



THE NEED FOR GREEN BUILDING RATING SYSTEMS DEVELOPMENT FOR NIGERIA: THE PROCESS, PROGRESS AND PROSPECT

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The literature on green building suggests the actuality and global concern of the phenomenon as a trend in sustainable building development. This paper is structured to review the process, progress and prospect of green building rating systems for stakeholders as a modern approach of building operation in the Nigerian building industry. For any nation to succeed in the implementation of sustainable built environment there is need to embrace the concept of green building which forms part of larger concept of “sustainable development”. Green or sustainable building design and construction are increasingly recognised as a clear answer to health, economic and environmental challenges, a large and growing number of government and private entities are requiring sustainable practices in their projects by incorporating green features into structures they are conceiving , designing, specifying, estimating, constructing planning or maintaining. This paper therefore aims to promote the development and establishment of a Green Building Rating System for Nigeria using the experience of the already established Green Building Councils world over as a case study. The paper also x-rays what the nation stands to benefit by developing a Nigeria based GBRS when it finally joins the rest of the world in developing workable strategies for sustainable built environment. This study concluded by making a strong case for a relevant GBRS framework as a tool to measure, monitor and manage the building processes to ensure success in sustainability.

Keywords: Green building, Green building council, Green Building Rating System (GBRS), Sustainable development, Sustainable built environment.

Introduction

The philosophy of green buildings is not a question of designing for low-energy use, but of considering in an integrated way the whole range of environments and ecological impacts involved. In order to consider in a systemic fashion the broader benefits of green design each building should be evaluated against the following perspectives; global warming, ozone layer depletion, biodiversity, recycling to mention a few.

The concept of sustainable development can be traced to the energy crisis and the environmental pollution concern in the 1970s. The green building movement in the United States of America originated from the need for more energy efficient and environmentally friendly construction practises. There are a number of motives to building green, including environmental, economic, and social benefits.

However, modern sustainability initiatives call for an integrated and synergistic design to both new construction and the retrofitting of existing structures. Also known as sustainable design, this approach integrates the building life-cycle with each green practice employed with a design purpose to create a synergy amongst the practices used. This energy design or energy conscious design can be achieved through intelligent design and use of materials and technology (Adedeji and Ogunsote 2010). This paper documents the efforts that has been made world over and especially in the African context and proposes ideal models and strategies for developing Green Building Rating Systems for Nigeria.

Impacts of Buildings on the Natural Environment

From the environmental viewpoint, buildings account for nearly half of all energy consumption and raw material use around the globe. Manufacturing of construction materials requires more energy, produces waste, and pollutes natural resources. The distribution and transportation of construction materials and technology also impact the environment by using additional energy to transport them from the manufacturing points to the point of assembly and building. Construction activities necessary to complete a building contribute to air pollution, including; land clearing, engine operation, demolition, burning, and working with toxic materials. In his reference to Bougdah and Sharples (2010), Salami (2012) agreed that buildings have a major impact upon the physical environment, which the materials used to construct and maintain them; the energy used to service them coupled with the typical life expectancy of 50-100 years ensures that they create a significant environmental load.

Green Building/ Sustainable Architecture

Green Building is the standard for construction that minimizes the effect of the built environment on the natural and social landscape (Greg, W. 2011).

Sustainability was first introduced as a global socioeconomic concept during the 1970s and defined later in 'Our Common Future' by Brundtland Commission as 'meeting the needs of the present without compromising the ability of future generations to meet their own needs' (UN 1987). In an architectural context, sustainability is defined as a term that describes economically affordable, environmentally healthy, and technologically efficient and high performance buildings.

Getting Involved with the Concepts of Green Building!

The need for and benefits from environmentally friendly building cannot be doubted. In both use and the construction process itself, buildings harm the environment. The construction process alone in the UK annually creates some 70 million tonnes of waste, 13 million tonnes of which is disposed of unused. Buildings in use comprise nearly 50% of the total CO₂ emissions in the UK. Also in the US, buildings use 40% of the total energy (including two-thirds of the country's electricity) and 16% of the total water. They are responsible for 40% of all material flows and produce 15-40% of the waste in landfills, depending on the region. Hence buildings are key to the challenge of reducing waste and minimizing climate change.

