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Development of a Green Building Rating System for Nigeria

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ABSTRACT: The practices used in rating green buildings are constantly evolving and differ from place to place; there are fundamental principles that persist from which the rating is derived e.g. siting and structure, design, energy, water and material efficiency, indoor environmental quality, enhancement, operations and maintenance optimization, and waste and toxic reduction. The essence of green building is an optimization of one or more of these principles. This paper presents a comparative analysis of seven well-known sustainable rating systems – BREEAM, CASBEE, GREEN GLOBES, GREEN STAR, HK-BEAM, IGBC Green Homes and LEED by the perceptions and opinions of stakeholders in Nigeria certified in green building rating systems in an attempt to select and adapt a green building rating system for Nigeria. Various aspects of these systems were scrutinized and analyzed in order to find out the best option for the Nigerian built environment. Based on the findings of this study the green building rating systems LEED which is the dominant system in the United States and Canada is appropriate for Nigeria because it helps costumers determine environmental performance, with strong base, large investments and proven advantages scored the highest with 80 points out of 100 points.

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INTRODUCTION

Climatic change and its attendant effects on the built environment is now widely accepted as being a reality today and have become a very serious problem facing humanity, and in a bid to overcoming these challenges, the adoption of an environmentally responsible approach to building design, construction has become inevitable (Smith, 2010). Some of these adverse effects include: extreme weather conditions being experienced, increase in rainfall, flooding, building collapses, increased thermal discomfort in buildings, water shortages and draught, increase in cost of building construction and operation amongst others. Also due to increase in research, technological advancement and economic growth, building construction has greatly increased and has been said to account for nearly half of all the greenhouse gas emissions and energy consumed owing largely to the energy used in the production and transportation of materials to building construction sites, and energy used to operate these buildings. Nigeria as a country is not left out of all the above experiences. Reports reveal the entire scenario is true about Nigeria and she is now faced with the challenge of evolving performance standards, systems, codes and other regulatory means to mitigate, forestall and develop the built environment. Consequently, the evolution of an environmentally conscious approach, standard and guideline to building design and planning techniques to bring about sustainability in our built environment is needed with the objective of selecting a Green Building Rating System for Nigeria.

The aim of the study is to select a sustainable design tool for the Nigerian built environment which will support long-term performance for an innovative and flexible future, can be used for building projects and which will necessarily set parameters to: improve quality, decrease the life cycle environmental impact, and optimize life cycle costs of the buildings to allow for comparisons and benchmarking of existing buildings as well as a mechanism to track public buildings' progress toward designing and operating the best buildings for their occupants.

1. CONTEXTUAL ISSUES OF GREEN BUILDING RATING SYSTEMS

According to Fowler and Rauch (2006) using a single sustainable building rating system in a country allows for comparisons and benchmarking of existing buildings as well as a mechanism to track public buildings' progress toward designing and operating the best buildings for their occupants

The following are the major building assessment tools and rating systems currently in use and considered in this study for selection (Nguyen and Altan, 2011; WBDG Sustainable Committee, 2009).

1.1. The Building Research Establishment's Environmental Assessment Method (BREEAM)

BREEAM, the first environmental certification system was created in 1990 for the UK's building market and is administered by the BRE Global Sustainability Board, which oversees BRE Global guides, publications, standards and certification programs (referred to as "schemes"). The Board represents a wide cross section of stakeholders from the UK's construction industry. It reports to the BRE Global Governing Body, which provides an independent overview of BRE Global schemes and activities. Further, the United Kingdom Accreditation Service (UKAS) has accredited all of BREEAM schemes, which means the UKAS also monitors and oversees the management of BREEAM (Aubree, 2009; BRE Global 2012).

BREEAM has four assessment tools that can be used at different stages of a building's life cycle. BREEAM Design and Procurement (D&P) can be used during the design stage of a building renovation for a new build or extension project. The Post Construction Review (PCR) is carried out once the construction is complete to verify the D&P assessment. The Fit Out assessment is employed during major renovations of existing buildings and a Management and Operation (M&O) assessment evaluates the performance of a building during its operation (Saunders 2008).

