Sustainable or Green Construction in Lagos, Nigeria: Principles, Attributes and Framework

Immaculata Nwokoro
Department of Urban and Regional Planning, University of Lagos, Lagos, Nigeria
E-mail: Ifunanya66@yahoo.com

Henry Onukwube
Department of Building, University of Lagos, Lagos, Nigeria
E-mail: Onukwube12345678@yahoo.com

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Abstract

The concept of sustainable development is used as a basis for enhancing understanding of sustainable construction. Principles of sustainable construction cover four attributes: social, economic, biophysical and technical. The research examined these concepts, principles and attributes in understanding sustainable and green construction as well as current practices and challenges of sustainable construction in Lagos, Nigeria. The research embraced both quantitative and qualitative methods of data collection. The sample frame is the total number of built industry registered and practising professionals in Lagos. A total number of 85 respondents were randomly selected for study from each group. A 5-point likert scale was used to assess respondents' judgement on the identified social, economic, bio-physical and technical indicators. Focus group discussions (FGDs) were also conducted with all the above professional groups to corroborate the primary information. For a wider coverage, three different construction sites were selected to reflect income neighbourhoods-Lekki (high income), Yaba (medium income) and Bariga (low income). Data Collected were analysed using the mean item score. A multi- stage framework which required the application of environmental assessment and environment management systems for construction projects was utilised. Research findings indicate that the most important factors considered for sustainable construction with their mean item scores are quality of working conditions (0.852), strengthening and enforcement of relevant laws and regulations(0.872), encouraging construction waste management(0.819), and design for flexibility and adaptability. Results from the FGDs indicate that the current practice on sustainable construction does not take into consideration integrated design process, acoustic and visual comfort in the planning and construction of sustainable projects. The research therefore, concludes that government should improve existing laws to enhance quality of working life, education, training as well as knowledge management for all stakeholders in sustainable construction.

Keywords: Sustainable construction, Green construction, Construction industry, Framework

1. Introduction

Sustainable construction has emerged as a guiding paradigm to create a new kind of built environment: "one that meets the needs of humans in the present without limiting the ability of future generalisations to meet their own needs" (Ofori, 2001). The creation, operation and disposal of the built environment dominate humanity's impact on the natural world (Kibert *et al*., 2000)

The construction industry is the largest destroyer of the natural environment (Woolley, 2000). It is a major consumer of non- renewable resources, produces substantial waste, pollutes air and water, and contributes to land dereliction (Wallbaum and Buerkin, 2003).Sustainable development is a development that meets the needs of the present without compromising the ability of future generations to meet their own needs (United Nations, 1987). A primary goal of sustainability is to reduce humanity's environmental or ecological footprint on the planet. Sustainable development has given rise to green buildings. Most green building practices fall into seven basic categories: energy saving, land saving, storm water runoff-reducing, material conservation and pollution reduction (ECO Northwest, 2001). A green building uses an average of 30% less energy than conventional building (Economist, 2004). Material waste generated during construction is reduced or recycled. Energy efficiency is improved, perhaps by relying on the use of natural light and ventilation or solar power. Less water is used, or rainwater harvesting system is installed to ensure wiser use. Measures taken to make buildings and construction more sustainable rely increasingly on life cycle approaches.

Construction is a major and primary sector of the Nigerian economy and its consideration of the issues of sustainability covers a huge spectrum of the sector (Nwafor, 2006). Thus, the role buildings play is fundamental to the realisation of sustainable development. Public awareness of environmental issues has increased significantly in Nigeria. Property owners and clients are seeking commercial buildings that meet acceptable environmental and health levels. Unfortunately, there is lack of institutional structures promoting green buildings; awareness on the part of clients, tenants, professionals in the built environment and other stake holders; professional capacity to incorporate green building issues and opportunities and; financial resources to undertake green building construction and upgrades. The aim of this paper therefore is to examine the principles, attributes, current practices and challenges of sustainable construction in Lagos, Nigeria. This study addressed the following research questions-(a) what importance is attached to attributes of sustainable construction in Lagos? (b) What are the current practices and challenges facing sustainable construction in Lagos? (c) How can the proposed framework address the challenges of sustainable construction in the study area?