In the scientific community, global warming is recognised as fact, and governments across the world have come together to address the problem at Kyoto and subsequent summits. Greater energy efficiency and greener buildings are vital if the damage that has been done is not to continue. There is a great need henceforth as a matter of urgency to incorporate green features into structures that the various stakeholders in the built environments are conceiving, designing, specifying, estimating, constructing, or maintaining. This will reduce the overall impact on the environment and human health by efficiently using energy, water, protecting occupants' health and improving employee productivity, reducing waste, pollution and environmental degradation (Kwami and Adi 2011; Francis D.K. Ching and Ian M.S. 2014).

What Are Green Buildings?

Green is an abstract concept, which requires the inclusion of the terms: sustainability, ecology, and performance. Though there is a categorical relationship between the sub-terms, each category is nevertheless independent and mutually exclusive, for instance a building, a building can be sustainable but not ecological or green, whereas a green building must be a combination of sustainable, ecological, and performative. The level of greenness is determined based on the level of interaction of these three categories. The focus of green buildings is providing most internal comfort at a minimal cost, little negative effect on the people and the environment. True green building is a holistic approach to programming, planning, designing, and constructing (or renovating). It involves analyzing such interconnected issues as site and climate considerations, building orientation and form, lighting and thermal comfort, systems and materials, and optimizing all these aspects in an integrated design.

UN- HABITAT (2010) describes Green buildings as those that emits fewer green house gases, consumes less energy, uses less water, and offer occupants healthier environments than do typical buildings. Green buildings use salvaged, recycled or low carbon materials (Plates 1& 2); they support rainwater harvesting (Plate 3), bicycle commuting, solar heating, natural ventilation, and/ or many other environmentally friendly practices. Installing a biogas system has two advantages: You deal with your toilet and kitchen waste in an environmentally sustainable manner and you gain energy in the form of gas for cooking.

The biogas system consists of an inlet, the digester, an outlet and possibly an expansion chamber. For the evacuation of the affluent, you can plan a pit or a composter. The main component is the digester and it can be constructed with burned bricks or stones. Cow dung can also be introduced for harvesting more gas



Plate 1.



Plate 2.

Construction of biogas system. Source: low cost house construction manual (2007)

Rain water from the roof for the toilet, kitchen and small bath-room can be installed at low cost. Gutters are important to protect your house from water, and they can also collect this water and direct it to a storage tank. This is recommended because you will gain a lot of water to be used in the household. It may also lessen erosion on the plot. The tank should be placed as high as possible to achieve water pressure for the taps, but also placed below the lowest point of the gutter.



Plate 3. Rain water harvesting. Source: low cost house construction manual (2007)

The World Green Building Council

The World Green Building Council is a network of national green building councils in more than one hundred countries, making it the world's largest international organisation influencing the green building marketplace.

The WorldGBC's mission is to strengthen green building councils in member countries by championing their leadership and connecting them to a network of knowledge, inspiration and practical support.

Green building councils are member-based organisations that empower industry leaders to effect the transformation of the local building industry toward sustainability. With one hundred thousand buildings and almost one billion square metres of green building space registered, the influence and impact of this global network is a significant force for social and environmental change (WGBC 2016).

The organisation foster and support new and emerging Green Building Councils by providing them with the tools and strategies to establish strong organisations and leadership positions in their countries. Since its establishment in 2002, they have been working closely with councils to promote local green building actions and address global issues such as climate change.

By driving collaboration and increasing the profile of the green building market, the WorldGBC works with its member councils to ensure that green buildings are a part of any comprehensive strategy to deliver carbon emission reductions.

As of December 2016 there are around 100 Green Building Councils at various stages of their development. Many of these are growing rapidly and aspire to become full members. The successful model set by the Established Councils and overseen by the World Green Building Council (WGBC) supports and guides this growth – offering a powerful framework.