BREEAM works by awarding credits in 10 categories for meeting a series of performance criteria that, if complied with, would reduce the building's negative environmental impact and increase its environmental benefits. The total number of credits awarded in each category is multiplied by an environmental weighting factor, which takes into account the relative importance of that category. The category scores are then added together to produce a single overall score on a scale of Pass, Good, Very Good, Excellent and Outstanding. A star rating from 1 to 5 also is provided. BREEAM International certification levels/schemes also use star rating systems: 1 Star – pass: 30%; 2 Stars: - good: 45%; 3 Stars: - 55%; 4 Stars: excellent: 70%; 5 Stars – outstanding: 85% (Saunders 2008).

The strengths of BREEAM are as follows: it allows comparison and benchmarking of different buildings, can be independently assessed, is adjusted to European and U.K. legislation and U.K. culture, and can assess any building with the BREEAM bespoke version. However the weaknesses of BREEAM are that it requires very exact requirements, the weighing system is complex, a market profile is required and has a high cost of compliance.

1.2. Comprehensive Assessment System for Building Environmental Efficiency

CASBEE, developed in Japan by the Japan Sustainable Building Consortium is a cooperative academic, industrial and government initiative charged with creating a nationally authorized green building rating system was launched in 2004 with four basic versions/assessment tools that corresponds to the individual stages of the building lifecycle, i.e. pre-design, new construction, existing buildings and renovation. (CASBEE 2006; CASBEE 2009; Saunders 2008).

The Building Environmental Efficiency (BEE) value is at the core of CASBEE's assessment method and represents the buildings total environmental performance value. The BEE value distinguishes between a building's environmental load (L), defined as the negative impact on the environment outside the virtual enclosed space, and the building's quality performance (Q), defined as the improvement of environmental quality within the enclosed virtual space. The indoor and outdoor environments are divided by a hypothetical boundary, which is defined by the site boundary and other elements (CASBEE 2008a).

The indoor environmental quality assessment under Q1 looks at source control of chemical pollutants, mineral fibers, biological contaminants and legionella; ventilation; and an operation plan that monitors carbon dioxide and controls smoking. Within the L2, there is a provision that focuses on materials with low health risks, which primarily relates to release of pollutants and contaminants into the outdoor environment (CASBEE 2012). The CASBEE assessment process rewards applicants that effectively employ an integrated strategy for indoor air quality: source control, ventilation, and an operation and management plan. The more aggressive or "strenuous" the strategy, the higher the performance level awarded (on a scale of 1 to 5, with 5 being the highest level) (CASBEE 2008b).

The strengths of CASBEE are as follows: it is highly comprehensive and versatile, with mandatory requirements to be fulfilled. However the weaknesses of CASBEE are that there are no external benchmarks, recertification baseline model or energy model.

1.3 Green Globes System

The Green Globes environmental assessment and rating system evolved out of BREEAM, which was brought to Canada as BREEAM Canada for Existing Buildings in 1996. Since then, it has gone through several iterations on its way to becoming Green Globes. The Building Owners and Manufacturers Association of Canada adapted Green Globes for Existing Buildings in 2004 under the name Go Green Comprehensive now known as (Go Green Plus or Go Green). Also in 2004, the Canadian federal government adopted Go Green Plus for all its buildings. More than 500 buildings in Canada have been assessed using Go Green Plus, including more than 300 Canadian government buildings (GBI 2009a, Bryan and Skopek 2008).

Presently, the program is administered by the Green Building Initiative (GBI) Green Globes offers two tools for certifying design, construction and/or operation of commercial buildings: Green Globes for New Construction (NC) and Green Globes Continual Improvement of Existing Buildings (CIEB) (GBI 2009a). Buildings that successfully complete all phases of the assessment are assigned a Green Globes rating of one to four Green Globes roughly correspond to LEED Bronze, Silver, Gold and Platinum ratings, respectively (GBI 2009a, Bryan and Skopek 2008).

