

SUSTAINABILITY IN THE BUILT ENVIRONMENT: THE CHALLENGE OF THE NIGERIAN ARCHITECT

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ABSTRACT

Among the several challenges which tend to redefined and broaden the role of the architect in the built environment in the last two decades, environmental sustainability is incontrovertibly the major one. Environmental degradation is one of the effects of global warming caused by man's activities in the global environment. The architect as the custodian of the built environment must wake up to his responsibilities in combating the challenges posed by the products of environmental degradation such as global warming and climate change through sustainable architectural principles and practices. This paper therefore discusses the principles of environmental sustainability in the face of global warming and climate change as a challenge to the architect. The paper also identifies drivers for a sustainable built environment and finally set up an agenda for the architect towards meeting current and future challenges. In order to achieve a sustainable built environment, the paper posited that the approach to the design of the built environment should be such that materials and designs are more energy efficient and less of greenhouse gases emission into the atmosphere.

Keywords: Sustainability, Built Environment, Energy Efficient, Environmental degradation, Global Warming

INTRODUCTION

Sustainability means to ensure economic growth and social progress to meet the needs of the present without compromising the health of the ecosystems that support us, or the ability of future generations to meet their own needs (Brundtland report *In* United Nations, 1987). The concept of sustainability is built on the realization of the need to alleviate the global crisis in a systematic manner that integrates human, ecological and economic factors. Sustainability can bring about efficiency. Efficiency in the broad senses is realized if a determined goal is achieved with minimum input or, alternatively, a certain fixed input is used in such a way that it leads to a maximum output.

Sustainable development in the face of global challenges occasioned by the fall out of technological advancement cannot be achieved without the architect playing a vital role. Architecture involves both the process of planning, which is design, and the product of planning, which is the built structure. Architecture is produced through a complex analysis and coordination of various factors including culture, climate, environment, social behaviour, technology, health and safety, client preferences and cost among others. In recent times, sustainability issues have become an important factor requiring the attention of the architect in his approach to the design and production of.

The history of architecture proves that architecture from prehistory to post-modern period developed in line with available resources and in response to socio-political and religious beliefs of the people as well as the constant changes in the environment and climate. Advancement in science and technology also brought about new challenges for the architect. The built environment provides us all with the most direct, frequent, and unavoidable images and experiences of everyday life. The presence or absence of buildings, the geometry of spaces, the human scale of architecture and relationships between spaces and buildings and deeply felt feelings of security, fulfilment, gregariousness and community all take their cue from the shape, form and quality of the built environment (Smith, Whitelegg and Williams, 1998). Most Nigerian cities are developing into materialistic societies which live in a built environment that is being extended and continually recreated at the expense of the earths' capital resources.

The current global challenge which has brought new challenges to the architect is environmental degradation. Environmental degradation is one of the ten threats officially cautioned by the high level threat panel of the United Nations (1987).

The United Nations international strategy for disaster reduction defines environmental degradation as "the reduction of the capacity of the environment to meet social and ecological objectives and needs". Environmental degradation is of many types. When natural habitats are destroyed or natural resources are depleted, the environment is degraded.

The product of environmental degradation which includes deforestation, desertification, pollution, climate change and global warming are major problems in the global environment. The built environment which is part of the global environment is not only affected by these phenomena but can itself impact negatively on the global environment, if necessary measures are not taken. Sustainability in the built environment is a concept that can be employed to mitigate these effects.

This paper seeks to discuss the challenges and the role the architect can play through his work to ensure sustainability in the environment.

DRIVERS FOR SUSTAINABLE BUILT ENVIRONMENT

The concept of sustainable development is a result of the awareness and need to preserve resources, conserve energy and protect the environment for the future. Sustainable development encourages the conservation and preservation of natural resources and of the environment and the management of energy, waste and transportation (Hui, 2002). One of the greatest challenges facing humanity is environmental degradation, including deforestation, desertification, pollution and climate change is an issue of increasing concern for the international community (Saferenvironment, 2008). Professionals that contribute to the activities of the built environment must work together at all levels to lessen the risks associated with environmental degradation and its contributing factors, such as climate change and ensure that the built environment is friendly and sustainable.

As experts in the built environment, consideration should be made on the environmental compatibility of building material use and construction. The use of green building products does not necessarily mean that the structure is sustainable or energy efficient. A sustainable environment should be design to encompass both green architecture and also be sensitive to the environment. There has been environmental problems and threat to sustainability due to over-consumption, water shortages, pollution and global warming.

Environmental degradation can lead to a scarcity of natural resources and loss of biodiversity. According to Smith et al (1998), global changes in the rate of consumption of raw materials and energy, the conversion of agricultural land to developed land, the loss of rain forest both tropical and temperate and the associated waste, pollution and loss of biodiversity have been documented in great details. Environmental efficiency can be increased through greater energy efficiency or recovery of waste heat and also closing resource loops by increasing reuse, recycling and salvage of resources. Environmental issues cannot be separated from social issues. Welfare efficiency requires a much more diverse social and economic system with many more possibilities for satisfying lifestyle requirements than at present (Smith et al, 1998). Welfare efficiency in an environment requires the built environment that protects and enhances the health of its occupants for high productivity.