WorldGBC recognizes three levels of membership:

- i. **Prospective Member:** This status is for GBCs at the earliest stages of development. Prospective members have brought together a diverse founding group and have put in place a comprehensive strategy for how they will adapt the GBC model in their country. Prospective members are expected to progress to Emerging status within 24 months.
- ii. **Emerging Member:** This status is for GBCs that have successfully implemented their strategy by developing the foundation for their organization. They are legally registered, open to membership, have an elected Board for strategic decision-making and hired staff managing day-to-day operations. Emerging members are expected to progress to Established status within 24 months.
- iii. **Established Member:** This status is for GBCs that are fully operational, running impactful programs and have shown stability and national positioning. They are seen as the go to organization regarding green building in their country.

Green Building Rating Systems and Processes Involved

The development of building rating systems was as the result of growing concerns in the building industry and management, in topics such as sustainability, building performance, environmental impact, energy, cost efficiency and maintenance. The rating systems were a partial response to these issues, proposing quantifiable tools to evaluate and measure the level of a building's environmental performance (Osman 2010).

The first stage at developing a green building rating system for any country is to establish a Green Building Councils (GBCs) in that country; they are non-profit, member based coalitions recognised by the World GBC that develop objective, voluntary tools for rating the environmental performance of buildings. GBCs also support the building industry through capacity building. By using objective measurement to inject an element of friendly competition, these Councils and their rating tools can exercise a catalytic, transformative impact on the building sector in a given country. GBCs exist in a number of countries around the world. It is only South Africa presently that has a functional Green Building Council in sub-Saharan Africa till date.

The Green Building Rating Tools and How They Work

The WorldGBC has developed rating tools to analyze green building performance as well as the socio-economic issues that are involved in green building. Currently, the WorldGBC has two rating systems.

- i. The **Quality Assurance for Green Building Rating Tools** is a guide for GBCs that provides a development as well as implementation process of nationally recognized green building rating tools. The guide addresses general quality assurance processes, criteria development, pilot projects, certification, impartiality and transparency, feedback, and internal audits.
- ii. The **Socio-Economic Framework for Rating Tools** is a joint project between the WorldGBC and the GBC of South Africa that focuses on incorporating environmental justice into the activities of the WorldGBC and its member councils. The guide addresses five themes that can be affected by sustainability efforts, especially green buildings. These themes are employment and economic opportunity, education and skills development, health and safety, equality, and community engagement and benefit. In order to create employment, the guide suggests using labour-intensive construction methods whenever possible as well as creating a facility that provides long-term economic opportunities. The guide suggests utilizing local and small business for goods and services as well as continued support in order to create economic opportunities.

According to (UN-HABITATS, 2010), the rating tools are voluntary mechanisms used to rate and certify the environmental performance of buildings. By rewarding exemplary building performance, 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. Green building rating tools put forward optional performance targets for a wide range of building initiatives. These performance targets are known as 'credits' and are organized into several environmental categories such as energy, water, materials and indoor environmental quality. Wherever possible, the credits use specific metrics and compliance with international standards to gauge performance and minimize subjectivity.

The rating tools are to help designers and users understand and mitigate the environmental impact of development and could also provide a roadmap for documenting and measuring environmental sustainability for buildings. They often use different evaluation criteria, methods, and procedures, ranging from scoring to categorization (Kwami and Adi 2011; Osman 2010).

Green Building Rating Systems Around the World

Currently, there are more than two dozen building rating systems worldwide, and they can be broadly categorized into one of three systems of; decision-making support systems, performance-based evaluation systems and whole building evaluation systems. Some of the primary green building rating systems include:

Table 1. Showing some of the established green building rating systems around the world.
Source: Osman (2010)

