

ASSESSING THE BENEFITS OF BIOPHILIC AND ENVIRONMENTAL STUDENT' ATTITUDE TO ITS DESIGN FOR URBAN SUSTAINABILITY: A CASE OF WAZIRI UMARU FEDERAL POLYTECHNIC, BIRNIN KEBBI

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Abstract

Biophilic elements are natural elements that promote closeness to nature. Green design is a basic form of the biophilic design elements. The aim of this paper is to examine the relevance of green infrastructure in sustainable development. The objectives are to; assess environmental benefits of biophilic design and; identify factors affecting biophilic design. The study employed both primary and secondary data. The sample frame as an estimated number of 841. The environmental students are made up of Urban and Regional Planning, Architecture, Quantity Surveying, Land Surveying and Geo-formatics, Estate Management and Building Departments. 265 copies of structured questionnaire were administered to the students. Descriptive statistics using frequency table and mean score was adopted for data analysis. The research deduced that all the environmental benefits of green environment identified, the respondents had satisfactory remark at a percentage that is not less than 72.5%. The research revealed that of all the factors identified to be affecting biophilic designs, the biophilic culture is mostly affected by rules and regulations affecting green design. It is recommended that biophilic education and awareness be promoted at all levels of government institutions, private sectors and at all government agencies.

Keywords; Biophilic, Cities, Design, Development, Green, Sustainable.

Introduction

The concept of biophilic design entails that good design, at the level of building, layout, city and regional scale, must incorporated with nature and natural elements (Beatley and Newman, 2013). It is largely dependent on the idea of *biophilia*, propounded by Harvard myrmecologist and a sociobiologist, E.O. Wilson. Wilson debated that humans evolved with the emergence of nature and human tendency increased with the need to connect and relate with nature so as to be healthy. Biophilia can thus be seen as the natural tendency and emotional attachment of human beings to other living organisms (Wilson, 2007). He posited that natural tendency is hereditary and hence forms ultimate human nature and that biophilia is a simple rule of learning developed with the thousand years of evolution and human interaction with the immediate environment (Wilson, 1993; Wilson, 2007).

According to Beatley and Newman (2013), Biophilic or green design can be adopted in reducing stress and sustaining the balancing physiologically, biologically and mentally. Biophilic design helps in sustainability by mitigating against disaster and any other shocks from both climate and

natural changes. The study in *The Lancet* deduced that populations with wide exposure to green areas are more likely to experience lower rate of mortality and that exposure to green areas can help reduce maintaining balancing in health (Mitchell and Popham, 2008). Godschalk (2003) on natural hazards characterized a resilient environment as one capable of resisting sudden and intense shock viz-a-viz the absence of immediate disorder or permanent harm.

The Aim of this paper is to examine the relevance of green infrastructure in sustainable development. The objectives are to; assess environmental benefits of biophilic design and; identify factors affecting biophilic design.

The Statement of Problem

Plessis (2003) emphasized that the sustainability of settlements is encompasses dimensional problem of various facets, especially in the aspects of institutional structure and capacity, human resource development, social relationships, and local customs and determinations. The conflicting parts of the constant usage in global natural resources give room to incessant rise in population (Kadiri, 2006).

Climate change will occur regardless of whether greenhouse gas emissions are reduced significantly. The effect of climate change on the built environment will depend on the sensitivity and adaptability of the systems (US Green Building Council, 2016). This pose a challenge to the global community especially third world nations who are faced with effects of climatic conditions in the area of flood, high humidity and condensation, dust and sandstorms, and solar radiation that affects the satisfaction of human being and also the safety of his immediate environment (Elimisiemon, Raymond & Hyeladzira, 2016). According to Beatley and Newman (2013), biophilic design is synonymous to green design and fostering the design of nature at the building, site, city and regional scale level. This therefore provides the basis for the study within the college of environmental studies.

The Concept of Biophilic Design

Biophilic design explains that good design of the building, location of site, beautification of city and the reflection at regional scale, must include green and other natural elements (Beatley and Newman, 2013). Biophilic cities are those that provide nearness and daily interaction with natural elements, and at the same time, seek to create awareness in caring for natural elements.

A biophilic city is one city in which inhabitants are involved in the activities of nature e.g. sky-gazing, gardening, watering, hiking, among many other activities. In biophilic cities, inhabitants are active in term of learning around, being entertained and also protecting natural elements around them and have developed important emotional connections with this nature (Beatley and Newman, 2013).

The Need for Green Design Development

The concept of green design is also known as *sustainable architecture* or *green architecture* (Elimisiemon and Kagai, 2016). It is an architectural philosophy that is associated architectural design that is environment friendly. It uses the principles of social, economic and ecological sustainability. The concept involves a conscious approach to energy and ecological conservation in the design of built environment. "Green architecture" as the indigenous approach of building practices with the goal of sustaining the ecosystem. It focuses on saving energy production and consumption (Odebiyi, Subramanian & Braimoh, 2010).