The concept of sustainability is built on the realization of the need to alleviate the global crisis in a systematic manner that integrates human, ecological and economic factors. The key drivers of sustainable built environment in line with this concept therefore are:

1. Ecological damage
2. Natural resource depletion
3. Concern for intergenerational flow of natural and man-made resources
4. Climate change and global warming

Ecological damage

Different materials and products use in the modification and planning of the built environment affect the environment at all stages in their life-cycle from raw materials extraction, to manufacturing, use and disposal. Ecological impacts can be measured using different studies such as life-cycle analysis, impact assessment, energy modelling and environmental auditing. The extent of ecological or environmental damage depends upon the nature of the materials employed, how and when they are obtained, what combination of materials are used in manufacture, how energy is used, how product is transported, how it is disposed of and whether it can be recycled in whole or part.

In order to safeguard the environment and the ecology, there is a need to develop a policy towards clean products. Architects, specifiers and engineers are to promote the design, production and marketing of products which have a reduced environmental impact during their entire life-cycle.

Natural resources depletion

The regular consumption of materials for construction has negative impacts on the environment and ecosystems; and the extraction of raw materials from the nature leads to resource depletion and biological diversifications. Around 50% of all global resources go into construction industry, with a specific example being that 70% of all timber is used for buildings (Edwards and Hyett 2001). It is therefore important to choose and use materials that do not lead to natural resources depletion, and sustainable enough to meet the challenge of providing for today's use and not endangering the generation of tomorrow.

According to Wikipedia (2010), resource depletion is an economic term referring to the exhaustion of raw materials within a region. Resources are commonly divided between renewable resources and non-renewable resources. The use of either of these forms of resources beyond their rate of replacement is considered to be resource depletion. A lot of natural resources such as forestry (timber), rocks, soil, water and fossil fuels are daily being depleted in the construction of buildings. This is a major challenge to the architect as he tries to shape the built environment.

Natural resources are being depleted as a result of economic growth and high consumption rate in our today's society. Energy generation, industrial processes, transport, high-input agriculture and domestic consumption continue to make bigger and bigger demands of the capacities of the earth and the atmosphere to absorb CO₂, Sulphur, NOX and Methane emissions, CFCs, and a range of toxic chemicals (David, 1996). The selection of eco-friendly materials of construction that can easily be regenerated is a way for providing quality built environment. Sustainability ensures the concept of conservation, development, reduction in resource depletion and a control of natural resources. The application of sustainable design principles will bring about conservation of natural resources.

Concern for Intergenerational Flows of Natural and Man-made Resources

There is the growing concern for natural and man-made resources to flow from one generation to another. Natural resources can be categorised into renewable and non-renewable. Sustainability concept will ensure that these resources are either renewed or recycled to ensure its flow for tomorrow's use.

Global warming and climate change

Global warming and climate change should be a general concern of the sustainable development issues of any country. Construction maintenance and use of buildings impact substantially on our environment and is currently contributing significantly to irreversible changes in the world's climate, atmosphere and ecosystem (CIOB, 2002). The process of manufacturing and transporting materials of construction in the built environment consume a lot of energy. This energy is sources for the emission of green house gases (GHG) that contribute for global warming and acid rain. Green house gases (GHG) are the by-product of the extravagant consumption of energy. Landfill from construction waste materials contaminate air and water producing an unhealthy environment which can be life threatening and hazardous.

According to the declaration on sustainability and cultural diversity approved by the International Union of Architects UIA (2008), the building and construction industries, and the processes that create, modify and remove built structures, and, the whole-of-life operation of those facilities represent half of our opportunity to resolve today's climate challenge. Construction professionals especially the architects in their designs should develop better building plant design and management, design more energy efficient buildings through exploiting technical innovation to reduce pollution and waste and the use of renewable resources of energy.

DESIGN APPROACH TOWARDS SUSTAINABLE DEVELOPMENT IN THE BUILT ENVIRONMENT

McLennan (2006) defined sustainable design as "a design philosophy that seeks to maximise the quality of the built environment, while minimizing or eliminating the negative impact to the natural environment. The goal of sustainable design is to create optimum relationship between people and their environment (Denver service centre, 1993). In a finite world, however, in which the human population is set to double and natural capital is depleted and degraded in increasing quantities, we cannot assume that resources exist in sufficient quantity to continue to meet fundamental needs (David, 1996). Buildings and their arrangement in settlements have negative impact on the environment and its inhabitants. Designing with the local climate of an area is a strategy towards achieving a sustainable environment. Adopting a design philosophy that seeks to produce low energy buildings which are sympathetic to the climate can create an environment with low impact and maximize renewable energy use.