The strengths of Green Globes are as follows: the employment of simple methodology and a user friendly interactive guide to assess and integrate green design principles for buildings, its web–based self-assessment improves

efficiency, reduces costs, provides opportunities to influence the design and planning processes of the project through immediate feedback, can be completed by any team member with general knowledge of the building parameters, integrates life-cycle thinking into its rating system and it provides both preliminary and final ratings during the assessment. However the weaknesses of Green Globes are that life cycle assessment and functional relevance with regard to material relevance are not sufficiently addressed. Also the rationale for the weights given to environmental impacts associated with building sectors in their sets of criteria is not transparent or necessarily consistent with life-cycle assessment methods.

1.4 Green Star

Green Star is a voluntary building rating system that evaluates the environmental design and construction of all Australian buildings. The Green Building Council of Australia (GBCA), a national, non-profit, member-based organization that is committed to developing a sustainable property industry for Australia, launched Green Star in 2002. Members represent a broad spectrum of both the building industry and governments across Australia. The GBCA objective in creating Green Star is to encourage the Australian building industry to embrace sustainable building by promoting green building programs, technologies, design practices and operations. New Zealand and South Africa have adapted Green Star to rate and certify sustainable buildings in those countries (GBCA 2009a, NZGBC 2009).

Technical manuals, which have been developed for the rating tools, are a key element of the Green Star rating system. These manuals provide detailed descriptions for each credit, including aim or objective, credit criteria, compliance requirements, additional guidance, background information and references for further information (GBCA 2009a). Although Green Star rating tools are available for self-assessment, a design, project or building cannot publicly claim or promote a Green Star rating or use the Green Star rating logo unless the GBCA has validated the project's achievement through a formal assessment (GBCA 2009b).

During the formal assessment process, Green Star offers applicants two opportunities to receive a rating. The first step is for the project team to select which rating tool is most appropriate and demonstrate that the project meets all four of the rating tool's eligibility requirements (GBCA 2009c). The four rating tool's eligibility requirements are space use, spatial differentiation, conditional requirements and timing of certification. The Assessment Panel may award a rating of one to six stars. Projects that are awarded one to three stars may not be certified, but those awarded with four or more stars may be certified and are recognized as follows: 4 Star Green Star Certified Rating (score of 54 to 59) – Best Practice; 5 Star Green Star Certified Rating (score of 60 to 74) – Australian Excellence; 6 Star Green Star Certified Rating (score of 75 to 100) – World Leadership (GBCA 2009d).

The strengths of Green Star are as follows: there are mandatory requirements, external benchmarks and can be customized, however the weaknesses of Green Star are that there are no baseline models and no recertification.

1.5 IGBC Green Homes Rating System

Indian Green Building Council (IGBC) Green Homes is the first rating programme developed in India, exclusively for the residential sector. It is based on accepted energy and environmental principles and strikes a balance between known established practices and emerging concepts. The system is designed to be comprehensive in scope, yet simple in operation (www.igbc.org; www.igbc.in) Measurement is in five areas: sustainability site development; water savings; energy efficiency; materials selection and indoor environment quality.

The strength of Green Homes Rating System is that it has a strong social component; however the weakness of Green Homes Rating System is that that there is an increase in cost of construction

1.6 Hong Kong Building Environmental Assessment Method

Hong Kong Building Environmental Assessment Method (HK-BEAM) developed in 1996 by the BEAM Society. HK-BEAM rewards buildings that are built operated and maintained using sustainable building practices throughout the buildings' lifecycles. But because Hong Kong is a subtropical, high-density and high-rise community, HK-BEAM emphasizes indoor environmental quality (IEQ) more than other green building rating systems. To that end, HK-BEAM embraces (in order of priority) safety, health, comfort, function and efficiency while protecting local, regional and global ecosystems throughout a building's life cycle (BEAM Society 2003; BEAM Society 2003a).

These standards apply to residential, commercial, industrial and institutional buildings (HK-BEAM Society 2004a, b).

