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PASSIVE CONTROL OF ENERGY: ACHIEVING SUSTAINABLE ARCHITECTURE IN PUBLIC AND INSTITUTIONAL BUILDINGS THROUGH PASSIVE STRATEGIES IN ANAMBRA STATE, NIGERIA

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Abstract
Nigeria confronts some energy-related issues and currently produces insufficient energy to meet the country's population's needs. Plans and initiatives have been developed nationwide to increase energy production. Nigerians self-generate a sizable amount of their electricity as a result, using highly polluting off-grid alternatives that are more than twice as expensive as grid-based power. Due to high energy usage, buildings, and energy systems are dealing with a variety of problems. Due to population expansion, increased building use, and increased desire for comfort and satisfaction in buildings, there is an increase in the energy demand in buildings. Due to the rise in individual energy needs, total energy consumption has recently been expanding more quickly than the population. Passive design systems can be used to improve energy efficiency in buildings through the use of natural elements. This paper aims to investigate passive design strategies and the impact of passive systems such as natural ventilation and natural lighting on improving energy efficiency. The disciplinary area of focus is tropical architecture, as such, the instrument of one research strategy: descriptive research method, and its tactics were used. The Unizik Senate building in the region will stand out as a distinguished institution that will enrich and improve the perception of the academic community. Most buildings in developing countries are often designed without taking sufficient account of the climate. Consequently, buildings often have a poor indoor climate, which affects comfort, health, and efficiency In the process, energy-consuming facilities which rely only on active mechanisms are growing without remedies. The provision of an energy-conserving facility will go a long way in saving cost and revenue for the school at the same time embracing the climatic factors which would enhance comfort within the facility. Hard evidence exists, showing that energy-efficient buildings help to maximize the climate and surroundings within which aids in the control of energy within the buildings as a result, this paper recommends achieving energy efficiency through passive design in Unizik Senate building

Keywords: *Architecture, Awka, Energy, Efficiency, Passive, Senate, Sustainable*

Introduction
The image of the university as a place where scholars can freely pursue knowledge without excessive interference from anybody or anything is a common one. Every university has its statutes or edicts that outline the duties of the various departments, faculties, committees of deans, and other organizational units (Ekundayo and Adedokun, 2009). The university which is a structured environment is saddled with the responsibility of providing facilities for teaching, learning, and research and is authorized to grant academic degrees, and carries out its academic functions with the aid of a relatively large, deliberative, and

participative body known as the University Senate (Birnbaun, 1989)

The term university was carried from the Latin word "universitas" meaning a corporation; a group of people organized for a specific purpose. The university has a noble image as a foundation of profound knowledge and an incubator of human resources. The word *universitas* originally applied only to the scholastic guilds, that is, the corporation of students and masters within the *studium*, and it was always modified, as *universitas magistrorum*, *universitas scholarium*, or *universitas magistrorum et scholarium*. Eventually, probably in the late 14th century, the term began to appear by itself to exclusively mean a self-regulating community of teachers and scholars recognized and sanctioned by civil or ecclesiastical authority. (Encyclopedia Britannica: History of Education. The development of the universities, 1911)

The university senate is therefore defined by (Birnbaum, 1989) as the highest academic decision-making body in the university, chaired by the Vice-chancellor, and has both professional and nonprofessional academic staff as members, therefore a senate building can hence be defined as a building that houses the decision making body of a university. It is the deliberative body for the discussion of University-wide policies and proposed changes in University practices and structure. The Senate sets its agenda with particular concern for academic programs and structure, personnel and budgetary policies, development of facilities, and community, professional, and educational relations of the University.

Anambra State University of Technology (ASUTECH), which is no longer in operation, gave birth to Nnamdi Azikiwe University. ASUTECH, which was founded by the government of the former Anambra state under Law No. 7 on July 30, 1980, operated as a multi-campus university with campuses in Abakiliki, Enugu, Awka, and Nnewi. The former Anambra State was divided into the Anambra and Enugu States in 1991. By Decree No. 34 issued on July 15, 1992, the Federal Government assumed control of Nnamdi Azikiwe University. Nnamdi Azikiwe University was established on a campus. Thus, Nnamdi Azikiwe University became a Federal University (www.unizik.edu.ng. (Retrieved February 22, 2015) One of the fundamental requirements of buildings is the protection of people who live and work within, from inclement of weather. Buildings in developing countries are often designed without taking sufficient account of the climate. Factors such as the urban surroundings or site characteristics, orientation and architectural design of the building, choice of building materials, etc are not given enough importance. Consequently, buildings often have a poor indoor climate which affects comfort, health, and efficiency. The problem is found according to (Roselund, 2000) in dwellings as well as places, work, and public buildings.