2. Literature Review and Conceptual Issues

To advance the understanding of sustainable construction, this study examines four attributes of sustainability, social, economic, biophysical and technical.

2.1 Social Attributes and Principles

According to Hill and Bowen (1997), the social attributes of green construction calls specifically for addressing poverty and inequality. The basic principle of social sustainability is to improve the quality of human life by ensuring secure and adequate consumption of basic needs, which are food, clothing, shelter, health, and beyond that by ensuring comfort, identity and choice. The first step towards achieving this goal is poverty alleviation. Social sustainability attributes include: Improve quality of human life, including poverty alleviation, make provision for social determination and cultural diversity in development planning, protect and promote health through a healthy and safe working environment, implement skills training and capacity enhancement of disadvantaged workforce, seek fair distribution of the social costs of construction, seek equitable distribution of the social benefits of distribution, and seek intergenerational equity.

2.2 Economic Attributes and Principles

According to Sultan (2005), economic sustainability attributes include: Labour – intensive construction policies (promotion of employment by mandating minimum crew size and supervisors and use of less machinery in construction projects associated with import reduction of machines, spares and foreign exchange savings); Energy – Efficiency policies in Design and Construction (Mandating the use of low embodied energy materials such as granite, minimizing high energy materials such as cement and steel, energy reduction in buildings via insulation, day lighting, optimize material use and minimize site waste); Credit and Policies to select projects, strategies for sustaining the continuity of affordable infrastructure projects (infrastructure projects can help enhance the process of industrialization by raising productivity and reducing production cost); Strengthening the law and regulations in construction and land affairs; Pricing policies (maintain the monetary and fiscal discipline required to promote price control); improve administration effectiveness and reduce bureaucratic procedures. Choose environmentally responsible suppliers and contractors. Ensure financial affordability for intended beneficiaries, and maintain sustained and efficient use of resources and materials, sustained employment opportunities through formal construction, material production and distribution, maintenance during the economic life span of buildings.

2.3 Bio physical Attributes and Principles:

This is founded on the second part of the definition of sustainability proposed by IUCN (1991). The IUCN stated that sustainability requires the improvement of the quality of human life within the carrying capacity of supporting ecosystems. Bio physical sustainable attributes include: Project design facilities that reflect consciousness of the fragility of the ecology in which it is situated and the awareness of its impact upon it; The use of renewable building materials from sustainable sources and designs that take into consideration existing cultural patterns and behaviours, materials and techniques; Prevention of pollution from construction activity and preserving sites in their natural state and water use reduction and conservation and rainwater collection and; Reduction of energy use and on-site renewable energy and encourage construction waste management(Wolley,2000)

2.4 Technical Attributes and Principles:

The technical attribute of sustainability has been used in this paper to group a number of concepts, including concepts that relate to the performance, quality and service of a building. The emphasis on the application of these principles should be on implementing a process which seeks to achieve consensus among interested parties on which principles are more and which are less important. Sustainable technical attributes include: Design for flexibility, adaptability and durability of exposed building parts. Pursue quality in creating the built environment and use serviceability to promote sustainable construction as well as revitalize existing urban infrastructure. (Hill and Bowen, 1997; Sultan, 2005; Wolley, 2000)

2.5 Process-oriented principles of sustainable construction

In this paper, the essence of process oriented principles is to articulate ways of achieving - social, economic, biophysical and technical indicators of sustainable construction. The concept is to emphasize that the following stages are essential in sustainable construction. That is, undertake prior assessments of proposed activities and involve all stakeholders on the project in due time; Promote interdisciplinary collaborations and recognize the complexity and multiplicity of objectives inherent in the concept of sustainability; Utilize a life cycle framework, which recognizes the need to consider all of the principles of sustainable construction at each and every stage in planning, assessment, design, construction, operation and decommissioning of projects. Comply with relevant legislation and regulations and manage activities through the setting of targets, monitoring, evaluation, feedback and self-regulation of progress (Gardner, 1989), in a process that is iterative and adaptive in nature.

