

GREEN ARCHITECTURE THE NIGERIAN PERSPECTIVE

Okeke F. O¹, Chinwe Sam-Amobi², Okafor C³, Andy N. N⁴, Ani E. K⁵, Okere C. E⁶, and Ugwu C. C⁷

Department of Architecture, University of Nigeria, Enugu Campus, Enugu

ABSTRACT

Green Architecture is a concept developed to encourage sustainable development. It brings transformation to design and construction in both developed and developing economy. The study is to bring to limelight green buildings and design, the Nigerian perspective, its benefit and the linkage of traditional architecture to green architecture. It also identify, examine and assess the factors that are hindering green building developments in the Nigeria's Built Environment. This research paper analyses the nature of design and construction in Nigeria on the basis of green and sustainable practice through review of existing literature. It surmises that the concept of green architecture will affect the nature of architecture and design which depends on the choice of materials, the construction techniques, the calculated cost of construction and the climatic conditions in Nigeria. It posits that the developmental concept of green architecture in Nigeria will encourage sustainable development and environmental protection

Keywords: Built Environment, Green buildings, Sustainable Building material, Traditional architecture, sustainability.

1. INTRODUCTION

Environmental sustainability is a primary goal in green architecture and design. The designs of architects are very important in mitigating environmental problem. This calls for the concept of green or sustainable architecture and invariably form the major concern of architects in seeking sustainability in design. Bribian et al. (2011) asserts that the building and construction industry consumes great quantities of raw materials and energy that approximate to about 24% of global raw materials. Watson and Balken (2008) also believes that the construction and operation of buildings require more energy than any other human activity. The International Energy Agency released a publication that reveals that existing buildings are responsible for more than 40% of the world's total primary energy consumption and for 24% of global carbon dioxide emissions (Howe, 2010), accounting for roughly a quarter of the world greenhouse gas emissions.

Therefore the friendliest way to handle the environment is not to build. However, without construction, life can be miserable and threatening (Kolawole et al 2005). What is needed is a dynamic equilibrium without any form of threat especially to the environment. The combination of these challenges gave birth to a new concept in design, construction/renovation, operation and maintenance of buildings in conformity with "sustainable practices for buildings" known as Green Buildings. Green building (GB) is the foundation of sustainable construction and refers to a structure that is resource-efficient in terms of economy, utility, durability, and comfort; Green

Buildings are those sensitive to the “Environment, Resource and energy consumption, Impact on people, Financial impact and the world at large (Greg Kats, 2003). The aim of the study is to bring to limelight green buildings and design, the Nigerian perspective, its benefit and the linkage of traditional architecture to green architecture. It also identify, examine and assess the factors that are hindering green building developments in the Nigeria’s Built Environment.

2. GREEN ARCHITECTURE

In the African context, this study views “Green Architecture” as the indigenous approach of building practices with the goal of sustaining the ecosystem. It is the design and construction with the environment in mind. It puts into consideration the easily affordable local resources and the development of concepts that sustain the socio-cultural value system within the building sector. Green Architecture approaches building construction (from design conceptualization and construction to its material usage all through its life-span) with the aim of minimizing harmful effect on human health and environment. It attempts to conserve environmental factors such as air, water and the earth by employing eco-friendly building materials and construction practices and focuses on saving energy production and consumption.

Green building measures can lead not only to lower building operating expenses through reduced utility and waste disposal cost, but also to lower ongoing building maintenance cost ranging from salaries to suppliers. The emphasis is on efficiency. Green design is intended to develop more environmentally benign products and processes. The application of green design involves a particular framework for considering environmental issues, the application of relevant analysis and synthesis, methods and a challenge to traditional procedures for design and manufacturing (hendrichson, Conway – Schempt, Lave and Mc Micheal, Undated). The green approach to architecture is not something new as it has existed for years. What is new is the realization that green approach to the built environment involves a holistic approach to the design of buildings; that all the resources that go into a building, be they materials, fuels or the contribution of the users need to be considered if sustainable architecture is to be produced (Brende and Vale 2007).In Nigeria some buildings embody one of the various verifiable characteristics of green design. Buildings with holistic approach are yet to be seen.

2.1 SUSTAINABLE BUILDING MATERIALS

Buildings impact on the environment during their whole life cycle and the choice of materials used will impact on their overall performance. They are used in various stages, from initial construction through to the operation stage when the buildings are maintained and refurbished to preserve their normal functioning until the end of their service life.

Traditional building materials including steel, concrete, aluminium and glass are high energy content materials. According to Franzoni (2011) the selection of building materials plays an important role in achieving the goal of sustainable development in the construction industry. Choosing materials with high contents of embodied energy entails an initial high level of energy consumption in the production process, which associated with high levels of GHG emissions

(Bribian et al., 2011). Thormark (2006) further states that more attention should be given not only to the operating energy of a building but also to the material choice.

