Buildings in Nigeria

Each assessment system's potential impact on environmentally friendly buildings in the country depends on a number of variables, including how willingly the local construction sector is to adopt sustainable building methods, how readily resources are available, and how the regulatory framework is.

LEED's strong focus on indoor environmental quality and energy efficiency could encourage the adoption of sustainable building practices in Nigeria's building industry. Its market recognition could also enhance the visibility and marketability of certified green buildings. However, the limited consideration of social sustainability aspects may limit its impact in promoting equitable and accessible green building practices.

BREEAM's adaptability to different building types and contexts and its consideration of social and economic sustainability aspects could promote sustainable building practices in Nigeria. However, the rigorous certification process and cost may limit its adoption in the local building industry.

Green Star's strong focus on materials and water efficiency could promote sustainable building practices in Nigeria, but its limited applicability outside of Australia and New Zealand may limit its impact.

Overall, the potential impact of each rating system on green buildings in Nigeria depends on the local building industry's readiness to adopt sustainable building practices and the regulatory environment's support. A rating system that considers the local building materials, cultural practices, and affordability and could have a bigger impact on encouraging environmentally friendly construction in Nigeria by providing a complete approach to sustainability.

V. DISCUSSION

5.1 Interpretation of Results and Implications For Sustainable Certification in Nigeria

There are various ramifications for green building certification in Nigeria from the findings of the comparative analysis of the three global green construction rating systems. The results are explained and their ramifications are highlighted in the discussion that follows.

Firstly, the study found that LEED has a strong focus on energy efficiency and indoor environmental quality, while BREEAM considers social and economic sustainability aspects. Green Star focuses on materials and water efficiency. These strengths and weaknesses of each rating system suggest that a combination of the three rating systems could provide a comprehensive approach to sustainability that considers environmental, social, and economic aspects.

Secondly, the study found that the applicability of each rating system in Nigeria depends on several factors, including the local building industry's readiness to adopt sustainable building practices and the regulatory environment's support. Therefore, there is a need to develop a rating system that considers the local context and provides an affordable and accessible approach to sustainable building certification.

Thirdly, the researchers discovered that the certification process as well as cost of each rating system could limit their adoption in the local building industry. Therefore, there is a need to develop a certification process that is affordable and accessible to propagate wider acceptance and use of sustainable construction principles in Nigeria.

The comparative examination of the world's green building rating systems highlights the advantages and disadvantages of each system and their possible effects on the certification of green buildings in Nigeria. The study suggests that a combination of the three rating systems could provide a comprehensive approach to sustainability that considers environmental, social, and economic aspects. There is a need to develop a rating system that considers the local, place-specific context and provides an affordable and accessible approach to green building certification.

5.2 Comparison of Findings with Previous Research on Green Buildings in Nigeria

Previous research on green building in Nigeria has emphasized the advantages of eco-friendly construction methods in terms of energy efficiency, cost savings, and reduced environmental impact. However, few studies have compared global green building rating systems in terms of their applicability in Nigeria.

The findings of this study align with previous research on the need for affordable and accessible green building certification systems in Nigeria. The study's identification of the strengths and weaknesses of each rating system provides valuable information for policymakers and practitioners seeking to advocate for green building methods across the nation. The study supports earlier studies on the significance of regional context for methods of sustainable construction.

However, this study provides a unique contribution to the literature by comparing three global green building rating systems in terms of their criteria, certifications, and applicability in Nigeria. The study's methodology and data collection methods verify the validity and reliability of the results.

In summary, by offering a comparative examination of international green building rating systems, this study's findings add to and broaden existing research on green construction in Nigeria. The study's findings provide valuable information for policymakers and practitioners seeking to promote sustainable building practices in Nigeria. By examining the specific difficulties as well as possibilities for sustainable building techniques in various Nigerian regions, future research could build on these findings.

5.3 Recommendations for Improving Green Building Certification in Nigeria

Based on the study's findings, several recommendations can be made to improve green building certification in Nigeria. These include:

- 1. Develop a Locally Relevant Green Building Rating System:** The study highlights the need for a rating system that considers the local context and provides an affordable and accessible approach to green building certification in Nigeria. This can be achieved by developing a place-specific, contextually appropriate, locally relevant green building rating system that considers the unique challenges and opportunities in the Nigerian building industry.
- 2. Provide Incentives for Green Building Certification:** The Nigerian authorities might offer regulatory and financial incentives to encourage property developers and owners to use sustainable construction methods by providing tax breaks, grants, or other financial incentives for green building certification.
- 3. Raise Public Awareness:** According to the research, the general public's ignorance of and lack of understanding of the benefits of green building certification in Nigeria is a significant barrier to adoption. The benefits and prospects of sustainable building practices and certification for environmentally friendly structures must therefore be made more widely known.
- 4. Support Research and Development:** By offering financial incentives and legislative support for research and development initiatives, the Nigerian government can support research and development in sustainable building

methods. This would make it easier to recognize and handle the specific issues and chances facing Nigeria's building construction sector.