3 Current Practices and Challenges of Sustainable Construction in Lagos

3.1 Energy Efficiency

According to Santoli and Matteo (2003), the energy performance of a building must be calculated using standards that indicate the insulation of the buildings, the characteristics of technical systems and installed equipment, the position and orientation of the building in relation to other climatic aspects, exposure, its own capacity for renewable energy sources and other factors, such as indoor environmental quality, that could influence the energy requirements of the building.

3.2 Integrated Design

Reed and Gordon (2000) emphasised that the integrated design process encompasses cross-disciplinary team work enabling the improved integration of buildings, community, natural and economic systems and therefore, is a key to sustainable design. There is considerable agreement among those in the field of sustainable design that cross-disciplinary team work early in the design process is essential to achieve the successful integration of building, community, natural and economic systems. Without the process of integration, systems are over designed and commonly function in conflict with one another. In this concept, the client takes a more active role than usual, the architect becomes the team leader rather than the sole form-giver, and the structural, mechanical, and electrical engineers take on active roles at early design stages. The team includes an energy specialist (simulator) and hopefully, a bio-climatic engineer, depending on the nature of the project, a series of additional consultants can be added.

3.3 Indoor Air Quality

The quality of indoor air depends on the concentration of pollutants at a particular moment in time. The perceived air quality is also dependent on the air temperature and the relative humidity which, in turn are linked. Health problems from inferior air quality include lung cancer, sick building syndrome(SBS), symptoms' and discomfort problems like bad smells and experience of dry air (Bornehag, *et al.,*2004)

3.4 Thermal Comfort

Creating thermal comfort for man is a primary purpose of the heating and air conditioning industry and this has a radical influence on the whole building industry. Comfort is not a product which is provided for building occupants, it is a goal which they achieve provided they are able to exert the necessary control over their environment (Shove *et al*., 2008). The control they exert over the environment will partly be decided by the building they occupy and its services and, may be subject to constraints (Cole *et al.*, 2008). The aim of the building must be to allow occupants to achieve their comfort goal. People adapt more readily to thermal environments with which they are familiar. The building should therefore be designed to provide a thermal environment that is within the range customary for the particular type of accommodation, according to climate, season and cultural context.

3.5 Visual comfort

Visual comfort is brought about by having good lighting which is adequate both in quality and quantity. The source of light may either be natural or artificial or a combination of both. In any case, windows have distinct advantages. Today there are still many new buildings that do not fully utilize the benefits derived from using natural light. Efficient day lighting considers heat gain, glare, different light levels, uniformity and solar penetration. The three basic rules of good day lighting are: avoid direct sunlight on heavy viewing tasks to prevent glare; let natural light in through skylights and good-sized windows that give deeper penetration and better distribution; and filter daylight and bounce it off surrounding surfaces with the use of vegetation, curtains, sunscreens and shades. When locating buildings in a particular site, correct spacing, together with proper orientation must be maintained to enhance natural lighting. Adequate window openings must be maintained to ensure that building interiors get enough natural lighting (Ochoa and Capeluto, 2009)

3.6 Site Suitability

Site suitability enquiry is essential as this ensures that the site can legally and physically accommodate the type and size of project being envisaged. When selecting sites for developmental purposes avoid sites in noisy areas and ensure compatibility with existing facilities. Determine what else is planned for the site in the future (Nwafor, 2006)

3.7 Acoustic Comfort

Sleeping disturbances are commonly reported as an important problem related to traffic noise (Griefahn and Spreng, 2004).Apart from secondary stress effects from sleeping disturbances, there are studies that suggest an association between residential road traffic noise exposure and hypertension(Bluhm *et al*.,2007)

3.8 Spatial Comfort

This is a concept that is used to express building layouts that are designed to maximise the space use and improve accessibility within the buildings such that the occupants derive comfort from such arrangements (Hiller and Hanson, 1984).