There are a number of research studies addressing the problems with materials selection. However, most of these studies have failed to properly and adequately establish the definition for 'sustainable building materials'. This makes it very difficult to establish principles and guidelines that enable sustainable building materials to align with the principles and goals of sustainable development in construction. Sustainable building materials are often regarded as materials that are natural and offer specific benefits to the users in terms of low maintenance, energy efficiency, the improvement of occupant health and comfort, the increase of productivity whilst being less harmful to the environment.

However, according to Franzoni (2011) natural materials are not necessary green materials such as asbestos, radon and turpentine. Therefore, sustainable building materials refer to materials that are environmentally friendly or environmentally responsible materials (Spiegel & Meadows, 1999; Franzoni, 2011). They must also be sustainable during their whole life cycle and requires the use of less energy in the manufacturing process. During the life cycle, these materials must not release pollutants or other emissions that impact on human health and comfort.

2.2 GREEN BUILDING AND SUSTAINABILITY IMPERATIVE

A building project can be regarded as sustainable only when all the various dimensions of sustainability (environmental, economic, social, and cultural) are dealt with. The economic point deals with growth, efficiency and stability. The social aspect is concerned with poverty, cultural heritage and empowerment while the environmental aspect deals with biodiversity/resilience, natural resources and pollution (Nwafor, 2006). The various sustainability issues are interwoven, and the interaction of a building with its surroundings is also important.

To achieve the sustainable building design goals of building functionality and appeal for the occupants while reducing the environmental footprint, a highly organized framework that emphasizes the integration of — or at least understanding of — all building components is required. The framework developed (and used) should consist of four primary categories that must be addressed sequentially, yet requiring that an overall comprehension of their integrated nature be applied during each step. The four categories, listed in the order that they should be addressed are:

1. Building Use and Occupant Needs — Assess the occupant's needs and expected building use to determine the functional design priorities of the building;
2. Climate Analysis — Conduct a local climate analysis to determine climactic needs and to assess the potential for passive design strategies;
3. Site Plan Development — Perform the preliminary site plan development and landscape design, while considering strategies that can improve occupant comfort, reduce building loads, and further enable passive design strategies;
4. Building Design — Proceed with the building design working to meet the occupants' needs and functional requirements of the facility, while incorporating passive design strategies, and being cognizant of the life cycle costs and impacts of material selection and energy use.

It is important to stress that although these are listed in order, the holistic design approach is more like an interconnected web, with each of the categories being addressed continually throughout the design process. Intimate knowledge of the design strategies and interrelated impacts of each category on one another is critical to effectively achieve green building design and beyond.

3. NIGERIAN TRADITIONAL ARCHITECTURE AND ITS LINKAGE TO GREEN DESIGN

Nigeria is a country that parades numerous traditional building design concepts at different regions of climatic conditions, socio-economic and cultural background. Rikko & Qwatau (2011), referred to traditional as a cultural heritage gained from generation to generation accepted and practiced by the people. Therefore designs in traditional architecture reflect the cultural lifestyle of the people and represent the symbols of the heritage of the residents. Hence response to the material, spiritual, and social design of the society cannot be over-emphasized (Olotuah, 2001). Consequently, creation of an intimate relationship to the entire system, reinstated the values and customs accepted by residents' social groups. In addition, the form and functions of housing vary with people customs and culture, as an aftermath of what the populace considered as important in their housing.

Detailed analysis by Rapoport (1969) emphasized that every building is first a product of cultural phenomenon; hence the environmental and climatic factors must be given pre-eminence. Over the years, it has been recognised that cultural rituals have evolved to adapt to climate conditions and vernacular architecture embodies some of these adoption in their plan and design features (Hawkes, 1996 in Bay and Ong, 2004). Thus, cultural components in line with climate condition will encourage green architecture.

Nigeria and tropical traditional architecture before the invasion of foreign concepts of architecture at most times were using mostly sustainable green construction materials in its operations. Except that the now architecture in tropics like Nigeria are now unadulterated transplants from temperate countries in the name of international style (Bay and Ong, 2004). This has incorporated mostly unsustainable construction materials in its operations as compared to the old tropical traditional concept of architecture that were practiced.

Green architecture supports mostly green construction materials for its operation. These are materials that tend to be derived from the earth that are more safely and naturally assimilated by the earth at the end of their service lives (Milani, 2005). Therefore, traditional building materials such as stone, earth, bamboo and wood commonly used in tropics such like Nigeria are essential for green construction. These materials because of capillary effect could absorb water which can then evaporate from their surfaces and thus hinder the interior air from being re-warmed by convection (Salam, 2003). It was concluded that effective building forms have emanated overtime that facilitates the attainment of high level of comfort both within and outside of built environment without recourse to artificial methods.