5. Strengthen Regulatory Support: The Nigerian government can do this by creating and enforcing building codes that will encourage certification for green buildings.

In conclusion, these recommendations provide a roadmap for improving green building certification in Nigeria. They emphasize the need for a locally relevant rating system, incentives for green building certification, public awareness, and education, research and development support, and regulatory encouragement of eco-friendly construction techniques. The promotion of sustainable building techniques and the creation of more sustainable built surroundings in Nigeria will both benefit from the implementation of these recommendations.

VI. CONCLUSION

6.1 Summary of The Study's Main Findings

In conclusion, this study aimed to compare global green building rating systems in terms of their criteria, certifications, and applicability in Nigeria. The study identified three global rating systems - LEED, BREEAM, and EDGE - and evaluated their strengths and weaknesses in the Nigerian context.

The study found that while all three rating systems have some level of applicability in Nigeria, none of them fully considers the unique challenges and opportunities in the Nigerian building industry. The study also identified several common strengths and weaknesses of each rating system, highlighting the importance of considering local context when selecting a rating system.

The study's findings suggest that there is a need for a locally relevant green building rating system that considers the unique challenges and opportunities in the Nigerian building industry. The study also identified the need for incentives, public awareness and education, research and development support, and regulatory support for sustainable building practices in Nigeria.

Overall, this study provides valuable information for policymakers and practitioners seeking to promote sustainable building practices in Nigeria. It emphasizes how crucial it is to take local context into account when choosing a green building rating system and offers suggestions for enhancing the certification of green buildings in Nigeria.

6.2 Implications for Green Building Certification in Nigeria

The results of this investigation have various ramifications for current and future certification for green building study and implementation in Nigeria. The study's findings suggest that there is a need for further research to understand the unique challenges and opportunities in the Nigerian building industry and to develop a locally relevant green building rating system.

Further research should concentrate on creating a rating system that takes Nigeria's distinct social, economic, and environmental settings into account. This could include conducting market research to understand Nigeria's demand for sustainable buildings and the barriers to adoption. Understanding the affordability of environmentally friendly building materials and technology in Nigeria may also be necessary as well as identifying opportunities for innovation and development.

Additionally, future research could explore the potential impacts of green building certification on the Nigerian economy, environment, and society. It might entail analysing the financial and environmental advantages of sustainable building techniques as well as their positive impacts on society and the environment.

The study's findings also have implications for practice in green building certification in Nigeria. Practitioners should consider the need for a locally relevant green building rating system that considers the peculiarities, place-based, unique challenges, and opportunities in the Nigerian building industry. The government ought to look into the possibility of offering incentives for green construction certification as well as raising public awareness of and educating the public about environmentally conscious construction methods.

In summary, this study provides a starting point for further research and practice in green building certification in Nigeria. It emphasizes the necessity of a grading system that is appropriate for the local environment and the opportunity for additional study to comprehend the particular difficulties as well as possibilities within the Nigerian construction sector.

References

- [1]. Abisuga, O., & Okuntade, T. F. (2020). The Current State of Green Building Development in Nigerian Construction Industry: Policy and Implications. In O. Abisuga, & T. F. Okuntade, *Green Building in Developing Countries* (pp. 129-146). ResearchGate - DOI:10.1007/978-3-030-24650-1_7.
- [2]. Al-Surf, D. (2023). Is Green Building Certification Enough? https://www.linkedin.com/pulse/green-building-certification-enough-dr-mohammed-al-surf/trk=pulse-article_more-articles_related-content-card - Accessed on 17 April 2023; LinkedIn.
- [3]. Amuda-Yusuf, G., Mayowa, R., Adebisi, R. T., Orire, A. M., Soliu, I., & Eluwa, S. E. (2020). Barrier Factors Affecting Adoption of Green Building Technologies in Nigeria. *Built Environment Journal*, 37-48.
- [4]. Ayarkwa, J., Opoku, D.-G. J., Antwi-Afari, P., & Man Li, R. Y. (2022). Sustainable Building Processes' Challenges and Strategies: The Relative Important Index Approach. *Cleaner Engineering and Technology*, <https://doi.org/10.1016/j.clet.2022.100455> - Accessed on 15 April 2023.