An interim update of the HK-BEAM standards is underway to place more emphasis on reducing greenhouse gas emissions. A new standard, HK-BEAM Commercial Interiors, also is in the works. In addition, online assessment tools are under development that will allow applicants to obtain a preliminarily score and BEAM rating of the new / existing building projects. These tools are user-friendly self-assessments that will automatically screen out the non-applicable credits (BEAM Society 2003b).

The strength of KH-BEAM is that it focuses on environmental and economic issues; however the weakness of HK-BEAM is that it does not have a socio-cultural category.

1.7. Leadership in Energy and Environmental Design

In 1998 the LEED ® Green Building Rating System was introduced based quite substantially on the BREEAM system (Nguyen and Altan, 2011). LEED was founded by Robert Watson of the United States Green Building Council (USGBC) in 1993 and consists of a suite of rating systems for the design, construction and operation of high performance green buildings, homes and neighborhoods. The LEED Green Building Rating System is a voluntary standard for sustainable buildings - that facilitates consistent application of sustainable design principles and serves as a measure of accomplishment (Buttler and Stoy, 2009; LEED 2012).

The LEED 2009 building certification program is a point-based system. Building projects earn points for satisfying green building criteria for specific credits. Projects also may earn Regional Priority bonus points for implementing green building strategies that address important local environment issues. Each rating system is organized into five environmental categories: Sustainable sites, water efficiency, energy and atmosphere, materials and resources, and indoor environmental quality. An additional category, innovation in design (or operation), focuses on sustainable building expertise as well as design measures not covered in the other categories (USGBC 2009c, USGBC 2009d).
Project teams interested in LEED certification must first register the project with the GBCI on its Web site (www.gbci.org) where they can access software tools, errata, critical communications and other essential information that will help project teams with the certification process (USGBC 2009d). LEED® is not only the U.S. market leader, but is also the most widely use rating system by Federal and state agencies in the US. (Hirigoyen, Ratcliffe, and Davey-Attlee, 2008). Five overarching categories correspond to the specialties available under the LEED Accredited Professional program. That system currently consists of: Green Building Design & Construction; Green Interior Design & Construction; Green Building Operations & Maintenance; Green Neighborhood Development; Green Home Design and Construction.
The strengths of LEED are as follows: strong marketing gets the message through, lots of information available, and no need for assessor and training, however, the weaknesses are that it is based on American ASHRAE standards, paper-based, rigid, complex and intense documentation is required, the certification can be costly and take up to four months to complete, fails to address life cycle assessment, no independent audit of the assessment; and main building functions and forms are difficult to assess.

2. METHODOLOGY

In order to identify the most applicable rating systems for Nigeria the following selection approach was used:
1. Identification of available, popular, influential and technically advanced sustainable building rating systems as they apply to the public building procurement processes leading to the choice of BREEAM, CASBEE, GREEN GLOBES, GREEN STAR, HK-BEAM, IGBC Green Homes Rating System and LEED.
2. Screening analysis of green building rating systems to limit review and test to most accessible, used, applicable and appropriate green building rating systems for adoption in Nigeria *(screening criteria)*.
3. Identification of public building drivers for a credible rating system (review criteria) in terms of popularity and influence (10 points); availability (10 points); methodology (15 points); applicability (20 points); data collecting process (10 points); accuracy and verification (10 points); user-friendliness (10 points); development (10 points); and results presentation (5 points). Consequently, the system of evaluating and marking was created with 9 categories of review criteria. Each category contributed a number of points due to their importance. The maximum final score is 100 points in total (Nguyen and Altan, 2011; Reed, Bilos, Wilkinson, and Shulte, 2009; Smith, 2010).