In recent years, Nigerian Architecture is characterised by the post-modern buildings of the 1990's and a sprawling new design concept and engrossed with new building materials mainly imported from China. The question at this juncture is why architects, designers and government policies have frivolously jettisoned the traditional architecture to modern architecture in recent time? Why is little attention focuses on intertwining between modern environment and traditional architecture (cultural heritage), in Nigeria? These and many other question are yet unanswered.

3.1 GREEN ARCHITECTURE AND COURTYARD SYSTEM

Green architecture entails adequate natural ventilation systems designed for efficient heating and cooling, appropriate energy-efficient lighting and appliances, adequate and appropriate landscapes that ensures maximum passive solar energy. Generally green architecture ensures minimal harm to the natural habitat. Location of building on site, including access, and utility supply routes; Arrangement of internal rooms, and doors and windows; Dimensions of building and environmental components Finally it takes into consideration the Colour, texture, ornamentation of building in relationship to the environment.

A Court or courtyard is an enclosed area, often a space enclosed by a building that is open to the sky and areas in inns and public buildings were often the primary meeting places for some purposes, leading to the other meanings of court. Courtyards have always been part of residential architecture for a very long time. In contemporary African setting like in Nigeria, it has been historically used for many purposes which included cooking, sleeping, working, playing, gardening, and even places to keep animals.



Figure 1;*The Court of faculty of environment studies building, university of Nigeria Enugu campus*

Source; *researcher's field work*

One of the great attributes of courtyard design concept is that it allows for good fenestration and privacy. It allows for good flow of indoor and outdoor activities thereby removing the pressure of activities within a given space. Courtyard regulates the micro climate within the enclosure through the free use of vegetation. In densely populated areas, a courtyard in a home can provide privacy for a family, a break from the frantic pace of everyday life, and a safe place for children to play. With space at a premium, architects are experimenting with courtyards as a way to provide outdoor space for small communities of people at a time.

Courtyard design accommodates the requirements of the permanent resident, whilst offering the flexibility required by the transient occupation of holiday accommodation. In traditional houses, courtyards perform an important task as a modifier of climate. It allows outdoor activities to occur with protection from wind, dust, and sun (Petherbridge, 1995).

Courtyards serve as light-wells in a building type that restricts exterior windows. They also serve as air-wells into which the cool, dense night air sinks. Since the courtyard is usually protected by walls, loggias, or galleries sun rays do not heat it until later in the day. When the sun reaches the court and heated air rises, convection current set up airflow that ventilates the house and keeps it cool Abarkan and Salama (2000).

4. IMPLICATIONS OF GREEN ARCHITECTURE FOR NIGERIA

Okwo (2008) identifies socio-economic development and mitigating climate change as two significant yet conflicting challenges facing Sub-Saharan Africa. Green innovations, beside the objective of mitigating climate change, have impacts on various issues that include social, economic, political and technological developments in Nigeria. It is imperative for developing countries to enhance their developments by concentrating on indigenous practices and values, in order to enhance the economy.

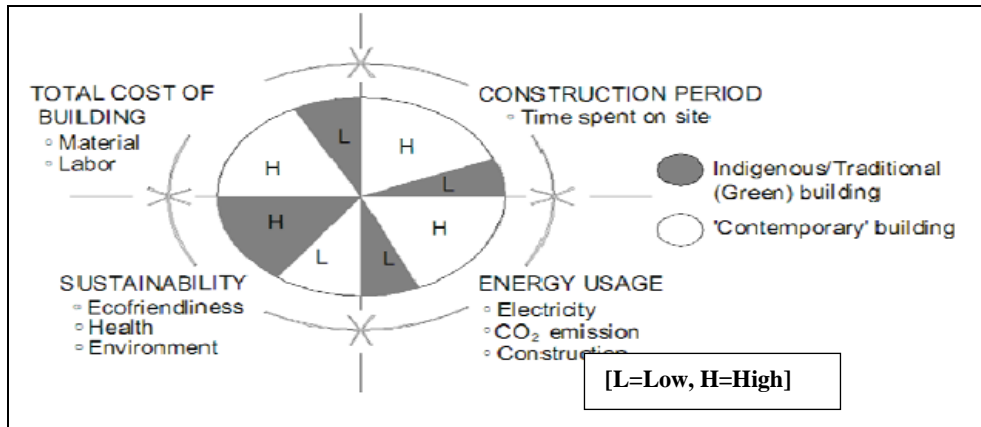


Figure 2; Graphical representation showing comparison quadrant between Nigeria’s indigenous buildings and contemporary buildings

Source; Odebiyi Sunday, 2010

This study identifies as graphical comparison quadrant worked out based on estimates for similar specifications among these two systems: Nigeria’s indigenous and the contemporary building types. It emphasizes the vitality of adopting indigenous architecture in Nigeria. It is observed that construction period for indigenous building is low, energy usage for indigenous building is low, sustainability is high and invariably lower building total cost. This is in comparison with contemporary buildings. The reliance on modern design techniques and materials has resulted to

high cost of construction in recent years. Contrary to this, traditional building materials enable cost effectiveness in terms of materials and simple innovative expertise of the local builders

4.1 HINDRANCES TO GREEN BUILDING DEVELOPMENTS IN NIGERIA'S BUILT ENVIRONMENT.

Every project or development comes with its unique benefits, challenges and factors that hindered its success; Green Building developments in Nigeria are not an exception.