3.9 Building Integrity

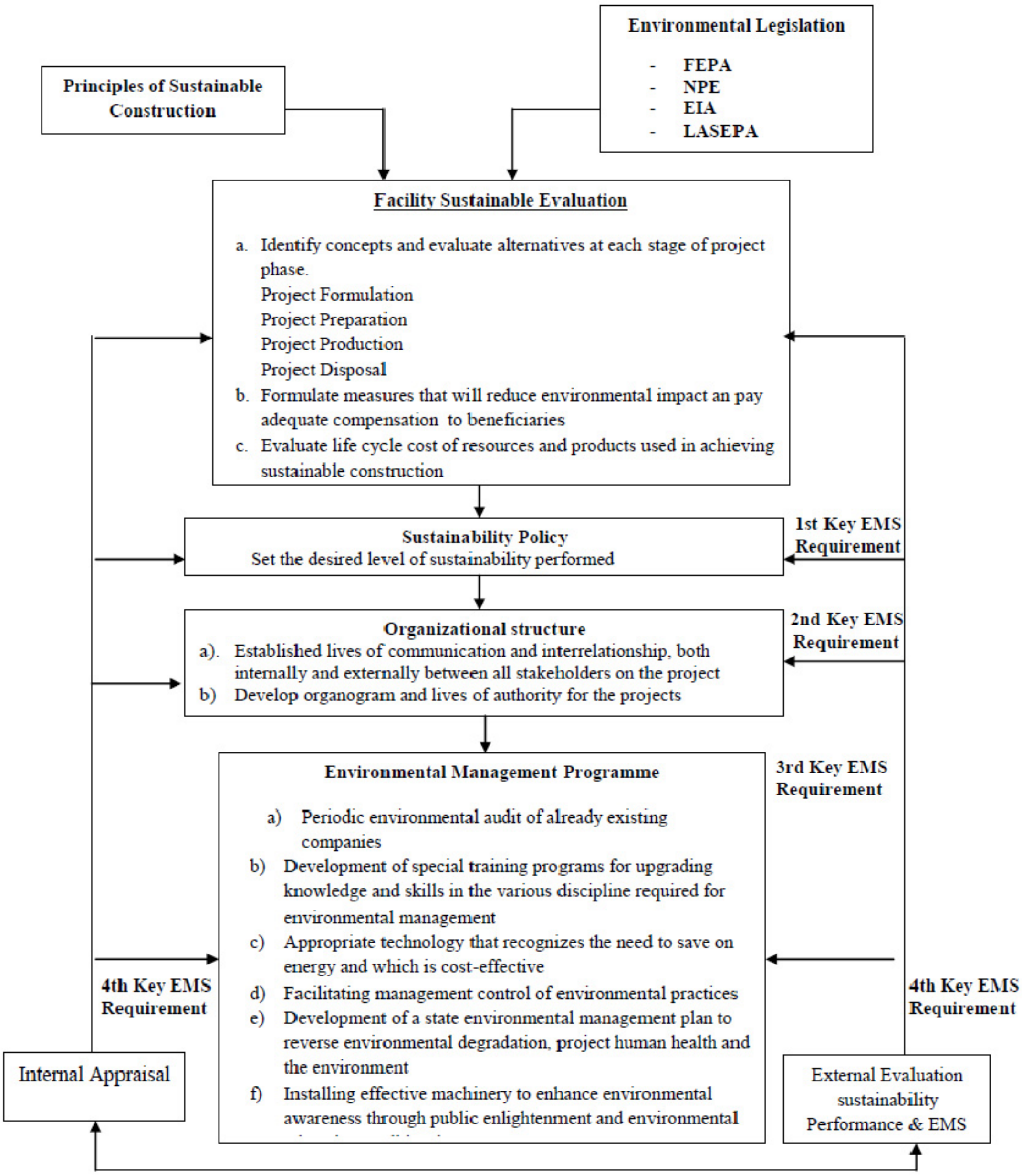
The crippling costs of corruption in the practice of sustainable construction can be reduced significantly through the application of proven principles and mechanisms such as building integrity. The basic approach is to stipulate actions that are corrupt both morally and ethically and expected punishment attached to such actions. If individuals recognise their actions are illegal, and that they may be discovered and imprisoned, this deters corruption (Lucas and Rubel, 2004)