The keys used during the review process are as follows: meet criterion; under development; meet criterion with exception(s); does not meet criterion; information unknown; and not applicable.
The following issues were considered under popularity and influence:
• *Well-known*: Is the system well-known among the built environment community? (2 points)
• *Importance*: Does the system play a significant part in the Built Environment? (2 points)
• *Number of Countries involved*: Countries which have buildings assessed by the system (2 points)
• *Number of Buildings/Projects involved*: (2 points)
• *Versatility*: Number of systems that use it as its basis for development or comparison (2 points)

The following issues were considered under availability:
• Availability of the system itself: (5 points)
Easy to Access: Is it convenient to have full-possession of the system? (1 point)
System's Format: In what format and language is the system available? (1 point)
How much information is available publicly? (1 point)
Cost of System: (1 point)
Certification fee: (1 point)
• Availability of references: (5 points)
Availability of On-line Information: (1 point)
Availability of Information that is not On-line (How to obtain?): (1 point)
Availability of Case Studies: (1 point)
Availability of Users' review: (1 point)
System's Openness: (1 point)

The following issues were considered under methodology:
• *Methodology Summary*: Identify the method used to process the inputs to produce final results/ grades/assessments (not marked)

• Weightings: Identify the system applied to weigh the issue categories (not marked)
• Rating Levels: Is the system's labeling classification system sufficient enough? (2 points)
• Standardization: Established collection procedures exist (2 points)
• Quantitative criteria: Does the system use prescriptive-based criteria? (1 point)
• Qualitative criteria: Does the system use performance-based criteria? (1 point)
• Whole Lifecycle Assessment: (2 points)
• Complexity: Assessment method's sophistication of (Sophisticated: 2 points - Average: 1 - Basic: 0)
• Efficiency of Assessment method (Very high: 5 points - High: 4 - Average: 3 - Low: 2 - Very Low: 1)

The following issues were considered under applicability:
• Stages of building lifecycle influenced*:* Maximum 10 points (6 stages: 10 points - 5 stages: 8 – 4 stages: 3 – 6 stages: 4 – 1 or 2 stages: 2). The following stages of building lifecycle are considered: Pre-Design/ Planning/ Site Selection; Design/ Procurement; Construction/ Post Construction Review; Existing Building Management/ Operations/ Maintenance; Tenant Fit-Out/ Refurbishment; Demolition.
• Technical contents*:* Maximum 10 points are awarded for each sustainable aspect. The score for this issue is the average of all aspects' scores.

The following issues were considered under data colleting process:
• Data Gatherer: Identify the party which in charge of data inputting process (2 points)
• Data Collecting Method: Identify the method used to input data (2 points)
• Documentation: What type of documents needed for the assessment? At what stage of the project? Is it easy to gather those documents? (2 points)
• Measurability: Does the tool use measurable method to collect data? (2 points)
• *Convenience*: Is it easy and quick to gather data without excessive technical knowledge? (2 points)

The following issues were considered under accuracy and verification:
• Accuracy of Data Processing Stage: (High: 2 points – Medium: 1 – Low: 0)
• Accuracy of Data Outputting Stage: (High: 2 points – Medium: 1 – Low: 0)
• Verification: Define the system for verifying assessment results, maximum 4 points:
Assessor Qualification: What qualification a person must have to be an assessor? (1 point)
Level of Detail of Check: To what level of detail do assessors review the applications? (1 point)
Third Party: Does the verification process involve third party assessment? (1 point)
Are the verified results widely acknowledged in different countries? (1 point)

The following issues were considered under user-friendliness:
• Ease of use: Complexity of the system. Is it easy to get used to the system? (2 points)
• Product support: Maximum 8 points:
Availability and responsiveness of direct request for assistance (2 points)
Availability of FAQs and Record of Enquiries (2 points)
Availability of training courses/sessions (2 points)
Adequacy of built-in or attached instructions/helps. Are they sufficient enough? (2 points)

The following issues were considered under development:
• System's maturity: Identify when the system was initiated and first available for public use. (2 points)
• System's stability: Availability of Testing & Development process and systems for revisions. (2 points)
• Update: How is the tool constantly improved? (2 points)
• Development approach: Identify if system was developed using a consensus-based approach, life cycle analysis, expert opinion approach, or other. (2 points)
• Future development: Potential improvement of the system and the expansion of its influence (2 points)