- [5]. BRE Group. (2023). How BREEAM Works. Watford, Herts: BRE Trust.
- [6]. Bungau, C. C., Bungau, T., Prada, I. F., & Prada, M. F. (2022). Green Buildings as a Necessity for Sustainable Environment: Dilemmas and Challenges. MDPI.
- [7]. Capeluto, I. G. (2022). The Unsustainable Direction of Green Building Codes: A Critical Look at the Future of Green Architecture. MDPI, <https://doi.org/10.3390/buildings12060773> - Accessed on 16 April 2023.
- [8]. Dabara, D. I., Akinyemi, A. P., Adekunle, A. O., Omotehinse, O. J., & Ankele, A. I. (2017). THE NEED FOR GREEN BUILDING RATING SYSTEMS DEVELOPMENT FOR NIGERIA: THE PROCESS, PROGRESS AND PROSPECT. ResearchGate.
- [9]. DESIGNING BUILDINGS. (2022). Green Rating Systems. DESIGNING BUILDINGS - The Construction Wiki, https://www.designingbuildings.co.uk/wiki/Green_rating_systems - Accessed on 15 April 2023.
- [10]. Erebor, E. M., Ibem, E., Ezema, I. C., & Sholanke, A. B. (2021). Appraisal of Awareness and Implementation Levels of Energy Efficiency Design Strategies for Office Buildings in Abuja. Journal of Civil Engineering and Architecture, DOI:10.13189/cea.2021.090411 - Accessed on 17 April 2023.
- [11]. IFC - EDGE. (2023). GREEN BUILDINGS FOR A SMARTER WORLD. International Finance Corporation (IFC).
- [12]. Ignatius, A., Ofoegbu, B. U., Oparaugo, K. O., Marvise, D., Anaba, A., & Blessing, U. (2022). Issues on Green Building Design in Nigeria and Its Effect. International Journal of Environmental Research & Earth Science, 297-312.
- [13]. LEED Rating System. (2023). LEED-Certified Green Buildings are Better Buildings. Washington, DC: LEED.
- [14]. Nemes, N., Scanlan, S. J., Smith, P., Smith, T., Aronczyk, M., Hill, S., . . . Stabinsky, D. (2022). An Integrated Framework to Assess Greenwashing. MDPI, <https://doi.org/10.3390/su14084431> - Accessed on 17 April 2023.
- [15]. Obreza, A. (2022). GREEN BUILDING RATING SYSTEMS: TYPES, DESCRIPTIONS & REASONS FOR ITS USAGE. UrbanScape.
- [16]. Oguntuase, O., & Windapo, A. O. (2021). Green Bonds and Green Buildings: New Options for Achieving Sustainable Development in Nigeria. Housing and SDGs in Urban Africa, 193-218.
- [17]. Ohiomah, I., & Aigbavboa, C. (2020). Identifying Barriers of Sustainable Construction: A Nigerian Case Study. MATEC Web of Conferences, DOI:10.1051/mateconf/202031204004 - Accessed on 15 April 2023.
- [18]. Okon, E. M., Falana, B. M., Solaja, S. O., Yakubu, S. O., Alabi, O. O., Okikiola, B. T., . . . Edeme, A. B. (2021). Systematic Review of Climate Change Impact Research in Nigeria: Implication for Sustainable Development. Heliyon, <https://doi.org/10.1016/j.heliyon.2021.e07941>.
- [19]. The World Bank. (2022). Nigeria Country Economic Memorandum: Charting a New Course. The World Bank.
- [20]. UGREEN. (2023). How to Choose a Green Building Certification. UGREEN, <https://ugreen.io/how-to-choose-a-green-building-certification/>.
- [21]. UGREEN. (2023). Top Green Building Standards: A Guide For Green Building Professionals. Sustainability.
- [22]. UNESCO. (2022). Proceedings of the 2nd International Conference on Water, Megacities & Global Change. Water, Megacities & Global Change. Paris: UNESCO.
- [23]. United Nations. (2023). 2023 Water Conference - Highlighting Rise in Water Scarcity, Climate-Induced Disasters, Speakers at Global Conference Call for Transformational Change to Better Manage Aqua Resources. Washington, DC - <https://press.un.org/en/2023/envdev2054.doc.htm> - Accessed on 17 April 2023: The United Nations.
- [24]. Uwaegbulam, C. (2021, July 05). Lagos Adopts IFC-EDGE's Green Building Initiative. The Guardian.
- [25]. Vierra, S. (2023). Green Building Standards And Certification Systems. WBDG - Whole Building Design Guide.