4. Environmental Laws and Regulations on construction in Nigeria

The Federal Government of Nigeria has promulgated various laws and Regulations to safeguard the Nigerian environment. The prevailing laws within the built environment include: Federal Environmental Protection Agency Act of 1988 (FEPA Act),National Policy on the Environment (NPE) 1989 and Environmental Impact Assessment Act of 1992 (EIA Act).The Federal Ministry of Environment (FME) administers and enforces environmental laws in Nigeria. The Federal Ministry of Environment has published several guidelines for the administration of the FEPA and EIA Acts and procedures for evaluating environmental impact assessment reports (EIA Reports).The approach of regulatory agencies is the prevention of environmental damages, the regulation of potentially harmful activities and the punishment of wilful harmful damage whenever this occurs. The environmental agencies also adopt the approach of engaging individuals and communities at risk of potential environmental damage in dialogue. The EIA approval process adopted by the FME involves a system of public hearings during the EIA evaluation process and interested members of the public are invited to such hearings. Lagos State Environmental Protection Agency (LASEPA) also takes the same approach. Unfortunately, the major challenge confronting FEPA is how to translate the laudable provisions of the Act into an effective tool for managing the environment. This is because most Nigerian legislations crumble at the implementation stage

5. A framework for the attainment of sustainable construction

The essence of this framework is to suggest how sustainable construction can be achieved. We are of the opinion that Environmental impact Assessment (EIA) should be carried out during the planning and design stages of projects, provided that the traditional EIA is expanded to include assessment of all four `indicators' of sustainable construction. It should also be undertaken in accordance with the process-oriented principles of sustainable construction, and enforcement by FEPA, NPE and LASEPA for each project, during construction, operation and, where appropriate, even decommissioning. The framework and its components are summarized in Figure 1 and discussed below. In this paper, a broad meaning is given to the term `environment', to include the physical, biological, social and economic indicators that affect the individuals and groups within the developmental area. Environmental impact Assessment' could include assessment of all four `indicators' of sustainable construction. There is need to set up a sustainability policy. Such a policy would set the desired level of environmental performance. Construction organizations could adopt a general environmental policy which could inform policies for specific projects. At the level of individual construction projects, environmental policy would emanate from company policy, if available; relevant legal requirements, and the EIA for the project, which would identify those principles of sustainable construction deemed relevant to the project through consultation with interested parties at an early stage in the EIA. The second key requirement is to provide an organizational structure and to determine the responsibilities, authority, lines of communication and the resources needed to implement the EMS. An EMS would need to determine the required interactions between the various contractors, consultants and clients involved in the project. Similarly, lines of communication should link the organizations involved, and should also provide a connection with a range of interested and affected parties external to the construction process. The third key requirement is to develop an environmental management programme (EMP) that stipulates environmental objectives and targets to be met and work instructions and controls to be applied in order to achieve compliance with the environmental policy. At project level, the EMP would contain operational procedures for controlling various activities, which would include: work instructions for determining the manner of conducting an activity; inspection procedures to ensure that mitigating measures are applied; procedures for dealing with accidents and emergencies; and, procedures for the measurement of performance indicators. In construction, where the primary goals of the contractor and the environmental management team may be different, the EMP may need to rely on penalties and bonuses to ensure compliance with standards. The fourth key requirement is to undertake periodic audits of the environmental performance of the construction team and the effectiveness of the Environmental Management System.