S/N	Name	Origin/ Est. Year	Governance	Scope/ Rating Tools
1	Building Research Establishment's Environmental Assessment Method (BREEAM)	UK 1990	BRE (Building Research Establishment)	BREEAM checks wide- ranging environmental and sustainability issues by providing building performance evaluations in distinct categories: (1) management; (2) health; (3) well-being ; (4) Energy; (5) transport (6) water; (7) material and waste; (8) land use and ecology, and pollution. BREEAM uses a scoring system based on scale of pass, good, very good, excellent and outstanding. It also uses a number-based rating of 1-5 stars.
2	Leadership in Energy and Environmental Design (LEED)	USA 1998	US Green Building Council (USGBC)	LEED provides a rating frame-work for developing and evaluating high- performance green buildings. The system primarily measures six categories: (1) sustainable site development, (2) water efficiency, (3) energy and atmosphere, (4) materials and resources, (5) indoor environmental quality, and (6) innovation and design process. LEED uses a 69-point scale system with four ratings: platinum (52-69pts), gold (39-51), silver (33-38), and certified (26-32).
3	Sustainable Building Tool (SBTOOL)	Canada 1996	Green Building Challenge (GBC)	SBTool is a customizable building rating system, which evaluates environmental and sustainability performance. The system is designed as a generic toolbox, which can be customized according to local and regional building performance requirements and needs. SBTool uses a scoring system based on a scale of: -1 (deficient), 0 (minimum pass), +3 (good practice), and +5 (best practice).
4	Building Environmental Assessment Method (BEAM)	Hong Kong 2002	Business Environmental Council (BEC), and HKBeam Society	BEAM evaluates and measures the environmental performance of buildings in Hong Kong. The evaluation is based on five building performance criteria: (1) hygiene, health, comfort, and amenity; (2) land use, site impacts, and transportation; (3) use of materials, recycling, and waste management; (4) water quality, conservation, and recycling; and (5) energy efficiency, conservation, and management, BEAM uses an overall assessment rating system based on a gained credit percentage scale. Accordingly, BEAM awards four rating classifications: platinum (excellent, 75%), gold (very good, 65%), silver (good, 55%), and bronze (above average, 40%).

5	Green Star Building Evaluation (GREEN STAR)	Australia	Green Building Council of Australia, Green Star New Zealand, Green Star South Africa	Green Star is a comprehensive, national, voluntary rating system that evaluates a building's environmental design and performance. Green Star is modelled after BREEAM; it uses a customizable rating tools kit that can be modified for different building types and functions. Green Star ratings are based on a percentage score across nine performance categories: (1) management; (2) indoor environment; (3) energy; (4) transportation; (5) water; (6) materials; (7) land use and ecology; (8) emissions; and (9) innovation.
6	Haute Qualite Environnementale HQE (High Quality Environmental Standard)	France 2004	Association pour la Haute Qualite Environnementale (ASSOHQE)	HQE evaluates the environmental impact of buildings, focusing on the following criteria: (1) design; (2) construction; (3) energy; and (4) water, and maintenance.
7	Green Building Assessment System (GBAS)	China 2006	Ministry of Science and Technology (MoST)	GBAS is developed from China's Green Olympic Building Assessment System (GOBAS, 2003), and measures basic environmental performance of buildings such as electricity, water, and energy consumption.

Some Notable Buildings Around the World with Sustainable Green Features

- Bahrain World Trade Centre (Bahrain)



Plate 4. Bahrain World Trade Centre (Bahrain), source: www.cnbc.com/ ten of the world's most sustainable buildings

The futuristic design of the World Trade Centre in Bahrain uses wind power by embedding three giant wind turbines on its façade. As much as 15 percent of the power used by the building comes from the turbines. The impressive feat of architecture and engineering uses turbines 29 meters (95 feet) in diameter to holster the power of the wind and transform it into electrical current. The Bahrain WTC also works on a heat recovery system and solar-powered lighting.

- One Angel Square, Manchester, UK.

Manchester's One Angel Square is the headquarters of the Co-operative Group. Housing 3,000 employees, it has been awarded an 'Outstanding' Building Research Establishment Environmental Assessment Methodology (BREEAM) rating.

According to the Co-op, the building is 'powered by pure plant oil fed Combined Heat and Power (CHP) system and utilizes rapeseed oil which is grown on the Co-operative's own farm land'. Excess energy is sent back to the grid. Other features include LED lighting and a system to recycle waste and rain water.