The following issues were considered under result presentation:
• Presentation Method: End products of assessment process, ratings, result product. (1 point)
• Clarity: Well-defined, easily communicated, and clearly understood among multiple parties. (2 points)
• Comparability: Amenable to normalization for comparisons over varying building types, locations, years, or different sustainable design characteristics. (1 point)
• Result Usability: Usability of result documentations. (1 point)

4. Data collection on applicable rating systems for comparative review from Nigerians with local, national, regional or international exposure in environmental and sustainability issues as well as green building rating system certification. The respondents in this study are individuals that are trained, with access to all the above green building rating systems and committed to the sustainable development of Nigeria. The sampling frame used for the selection

process is stakeholders of the Nigerian building industry and affiliated professions certified in green building rating systems and exposed to its use - architects, project managers, planners, urban designers, quantity surveyors, landscape architects, engineers, builders and estate surveyors, lecturers in the built environment faculty, federal and state agencies, building materials manufacturers and other service providers in the building industry as well as fellows of Leadership for Environment and Development (LEAD) Nigeria. LEAD is a global network of individuals, and national and regional organizations committed to sustainable development and the training of individuals to inspire leadership and change for a sustainable world. A simple random sample of the sampling frame of 2800 stakeholders resulted in the selection of two hundred and eighty respondents that were administered the questionnaire to select a green building rating system for Nigeria.

3. FINDINGS

Out of the 280 questionnaires administered to stakeholders in the Nigerian building industry to select a green building rating system for Nigeria, 232 were returned and found useable making a response rate of 82.85%. Of the 232 respondents 24 were architects, 29 were engineers and 12 were project managers, 6 were planners, 8 were urban designers, 7 were quantity surveyors, 3 were landscape architects, 15 were builders or contractors, 7 were estate surveyors, 33 were lecturers in the built environment faculty, 25 were federal and state agencies, 26 were building materials manufacturers, 12 were developers and 10 were service providers in the building industry 15 were fellows of Leadership for Environment and Development (LEAD) Nigeria.

Table 1: Comparative review of BREEAM, CASBEE, GREEN GLOBES, GREEN STAR, IGBC Green Homes Rating System, HK-BEAM and LEED

Variables	BREEAM	CASBEE	GREEN GLOBES	GREEN STAR	GREEN HOMES	HK-BEAM	LEED
Popularity & Influence (10)	10	8	5	6	5	6	10
Availability (10)	8	7	5	8	5	8	8
Methodology (15)	12	13	11	9	10	10	10
Applicability (20)	13	12	10	10	9	8	13
Data Collecting (10)	8	6	5	9	4	8	8
Accuracy & Verifying (10)	8	9	7	6	6	6	8
User friendliness (10)	8	6	5	8	4	8	10
Development (10)	8	8	7	8	6	8	8
Result Presentation (5)	4	4	3	3	2	4	5
Total Score (100)	79	73	58	67	51	66	80

Based on the respondents of this study, the green building rating systems LEED was rated the highest with 80 points, BREEAM was rated second with 79 points, CASBEE was rated third by scoring 73 points, GREEN STAR was rated 67 points, AK-BEAM was rated 66 points, GREEN GLOBES was rated 58 points and IGBC Green Homes was rated 51.

4. IMPLEMENTATION/ADAPTATION STRATEGIES AND PROCESSES OF LEED-USA IN THE NIGERIAN BUILT ENVIRONMENT

To adapt LEED – USA as the Green Building Rating System in Nigeria the following are pertinent:

Nigerian initiators should follow the step-by-step instructions/guide on establishing a Green Building Council for Nigeria as presented and published on the website of the World Green Building Council (2011b). The guide provides a functional framework for the establishment of national GBC's. The document comprises of chapters explaining how to establish a core founding group, develop a business plan, form a founding board, and secure initial funding and many other key chapters. The interested parties after submitting the Expression of Interest and upon its acceptance gain access to detailed multiple tools that support each activity which comprise of spreadsheets, case studies, guides and others.

Develop a framework for the green rating of local and imported building materials and provide intellectual support for the establishment of a Nigerian Green Building Council (NGBC) and implement the LEED-USA while taking into cognizance a number of elements in the existing LEED – USA that would need to be removed or modified to realize the aim and strategies of the Nigerian Green Building Rating System as well as make it work in the Nigerian context.