Capital constraints has been identified as a primary reason for the lack of energy efficient measures being taken. The common and the first question often asked about sustainable design is: *what does "green" cost? Typically meaning does it cost more? This raises the question: More than what? More than comparable buildings? More than the available funds? Or more than the building would have cost without the green or sustainable design features?* The answers to these questions have been thus far elusive, due to the lack of hard data. Morris (2007); argued that "The most common reasons cited for not incorporating green elements into building designs is the increase in first cost". Bartlett and Howard (2000) suggest that there is a misconception in the construction industry that energy efficient and environmentally friendly buildings cost 5 - 15% more to build. They outline one of the reasons for this being that examples of environmentally friendly buildings are used in the press that are usually 'futuristic' buildings that do cost more to build and therefore the wrong conclusions are drawn that green buildings are more expensive and complex to build. This is supported by Sorrell (2003) who highlights that there may be a bias against energy efficient buildings as they tend to involve more design work and therefore a timelier design process despite the possible result of lower capital and operating costs. It is stated that; 'at all stages of the construction process, it can take longer to design, assess and implement novel and unfamiliar features than to use tried and trusted solutions.'

While a Davis Langdon Report in 2007 stated that "*there is no one size that fits all answer to the question of the cost of green*".

Below is a Listing of Hindrances to Green Building Developments in Nigeria

- a) The Perception of green building as Expensive Concept (Perceived Increased cost for incorporating green building features etc.)
- b) Green building Technical Know How (green building requisite knowledge among the Built environment Professionals & the scarcity of green building certified professionals)
- c) Divergent interests and views of success factors and success criteria of green building developments among stakeholders
- d) Shortage of green building cost data and other performance related.
- e) green building as a new change (which comes with its associated risks)
- f) Green Buildings awareness
- g) Insufficiency of Locally or a single unified/standard green building assessment system
- h) lack of local green building material and other components and High cost of Imported green building materials

5. DISCUSSION

The two main targets to achieve green architecture are the institutions of higher learning and building industry with its professionals. Indeed, universities are often relied on to serve as the wellspring of innovation and success, particularly for the sciences and engineering; for centuries they have been precisely doing that in nearly any field that has played a role in the remarkable success of twenty-first century humanity. Now they must embrace and foster a new direction of innovation: Universities that once relegated sustainability to the provinces and to grassroots efforts should now make serious structural and philosophical changes in recognition of the challenges and opportunities a resource-limited world brings. Green or sustainability concepts should be universities watch word.

Sustainable construction measures needs the support of multiple actors at various places and times in the decision making process to become effective. The professionals such as architects, engineers, town planners, builders amongst others should take cognizance of indigenous design theory, technology, craftsmanship and artisanship associated with the advent of traditional building. Thus, recent domination of modern innovations would be to the detriment of our indigenous expertise. The construction industry needs a review of the way that it design and builds to encourage more sustainability.

Various measure to improve sustainable practices, include:

- making developers more accountable for the performance of buildings in use
- Widespread adoption of whole life costing
- Development of integrated design
- Client education and adoption of post-occupancy evaluation
- Comparison of building performance against standardised benchmarks

6. CONCLUSION

The sustainable energy potential of Nigeria encourages the adoption of green architecture concept. Green and sustainable design has become an increasingly popular issue in both the preservation and new construction industries. With our threatened environment, it is imperative that we make sustainable living a part of our lives. The public benefits of both preservation and sustainability are very clear and there is no reason why these goals cannot work together. From studies, it is evident that sustainability in general is a huge field incorporating different dimensions and within that there are different areas to consider with regards to sustainable construction. Like the design process, the design of green buildings and sustainable environment involves creative arrangement of components and details to meet a set of specifications/guidelines subject to other constraints. The "green" architect or designer attempts to safeguard air, water, and earth by choosing eco-friendly building materials and construction practices. There is no doubt that sustainable development concepts, applied to the design, construction and operation of buildings can enhance both the economic welfare and environmental health of communities in Nigeria and other third world countries. This is more apt

in this era of climate change. There is no better time other than now for Nigeria to pursue green designs and technologies to combat present and future challenges.

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