Green architecture is the systematic consideration of a project's life cycle impact on environmental and energy resources (Nwafor, 2006). According to Giaccardo (2004) green design is important in reducing or eliminating the negative impact of buildings on the environment and inhabitants in five broad areas like energy efficiency, sustainable site planning, safeguarding water and water efficiency, conservation of resources, indoor environmental quality and renewable energy,. The main goals of green architecture are to reduce depletion of natural resources (energy, water and raw materials), minimize negative impacts of environment caused by buildings and facilities throughout their lives, and to create better building environment (Nwafor, 2006).

Biophilic Cities, Urban Sustainability and Sustainable Development

The concept of green design is also known as sustainable architecture or green architecture (Elimisiemon and Kagai, 2016). It is an architectural philosophy that is associated architectural design that is environment friendly. It uses the principles of social, economic and ecological sustainability (Elimisiemon and Kagai, 2016). Green architecture is an indigenous approach of building practices with the goal of sustaining the ecosystem.

Sustainability is ideally understood as the overall frame of reference for guiding the development of city and for aiding cities to do many things at once. The definition of sustainability proposed by International Union for Conservation of Nature (IUCN), (1991). The IUCN stated that sustainability requires the enhancement of the quality of human life any given ecosystems. Aside to reduce their ecological footprints and resource needs, it also deepen relationships to landscape and place and at the same time enhance livability and quality of life while widening economic opportunities for the less privilege, among others. The environment aspect of sustainable development requires that we find a balance between protecting the physical environment and its resources, and using these resources in a way that will allow the earth to continue supporting an acceptable quality of human beings (Agenda 21 for sustainable construction in developing countries 2002).

The Brundtland report (UNWCED, 1987), defines sustainable development as development that meets the needs of the present without compromising the ability of future generations to meet their own needs. UN-Habitat (2002) sees sustainable city as one in which achievements are evident in social, economic and physical environment. According to Adegbite (2015), this definition included the three pillars of sustainability; the environmental, economic and social sustainability. Reffat (2004) interprets sustainable development to mean integrative and holistic process of maintaining a dynamic balance between the needs and demands of the people for equity, prosperity and quality of life, and what is ecologically possible.

Attributes of Sustainability in Green Design

According to Elimisiemon and Kagai (2016), there are five attributes of sustainability reviewed in this study. They include environmental, economic, biophysical, social and technical. According to Hill & Bowen (1997), the social attributes of green construction can be used to address the problems of inequality and poverty. The basic principle of social sustainability is to improve the quality of human life by security of basic needs, which are food, clothing, shelter, health, and beyond that by ensuring comfort, identity and choice. Social sustainability can be attributed to: raising the quality of human life, promoting cultural diversity, health security through training and capacity development, and then getting equitable distribution of the social benefits and intergenerational equity.

According to Sultan (2005), economic sustainability include Labour- promotion of employment by standardized size and the use of less machinery in construction projects associated with import reduction of machines, spares and foreign exchange savings); Energy efficiency policies in the use of low embodied energy materials such as granite, while reducing high energy materials such as cement and steel, reduction of energy in buildings through insulation, day lighting; Credit and Policies to select projects, strategies for ensuring the continuity of affordable infrastructure projects and the Strengthening of the rule of law in construction and land affairs; improving the administration and bureaucratic procedures. Thus, promoting material production and distribution, and then regular maintenance during the economic life span of buildings.

Bio-physical sustainable attributes include project design facilities that reflect consciousness of the nature of the ecology; the use of renewable building materials and designs that promote the prevailing cultural patterns and behaviours, materials and techniques; Prevention of pollution from construction activity and preserving sites in their natural state, usage of water reduction and conservation of rainwater collection and; the establishment of construction waste management and the reduction of energy use and on-site renewable energy (Wolley,2000)

The technical attribute of sustainability include a number of concepts, such as those related to the performance, quality and service of a building. The attributes seek to achieve consensus among interested parties on which principles are more and which are less important. Sustainable technical attributes include designing for flexibility, adaptability and durability of buildings. This attribute promotes the revitalization of existing urban infrastructure (Hill & Bowen, 1997; Sultan, 2005; wolley, 2000)

The purpose of process oriented principles is to formulate ways of achieving social, economic, biophysical and technical peculiarity of sustainability. First, there is the assessment of proposed activities and involve all stakeholders on the project in due time. At the second stage, affiliations of interdisciplinary collaborations and recognize the complexity and multiplicity of objectives inherent in the concept of sustainability and then establishing 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. There must be the accordance to legislation and regulations so as to manage all activities (Gardner, 1989).

Methodology

The study was carried out at the College Of Environmental Studies in Waziri Umaru Federal Polytechnic, Birnin kebbi, Nigeria. The research employed both primary and secondary data. The primary data made used of a structured questionnaire while the secondary data used include the use of relevant literatures in the form of Journals, and online materials. The sample frame as an estimated number of 841. The environmental students are made up of Urban And Regional Planning, Architecture, Quantity Surveying, Land Surveying and Geo-formatics, Estate management and Building department. Random sampling technique was adopted and the sample size determined using Krejcie and Morgan (1970)'s sample size table. As a result, a well-informed research with a total of 265 constituted the sample size and hence, 265 copies of structured questionnaire were administered to the students.