The energy performance of buildings within the built environment is critical to bringing emissions under control. It is imperative to design buildings within environmental limits and make more efficient use or maximize renewable energy use. The consumption of non-renewable resources within the built environment

Sustainability in the Built Environment: The Challenge of the Nigerian Architect

reduces the quantity that would be available for tomorrow's use. The architect or the designer of the built environment is to try to formulate design approach for the sustainable use of natural resources both present and the future. Due to the massive environmental damage especially in developing countries, the need for people to appreciate that sustainable design is about delivering real benefits cannot be overemphasized.

A sustainable policy on non-renewable materials should involve an economic and better use in order to allow a large quantity for tomorrow's use rather than a total ban on their consumption. A well design built environment cannot do without the consumption of some of these non-renewable resources. However, the depletion of non-renewable resources should be minimized. On the other hand, the extraction of renewable resources should not exceed how much it is renewed and must not destroy the biodiversity of the ecosystem.

Key sustainable design strategies towards the goal of sustainable development are:-

1. Design with climate (passive architecture): Having a comprehensive knowledge and understanding of heat transfer and fluid mechanic. Passive architecture refers to the effective harnessing of climate and environment to heat, cold, ventilation and illuminate buildings. A design philosophy that seeks to produce low energy building which are sympathetic to the climate.
2. Maximise or optimized use of other natural and renewable resources through designing for best use of sunlight and wind.
3. Design for low environmental impact: Building materials should be low in maintenance, with minimal environmental impact.
4. Design for durability and re-use
5. Design for healthy and minimize environment pollution
6. Enhance biodiversity
7. Use of on-site and locally available materials and indigenous vegetation. On-site recycling of waste is an important aspect of sustainable design practice.
8. Respect for people and the local environment.

AGENDA FOR THE ARCHITECT TOWARDS MEETING THE CHALLENGES OF SUSTAINABLE BUILT ENVIRONMENT

Architecture presents a unique challenge in the field of sustainability. Architecture is all about the creation and responsible management of healthy built environment. For a sustainable built environment to be created or constructed, it must be based on resource efficient and ecological principles. A sustainable built environment can be made to be cost effective through efficiency improvements and reduced energy and raw material inputs. According to Hui (2002), the idea of environmental sustainability is to leave the earth in as good or better shape for future generation than we found it for ourselves. The challenges of sustainable built environment to the Nigerian architect go beyond simply reducing the environmental impact of materials used but rather a consideration of how the built environment has been designed to meet the needs of today and future generations. Sustainable architecture is a general term that describes environmentally conscious design technologies in the field of architecture (Wikipedia, 2010).

The creation of a sustainable built environment is achieved by the minimization of non-renewable resource consumption in order to enhance the natural environment. Consideration must be made by the architect of the entire life-cycle of buildings, taking environmental quality, functional quality and future values into account. In the aspect of quality design of buildings and embodied energy, an integrated and systematic approach including environmental management system can be developed to achieve resource efficiency and energy efficiency. The design considerations does not only involve the house form, but start out with questions of function, before addressing issues such as material use, land use and planning.

The design and organization of the built environment also involves opening up of the process to ordinary people and allowing them active involvement in, and a feeling of ownership of the built environment around them. Community participation in the design of the built environment is a social dimension of its sustainability. The design of the environment should be all inclusive and accessible even to the most disadvantaged group. The architect who is a major contributor to the built environment must create spaces and use materials with minimal resource consumption and that are from renewable resources. Materials with toxic substances are to be eliminated in order to reduce the effect of green house gases (GHG) emission.

CONCLUSION

Sustainability is now seen as a restraint on hazardous built environment and a driver which improve on the quality of life of all within the environment. There is now ample knowledge in existence for the Nigerian architect to show commitment and responsibility in creating a sustainable built environment for better growth and productivity. In achieving a sustainable built environment in Nigeria, the architect needs to cope

first with the non-sustainability of the existing built environment. Sustainability of the built environment requires a fundamental shift in values and behaviour of the architect and professionals to a more holistic view of what constitutes quality of life within the environment.

From this study, it is evident that there are links between the environment, the society and the architect as the modifier of the built environment. In the design of the built environment, there is a need to move towards social relations which provide more cohesion and fulfilment and which encourage more environmentally friendly lifestyles. A fiscal measure should be set up to produce an economy that is much more locally based, as it becomes cheaper to produce and buy products from the local area which result in a reduction in the total embodied energy of material consumption. For individual buildings, a higher standard of insulation and greater care in the choice of heating systems and building materials can make a significant contribution to reducing their environmental impacts.

There must be reduction in the level at which materials, energy and space are used such that buildings, settlements and means of transport make fewer demands on resources and create less waste and pollution.

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