Develop a West – African and African sub-regional green building rating systems, and the establishment of a West African sub region Green Building Councils (GBCs) which are non-profit, member-based coalitions that develop objective, voluntary tools for rating the environmental performance of buildings. To promote the use of appropriate

building materials, technologies, services and processes that reduces the impacts of new buildings on the environment and human health.

Develop an online sustainable search engine or web portal for the creation of a current database for sustainable buildings all over the world, sustainable product suppliers and availability, green business community; to evaluate and promote green products such as green roofing and energy saving products on the basis of life cycle analysis, long-term desirability, maintenance, environmental impact and energy savings, to demonstrate green solutions in building and provide news about green building; determine current levels of building efficiency in Nigeria using LEED standards, and establish benchmarks by which to measure improvements; collect, digitize and disseminate through the web portal, recent resources and research on sustainable building in tropical climates; supervise, and provide research support to postgraduate students conducting research into sustainable building; promote green rating of building materials; and disseminate the information to all stakeholders through mailing lists, chat rooms, seminars, conferences and interviews publicized on radio, television, newspapers, international conferences and collaboration towards achievement of the vision 20-20-20 goal of providing sustainable physical infrastructure in Nigeria.

Provide a platform for discussions and collaboration between various disciplines in the academia with government agencies, non-governmental organizations, and professionals in the building industry, building materials manufacturers, building contractors and other stakeholders for the exchange of ideas and information, promotion of sustainable building practices, pursuit of LEED accreditation for all professional construction bodies and for the dissemination of research findings on sustainability to avoid duplication of effort.

Governments at federal, state and local levels should support and legislate a national/state/local green building policy and regulation on sustainability issues, implement same in the building acts, building regulations, building bye-laws and building codes, adopt LEED standards in new buildings and renovations, fund and procure green building projects, fund and support green building education, technology and books and give tax/financial incentives to clients who erect sustainable buildings, require a minimum sustainability rating for buildings. In future they may be increased financial penalties for noncompliance.

Adopt a nation-wide approach to sustainability in design, construction, maintenance, energy-usage, water consumption, transportation, landscaping, and health and safety.

Persuasion of public and private clients should evolve a green building organizational policy, procure green building projects and commit to LEED certification for the construction of new and renovated public and private buildings and commit to levels of certification beyond the basic level where possible.

Effective promotion of sustainable personnel, designs and buildings by more enlightenment, training and education programs

RECOMMENDATIONS

The green building rating systems LEED is my proposal for adoption for Nigeria helps costumers determine a structural level of environmental performance, with strong base, large investments and proven advantages scored the highest with 89 points.

Governments, clients, architects, project managers, building developers and investors, should be encouraged to adopt LEED strategies in motivating the consumers to buy and invest in green homes.

CONCLUSION

A positive Nigerian government's attitude towards sustainability as sustainable design and the implementation of LEED rating systems offers a lot of benefits in terms of economic, social and technological. The Nigerian government can drive this through by reforming and creating building performance standards in our building codes and standards to address policies and structures, creating governmental mandates that Federal, State and Local government buildings meet energy and environmental efficiency targets and finally supporting governmental action to use incentive based regulatory means. State and local governments can also adopt LEED incentive programs. Program incentives include tax credits, tax breaks, reduced fees, priority or expedited permitting, free or reduced-cost technical assistance, grants and low-interest loans.

Though realizing that sustainability and environmental benefit won't resonate with everyone, framing the benefits of green homes in terms of indoor air quality, comfort, and economy can convince buyers that green homes would surely have a direct impact on their health, happiness, and quality of life. The USGBC recognizes the importance of local conditions, and the need for LEED to be flexible to accommodate these conditions. And though the challenges of applying LEED rating systems to projects in Nigeria are many, they are not insurmountable. Success lies in patience, teamwork, and respect for cultural differences. The rewards for establishing the LEED green rating systems would be significant and Nigeria, as a country will be better for it at the end.

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