TABLE 1: Environmental Benefits of Green Environment

Environmental Benefits of Green Environment	1	2	3	4	5	Grand Total
Green design minimizes depletion of natural resources	124	80	22	39	0	265
Green design reduces negative impacts from buildings and facilities	85	129	41	5	5	265
Biophilic design helps landscape performance	146	94	15	10	0	265
Awareness of green aids positive mood and enhances livable cities	138	115	12	0	0	265
Biophilic design helps to expand economic opportunities for the least-advantaged	124	110	20	11	0	265
Extensive tree canopy helps in moderation of air pollutants and prevent noise pollution	160	95	10	0	0	265
Extensive tree canopy helps cooling through evapo-transpiration and shading	180	85	0	0	0	265
Green designs help to reduce consumption of energy for heating and cooling	162	65	38	0	0	265
Outdoor oriented activity in a green cities promote and foster social interaction	140	52	13	0	0	265

Source: Field survey, 2020 (1-Very Satisfied, 2- Satisfied, 3-Moderately Satisfied, 4-Fairly Satisfied and 5-Not at all satisfied).

Table 1 reflects the environmental benefits of green environment. On the respondents' opinion on the use of green design for minimizing depletion of natural resources, very satisfied and satisfied have frequency value of 124 and 80 respectively. These two contributed to a percentage of 77.0% of the total respondents. On the use of Green design reducing negative impacts from buildings and facilities, the respondents had 85 and 129 frequency value respectively for very satisfied and satisfied. These frequencies contribute to 80.0% of the total respondents. On the feedback on the biophilic design helping landscape performance, the frequency values of very satisfied and satisfied are 146 and 94 respectively. The two options contribute to 90.6% of the total respondents. On the awareness of green aiding positive mood and enhancing livable cities, the frequency values of the respondents for very satisfied and satisfied are 138 and 115 respectively. These result into 95.5% of the total respondents. On the biophilic design helping to expand economic opportunities for the least-advantaged, the frequency values for very satisfied and satisfied are 124 and 110, the percentage of which is 88.3%.

On the respondents' opinion on extensive tree canopy helping in moderation of air pollutants and preventing noise pollution, the frequency values for very satisfied and satisfied are 160 and 95. The percentage of which contribute to 96.2% of the total respondents. On the respondents'

opinion on extensive tree canopy helping cooling through evapo-transpiration and shading, the frequency values for very satisfied and satisfied are 180 and 85. The percentage of which is equivalent to 100%.

The respondents' feedback on the use of Green designs to reduce consumption of energy for heating and cooling, the frequency values for very satisfied and satisfied are both 162 and 65. The percentage of which contribute to 85.7% of the total percentage of the respondents. On the Outdoor oriented activity in a green cities promoting and fostering social interaction, the frequency values for very satisfied and satisfied are 140 and 52 respectively. These frequency values contribute to a percentage of 72.5% of the total percentage of the respondents.

TABLE 2: Factors Affecting Biophilic Design

Factors Affecting Biophilic Design	Frequency	Percentages
Cultural norms can affect green design	18	6.8
Absence of care and concern for nature	7	2.6
Rules and regulations can affect green design	100	37.7
Finance can affect green cultivation	85	32.1
Fear of some living organism can affect green design	55	20.8
Total	265	100

Source: Field survey, 2020

Table 2 identified factors affecting biophilic designs. 6.8% of the respondents agree that Cultural norms can affect green design, 2.6% of the respondents are of the opinion that the absence of care and concern for nature is a factor affecting biophilic design. 37.7% of the respondents agree that rules and regulations can affect green design, 32.1% of the respondents attribute finance as the factor affecting green cultivation while 20.8% of the respondents show that the fear of some living organism can affect green design. This implies that rules and regulations to establish biophilic culture within the students are the major factors affecting biophilic designs.

Conclusion and Recommendations

The study examine the relevance of green infrastructure in sustainable development. The research deduced that all the environmental benefits of green environment identified, the respondents had satisfactory remark at a percentage that is not less than 72.5%. For instance, of all the most rated percentage of respondents' satisfaction, extensive tree canopy helping in moderation of air pollutants and preventing noise pollution had 96.2%, while biophilic design helping landscape performance had a rated satisfaction by the respondents at 90.6%. This is immediately followed by green designs in reducing consumption of energy for heating and cooling at 85.7% of satisfaction by the respondents. The research revealed that of all the factors identified to be affecting biophilic designs, the biophilic culture is mostly affected in the following order; rules and regulations can affect green design, finance is one of the factor affecting green cultivation and fear of some living organism affect green design.

It is recommended that biophilic education and awareness be promoted at all levels of government institutions, private sectors and at all government agencies. It is also recommended

that biophilic institution and governance be promoted to make people socialize and familiar with their rules and regulations.

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