(Source: Adapted and modified from Hill and Bowen, (1997:234)

Figure 1. Framework for Sustainable Construction

6. Research Method

The study embraces both quantitative and qualitative methods of data collection. Relevant information is sourced from professionals in the construction industry, contractors, developers and clients. Using a structured questionnaire, information on how social, economic, bio- physical and technical indicators facilitate sustainable construction are elicited. Respondents were asked to indicate their judgement on identified social, economic, bio-physical and technical indicators. A 5-point scale was used to assess the importance of these factors. Section A addresses questions on name and type of organisation, years of construction industry experience. For each factor, an important index was determined. Questions on section B to F are quantitative in nature. Section B comprises nine questions on social attribute of sustainable construction while section C comprises twelve questions on economic attribute of sustainable construction. Sections D, E and F comprise eight, six and six questions on bio physical, technical and process-oriented principles of sustainable construction respectively. The sample frame is the total number of registered professionals in the built industry in Lagos. A total number of 85 respondents were randomly selected for study from each group. In addition, two construction sites each were randomly selected and visited in 3 different income class neighbourhoods, thus, Lekki (high income), Yaba (medium income) and Bariga (low income).

Focus group discussions (FGDs) were also conducted with all the above groups to corroborate the primary information. This involved a meeting of ten (10) stakeholders drawn from professionals of the built industry in each of the three selected neighbourhoods. These groups were also gender and age sensitive to achieve diverse information. The work of Sultan (2005) was identified and used for the quantitative aspect of the study because of the similarity of data in both researches. The response format designed by Sultan (2005) was altered. In this study instead of using a 3-point likert scale used by Sultan, a 5-point likert scale was used to achieve operationality of variables. Cronbach's alpha is a measure of internal reliability. This is bound by 0 and 1, with measures closer to 1 representing strong reliability for the items in the research instrument. Data Collected are analysed with using mean item score. The sustainability instrument in this study recorded a Cronbach's alpha value of 0.91 and the data collected was analysed using statistical packages for social sciences (SPSS).

7. Data Presentation and Analysis

Data collected from Section A of the research instrument shows that 24(28%) of the respondents are consultants, 21(25%) are developers, 20 (23.5%) are contractors while the remaining 20 (23.5%) are clients. Majority of the respondents 35 (41%) had more than 25 years construction industry experience, while 28 (33%) had experience ranging between (15- 20) years. Others are 13 (15%) for industry experience ranging between (10-14) years while the last group recorded 10 (11%) for industry experience of (5-9) years. The implication of this result is that most of the respondents had enough knowledge and experience to make useful contribution to this area of research. The information elicited from the respondents were discussed along the lines of the different attributes of sustainability thus; social, economic, bio physical, technical and process oriented. This is further supported by the responses from the FGDs conducted in three different income residential areas. The ranking of these various indicators corresponds with the respondents need in order of importance.

Table 1: Prioritisation of Social Indicators

Table 1 reveals that most respondents rated quality of working conditions very high (Mean item score = 0.852) as an important social factor in achieving green construction. This means that the respondents expect improved working conditions, fringe benefits and social amenities that will facilitate better standard of living. This finding supports the contribution of Hill and Bowen (1997) in their study on principles of sustainable construction. The finding of Sultan (2005) in this area of study is also in agreement with this result. Education and training, and knowledge management are ranked 2nd and 3rd respectively. This is a major factor in the developed countries where sustainable construction has been achieved. Respondents agreed that implementing skills training and capacity enhancement will help the disadvantaged workers. This will also create awareness about the benefits of green construction. Other social factors that were ranked high by respondents are impact on employment, health and safety and innovative potential. Currently the rate of employment is high and this contradicts the purpose of social sustainability. These factors are important factors that must be taken into consideration in planning for social sustainability.