Plate 5. One Angel Square, Manchester, UK., source: www.cnn.com/ten-of-the-worlds-most-sustainable-buildings

The Progress made in Nigeria so Far

The conference on promoting Green Building Rating Systems (GBRS) in Africa was organised by UN-HABITAT in Nairobi in May 2010. The conference attracted more than 50 participants who represented 19 countries (including Nigeria) in Africa and several countries from outside the region. The participants were private professionals and public officials representing all aspects of the building and construction industry. Although parts of the objectives of this conference is to make commitments, and develop the elements of strategies and roadmap, for promoting green building and green building rating in participants' countries or sub-regions in Africa. Nigeria still remains a prospective member while South

Africa is the first and only established GBC in Africa till date (UN-HABITAT 2010; Prucnal-Ogunsote, et-al 2011).

Also, as part of what could be seen as a positive development towards the establishment of GBRS in Nigeria the Minister of Power, Works and Housing, Babatunde Raji Fashola, SAN, has launched the Building Energy Efficiency Guidelines as part of measures to include Energy Efficiency into the National Building Code. The Minister said that the guide should be a handbook for all professionals in the built environment, which include Architects, Engineers, Builders, Quantity Surveyors and Town Planners, to enable them come up with the realities of Energy Efficiency in buildings. With this latest development professionals in the industry will become conscious of the need to adopt the principles of energy efficient building designs and contribute to energy sufficiency which forms part of the critical rating tools world over.

There are key challenges to the development of the rating systems in Nigeria which include:

- 1) Absence of drivers- government policies/laws in support of environmental ethics.
- 2) Insufficient research on materials/indigenous building technologies.
- 3) Lack of requisite human resources/capacity.
- 4) Insufficient financial resources to offset cost of use of available/adaptable rating systems.
- 5) Lack of awareness/ determination of clients.

Prospects and Benefits of Implementing Green Building Rating Systems for Nigeria

Shuaeeb (2011) opined that all the private construction industries and property developers in Nigeria are yet to appreciate the long terms significance of sustainable development and that an implementation of Green Building Rating System will gradually strengthen the perspective of all local practitioners towards embracing sustainable development. Baruwa (2011) also added that government needs to lead by example in this regard, rather than passing laws determining what the private sector can do. Government agencies must incorporate sustainable strategies into their own projects. Policies on greening construction/buildings should be introduced with the government championing implementation. Such policies could include energy and water efficiency, environmental quality of building materials and resources, indoor environmental quality and innovation in design.

Some other benefits of adopting green building rating systems for Nigeria includes:

Environmental Benefits

1. Enhance and protect biodiversity and ecosystems
2. Improve air and water quality
3. Reduce waste streams
4. Conserve and restore natural resources

Economic Benefits

1. Reduce operating costs
2. Create, expand, and shape markets for green product and services
3. Improve occupant productivity
4. Optimize life-cycle economic performance
5. Create job opportunities

Social Benefits

1. Enhance occupant comfort and health
2. Heighten aesthetic qualities

3. Minimize strain on local infrastructure
4. Improve overall quality of life

Conclusion and Recommendations

It is evident that in order to reduce CO₂ emissions and help strengthen the ability of cities to adapt to climate change while improving the quality of the built environment, it is urgent that to improve the environmental performance and energy efficiency in buildings, Nigeria as part of larger global community has a role to play in the establishment of Green Building Council.

Adopting an internationally acknowledged green building rating system into the local building construction industry will not only boost the country's effort towards green development, but will set a pace for other West African countries.

Based on the findings of this study, the following recommendations are put forward:

- 1) The Government should take the bull by the horn to pave the way for the establishment of a formidable Green Building Council in Nigeria.
- 2) There is an urgent need for the trainings of professionals, manufacturers of building materials, building contractors on the benefits of green building products.
- 3) The need to introduce green building practices in the education system, in order to increase public awareness and skills to spread green practices.
- 4) The need to set up African network to foster exchange between experts, professionals, decision makers and the private sectors and to assist emerging Green Building Councils in the Region.
- 5) Advocate for policy and regulation to encourage the adoption and enforcement of the appropriate rating system and best practice in Nigeria in particular and Africa as a whole.

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