Buildings are responsible for the largest share of energy use and carbon emissions, hence their prominence in the sustainability debate. Two evolving crises that will bear hard on the construction industry. The first is the accelerating pace of climate change; the second is the growing uncertainty about the security of supplies of fossil fuels. (Peter F. Smith, 2010)

Winston Churchill said 'We shape our buildings, and afterward our buildings shape us'. The reverse is now probably true for

climate – it has shaped human activity, and now human activity is shaping the climate.

The objective of an environmental building design is the creation of a comfortable and also energy- efficient internal environment and the success of this relies on the rudiments of the climatic nature of the environment. Consequently, the study of the interactions between buildings and climate (building climatology) is as old as the concept of shelter itself. Early civilizations demonstrated a deep understanding of how built form could work with the prevailing climate to create habitable and comfortable internal environments. Caves were an early form of shelter that offered summer cooling and protection from wind, rain, and snow. The Greek, Xenophon, in 400 BC, described the design and orientation of openings to provide natural heating and cooling in buildings. The Roman architect Vitruvius, in the first century BC, included in his famous Ten Books on Architecture advice on Passive solar design and natural ventilation.

Heating and cooling of buildings account today for high energy consumption. Higher living standards lead to active methods of adjusting the indoor climate of buildings such as offices, hotels, and other public buildings as well as residences. Air conditioning plants are installed without any adaptation of the buildings to these new appliances, which leads to excessive consumption and high cost, and may also damage the buildings. (Adamson , Aberg 1993)

To ensure comfort, these structures frequently consumed large amounts of energy. A revived interest in designing climate-sensitive buildings has arisen as a result of worries about fuel prices, environmental impact, sustainability, and occupant health. In today's low-energy, sustainable, and environmentally conscious structures, many of the methods that were intuitively understood in the past are being explored and used. Passive design is about ensuring that the fabric of the building and the spaces within it respond effectively to local climate and site conditions to maximize comfort for the occupants. Using passive design principles can reduce temperature fluctuations and make a building drier, quieter, and more enjoyable to live in. The basic idea of passive design is to allow daylight, heat, and cool airflow into a building when it is needed. The objectives are to control the entrance of sunlight and air flows into the building at appropriate times and to store and distribute the heat and cool air so it is available when needed. Many passive design options can be achieved at little or no additional cost. Others are economically viable over a building's life cycle. Natural processes and the architect's vision are used in passive design. Passive strategies adjust to environmental conditions primarily through architecture and should be considered before active. This means that the architect must be strategic. It means using the resources on-site rather than importing energy from a remote source. Passive Design is achieved by using ventilation, use of courtyards, and microclimate coupled with the configuration and thermal properties of the building. In addition to cooling, ventilation is necessary to provide for the respiration of the occupants and also to control the level of pollutants inside a building.

The need to reduce our consumption of energy and to give users more control over their immediate environments are good reasons for designers now to reevaluate the role of natural ventilation in buildings and to become familiar with the basic principles involved (Richard, 2007).

Energy efficiency in simple terms, means using less energy to perform the same tasks and functions. For office buildings, this could mean reducing the amount of energy needed for heating by improving the insulation of the office building, introducing lighting control, or also regulate space heating and cooling. In 1991 the United Nations described energy-efficient buildings as buildings with minimum levels of energy inputs. Well-designed passive buildings are energy-efficient buildings as they maintain the best indoor environmental comfort for humans with minimum energy consumption.

Aim of Study

This paper aims to bring to the attention of the University community, the need to design and create an Energy Conserving University Senate building that will be located in Awka Campus of UNIZIK. Anambra State.

Research Method

This work, Unizik Senate building, investigated the spatial integration of the buildings that correspond to passive design strategies in Unizik Awka and the architectural solutions to improving the use of passive design strategies in infrastructures in Unizik. The author was careful with the analytical instrument and tools used. The disciplinary area of focus is tropical architecture, As such, the instrument of one research strategy: the descriptive research method and, its tactics were used. Descriptive research is an appropriate choice when the research gears to identify characteristics, frequencies, trends, and categories. When there is limited information available on a subject or issue, it is helpful. You must comprehend the circumstances surrounding an event before you can determine why it occurs. A phenomenon's qualities and objective are to be described. In order to collect data, observation, surveys, and case studies are frequently used (Gall et al., 2007).