Table 2: Prioritisation of Economic Indicators

For the economic indicators for sustainable construction, strengthening the law and regulations in construction ranked highest with a mean item score of 0.872 as shown in table 2. This includes sorting out all legal rights for investors and tenures via legal agencies to ensure the well conduct of the industry activities in a sustainable and efficient manner. The respondents also feel strongly about getting strategies for sustaining the continuity of affordable infrastructure projects and sustained and efficient use of resources and materials as these indicators ranked 2nd and 3rd respectively. The choice of suppliers and contractors who are environmentally responsible in addition to enforcing local material protection policy were other economic factors considered important for sustainable construction. Based on the mean item score of these factors all fall under the classification of very important and important economic indicators, this findings agrees with literature (Sultan, 2005).

Table 3: Prioritisation of Bio Physical Indicators

The ranking of certain bio physical factors that enhance sustainability in construction is highlighted in table 3. Respondents strongly agree that waste management in construction should be encouraged. This indicator is ranked first (mean item score = 0.819). This is a major challenge in most Nigerian construction sites and also corroborated by the FGDs across income areas. The inability to manage construction waste leads to air pollution and other health hazards. This construction waste problem manifested seriously at all construction sites visited. Another very important bio physical indicator for sustainable construction is the use of renewable building materials from sustainable sources. This will reduce the cost of maintenance due to the durability of materials used. The issue of renewability is considered as a key factor by the respondents as promotion of the use of rapidly – renewable materials also rank high. Table 3 shows other details of relative index of bio physical indicators in sustainable construction. All the indicators based on their respective (MIS) are very important factors, hence their consideration in sustainable construction is very essential. This agrees with the observation of (Wolley, 2000) that these factors will facilitate the attainment of sustainable construction.

Table 4: Prioritisation of Technical Indicators

Both results from questionnaire information and FGDs revealed that the most important technical indicator for sustainable construction is Design for flexibility and adaptability (item mean score = 0.875) as shown in table 4. Design for durability of exposed building parts and ensuring quality in creating the built environment are other two highly ranked indicators. Table 4 further indicates that the other factors were not considered necessary for green construction. To achieve this in Nigeria, the technological base has to be enhanced. Participants at the FGDs also showed concern at the low level of infrastructural and technological base which affect the quality of building materials and design.

Focus Group Discussions on Current Practices and Challenges of Sustainable Construction

Participants at the FGDs are of the opinion that the current practice on sustainable construction does not take into consideration integrated design process, acoustic and visual comfort in the planning and construction of sustainable projects. However, some participants are of the opinion that they apply the principles of site suitability, spatial comfort and building integrity in the sustainable projects that they were involved.

Conclusions

This research demonstrates how sustainability can be viewed in the context of Nigeria.

It points to the importance of process in any efforts at sustainable construction. Sustainable construction requires a process that looks at sustainability comprehensively, exploring each of its component dimensions to discern its fit and relevance to a given context.

- The prioritization of social needs clearly shows that to achieve social sustainability in Nigeria, emphasis is on quality of working life, education and training as well as knowledge management.
- The ranking of economic indicators of sustainable construction in Nigeria indicates that strengthening of existing laws, efficient use of resources, appointment of environmentally responsible contractors and local material protection are essential factors necessary for attainment of economic sustainability in construction.
- The application of efficient waste management system, the use of renewable construction materials and effective use of project design facilities will facilitate the attainment of biophysical sustainability in Nigeria
- Design for flexibility, durability, adaptability and quality are essential factors necessary for the attainment of technical sustainability in construction.
- Compliance with relevant legislation and regulations, ability to carry out preliminary assessment of purposes and activities as well as utilize a life cycle framework and manage activities through the setting of targets are essential factors necessary for attainment of sustainable construction.
- Emphasis should also be placed on integrated design process, site suitability, acoustic, visual, spatial and thermal comforts as well as building integrity in the practice of sustainable construction.
- A multi- stage framework for sustainable construction is proposed which requires application of Environmental impact assessment (EIA) and implementation of Environmental Management Systems (EMS) for all stake holders involved in sustainable construction.

Recommendations

In the light of research findings and conclusions, the following recommendations are made in order to motivate the application of sustainable construction in Nigeria.

- Government should improve existing laws in this area of research paradigm so as to improve quality of working life, education, training as well as knowledge management for all stakeholders in sustainable construction.
- A clause should be introduced in the conditions of contract that will address environmental issues of sustainable construction as this will facilitate the appointment of environmentally responsible contractors and suppliers.
- Seminars, workshops and lectures should be organised for all stakeholders in sustainable construction to address issues on efficient waste management, environmental management systems, and design for flexibility, durability, adaptability and the use of renewable construction materials.

Contribution to Knowledge and Practical Implications

This study also expands the current literature on sustainable construction by carrying out a comprehensive overview of social, economic, biophysical and technical indicators associated with sustainable construction as well as the current practice and challenges facing sustainable construction (Hill and Bowen, 1997; Wolley, 2000; Sultan, 2005). Most research in this area of study has been qualitative in nature. This study has gone a step further by adding quantitative dimension to identified social, economic, biophysical and technical indicators. This prioritizing will guide policy thrust in the area of sustainable construction. Another major contribution of this study is the modified multi- stage framework developed for stakeholders in sustainable construction. From a practical perspective, this study's results have implications for stakeholders in sustainable construction. First, our findings suggest that effective enforcement of existing laws on the environment will definitely encourage the practice of sustainable construction. Further the results shows that improvement on quality of working life, education and training of stakeholders will facilitate rapid growth in application of principles of sustainable construction. This agrees with the opinion of Hill and Bowen (1997).

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Table 1. Relative Index of Social Indicators in "Sustainable" Construction

Social Indicators	Mean Item Score	
Quality of working conditions	0.852	1
Education and training	0.845	2
Knowledge management	0.833	3
Impact on employment	0.795	4
Health and safety	0.762	5
Innovative potential	0.760	6
Social characteristics and cultural diversity in development planning	0.718	7
Societal product benefit	0.694	8
Societal dialogue	0.663	9

Table 2. Relative Index of Economic Indicators in "Sustainable" Construction

Economic Indicators	Mean Item Score	Ranking
Strengthening the law and regulations in construction	0.872	1
Strategies for sustaining the continuity of affordable infrastructure projects.	0.833	2
Sustained and efficient use of resources and materials	0.828	3
Choose environmentally responsible suppliers and contractors	0.826	4
Local material protection policy	0.816	5
Energy – Efficiency policies in Design and Construction	0.798	6
Pricing policies	0.793	7
Improve administration effectiveness and reduce bureaucratic procedures	0.788	8
Ensure financial affordability for intended beneficiaries	0.767	9
Sustained employment opportunities	0.760	10
Credit and Policies to select projects	0.760	11
Labour – intensive construction policies	0.734	12

Table 3. Relative Index of Bio physical Indicators in "Sustainable" Construction

Bio Physical Indicators	Mean Item Score	Ranking
Encourage construction waste management	0.819	1
Renewable building materials	0.816	2
Project design facilities	0.814	3
Promote the use of rapidly – renewable materials	0.805	4
Prevention of pollution from construction activity	0.795	5
Designs that takes into consideration existing cultural patterns and behaviours	0.791	6
Reduction of energy use	0.741	7
Water use reduction and conservation and rainwater collection.	0.704	8

Table 4. Relative Index of Technical Indicators in "Sustainable" Construction

Technical Indicators	**Mean Item Score**	**Ranking**
Design for flexibility and adaptability	0.875	1
Design for durability of exposed building parts	0.828	2
Pursue quality in creating the built environment	0.814	3
Use serviceability to promote sustainable construction	0.784	4
Construct durability of exposed building parts	0.778	5
Revitalize existing urban infrastructure.	0.764	6