Findings

The Unizik Senate building in the region will stand out as a distinguished institution that will enrich and improve the perception of the academic community. Anambra State was created from the former East Central State. Nigeria once had an administrative division called East Central State. It was established on May 27, 1967, from portions of the Eastern Region, and it lasted until February 3, 1976, when it was split into the two states of Anambra and Imo. According to East Central State (2006), Anambra, Imo, Enugu, Ebonyi, and Abia are the current five states that make up the Anambra and Imo States. Anambra State is located in the southeast geopolitical zone of Nigeria. The state is an inland state with its capital in Awka. Its name was inspired by one of its Northern and riverine clans *Anam* but merged with "branch". The colonialists who traveled from the present-day Anambra region to present Northern Nigeria often described where they were coming from as "Anam branch". The term, coupled with Omambala, the Igbo name of the Anambra River, formed the name Anambra. Onitsha, a historic port city from pre-colonial times, has developed as by far the largest urban area in the state. The state's theme is "Light of the nation". The people of the state are warm, hospitable, and highly enterprising and could be found engaged in trading all over the country. The state is comprised of 21 local government areas namely: Aguata, Anambra West, Anambra East, Awka North, Awka South, Anaocha, Ayamelu, Dukunofia, Nnewi North, Nnewi South, Oyi, Onitsha North, Onitsha South, Ogbaru, Ekwusigo, Njikoka,

Idemili North, Idemili South, Orumba North, Orumba South, and Ihiala. (www.cometonigeria.com). Anambra State was created in 1976 from the old East Central State with its capital at Enugu. A further reorganization of the Nigerian federation in 1991 saw the state divided into two states- Anambra and Enugu states- with its new capital at Awka. (www.cometonigeria.com). Anambra State University of Technology (ASUTECH), which is no longer in operation, gave birth to Nnamdi Azikiwe University. ASUTECH, which was founded by the government of the former Anambra state under Law No. 7 on July 30, 1980, operated as a multi-campus university with campuses in Abakiliki, Enugu, Awka, and Nnewi. The former Anambra State was divided into Anambra and Enugu States in 1991. By Decree No. 34 issued on July 15, 1992, the Federal Government assumed control of Nnamdi Azikiwe University. Nnamdi Azikiwe University was established on a campus. Thus, Nnamdi Azikiwe University became a Federal University (www.unizik.edu.ng. (Retrieved February 22, 2015). From its inception, the University Senate has been within the administrative block of Nnamdi Azikiwe University but presently holds its meeting in the school auditorium. However, the Senate Building has been adequately provided for in the University Master Plan. This underscores the understanding of the Master Plan designers of the need for a Senate Building which is a necessity to the university system. During the tenure of Vice-Chancellor Egboka, the council held her meetings in the Senate Chambers, but as a reason of population growth, there was a move to the school auditorium during the tenure of Vice Chancellor Ahaneku. (www.unizik.edu.ng. Retrieved 22 February 2015)





Plate 1:- Pictures of the school auditorium where the senate meeting has its meeting
Source:- Ndulaka , 25 Oct, 2021



Plate 2:- Admin building with a provision of Senate chamber on the last floor
Source :- Ndulaka, 2021



Plate 2:1 Ariel View of Admin building
Source:- Ndulaka, 2021

Conclusion

Unizik remains a growing academic community and with an edifice like the senate building, the project would be befitting to the image of the school. Building energy efficiency may be increased using passive design techniques. Both ventilation and lighting play a big role in determining how comfortable building occupants are; a large percentage of occupants believe ventilation to be the most essential comfort aspect and would prefer to have control over it. Passive design strategies should be adopted from the initial design phase of a building. Orientation and building shape provide a significant influence on how natural ventilation and natural lighting would have access to the building while minimizing solar heat gain, solar glazing and shading devices also reduce solar heat gain and can allow adequate natural light into spaces in the buildings, while natural ventilation helps reduce the constant use of artificial ventilation. These passive design strategies if properly adopted can greatly promote energy efficiency in residential buildings and also reduce energy

consumption. Buildings should be designed to provide adequate natural lighting and ventilation while giving building users control over these factors. The provision of an energy-conserving facility will go a long way in saving cost and revenue for the school at the same time while embracing the climatic factors which would enhance comfort within the facility

Recommendation

Hard evidence exists, showing that energy-efficient buildings help to maximize the climate and surroundings within which aids in the control of energy within the buildings as a result, this paper recommends achieving energy efficiency through passive design in Unizik Senate building

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