www.cenresinpub.org
ISSN 2277-0100

CHALLENGES AND PROSPECTS FOR ECOLOGICAL CONSCIOUSNESS IN THE DESIGN OF ACADEMIC LIBRARY: THE CASE OF TERTIARY INSTITUTIONS IN YOLA, NIGERIA

AYUBA B.I. AND JALLALUDEEN M.
Department of Architecture,
Modibbo Adama University of Technology, Yola, Nigeria.
E-mail: jadeenmuazu@gmail.com.

ABSTRACT: This paper aims to determine the challenges and prospects for the design of academic library within the context of ecological consciousness by investigating the attributes of sustainable architecture based on the analysis of three tertiary institution libraries in Yola, Nigeria. Using questionnaire survey and the attribute developed from literature review on sustainable architecture and ecological conscious design, the findings suggest that ecological consciousness is not effective in two of the cases as all the attributes were either absent or not considered. The research hence contributes some recommendation that shows that the design of ecological conscious building will vary base on the type of building, geographical location and other ecological factors which should be critically analysed in the design and the fact should be used throughout the design stage to the construction.

Keywords: Ecology, Building Design and Library

Introduction:

Buildings have a major part to play in meeting the emission reduction targets: According to EU INTEND (2006), the world is facing a critical situation regarding energy supply uncertainty and dependency on imported fuels and more than one fifth of the present energy consumption and up to 30-45 mega tone of CO2 per year could be saved by applying more ambitious and ecological conscious buildings. In 1992 conference "The Agenda 21; the earth summit to save our planet", a preposition which world is presently on the path of energy production and consumption which cannot be sustained was reported where individuals and groups around the world have a set of principle that will change world economics and trade policies by making design profession not what new products make but how to reinvent design culture that will make designers realize that design has historically been a dependent, contingent practise rather than one based on necessity and the conference emphasized that designers should be challenged by human problems . These problems were mentioned to six themes: quality of life, efficient use of natural resources, protecting the global commons, managing human settlements, the use of chemicals, the management of human industrial waste, and fostering sustainable economic growth on the global scale.

The basic premise of this paper is that, although ecological consciousness is the first step to be considered in the design to solve dependence on external energy by buildings, design practice in many cities is been done without considering ecological factors which result to building with extremely dependency on external or imported energy. This paper following a background knowledge and discussion focuses on the analysis and assessment of high institution academic libraries in terms of their consideration of ecological consciousness in order to determine the challenges and prospects for academic libraries in Yola, Nigeria and other locations that have the same ecological factors.

Academic Library

The term "Academic library" is a broad and might mean different things to different people. It is generally used to refer to as that vicinity where we acquire reading materials such as: books, journals, etc. It is primarily created to serve a college or university and its main users are the students, faculty and the staff at the institution.

Ecology

The term:"Ecology" is the science of the relationship between organism and their environment. It has spread rapidly in the 20th century from technical to general use to mean the study of the interaction of people with their natural environment. This has also shown how people interact with their environment in the construction industries by considrring these ecological factors during design and construction. Which are rainfall, temperature, humidity, wind intensity, sun intensity and etc. Ecology has also produced the prolific prefix "Eco" as in eco-label, eco-design, eco- correct, and etc (Ian 1971).

Ecological Design

The term "Ecological design" is any form of design that minimizes environmental destructive impacts by integrating itself with living processes (Sim et al., 1996). It helps connect scattered efforts in green architecture, sustainable agriculture, ecological engineering and other fields. The inchoate developing nature of ecological design was referred to the adding in of environmental factors to the design process. This was undertaken by including life cycle models and through energy and material flow, ecological design was related to the new interdisciplinary subject of industrial ecology. Industrial ecology meant conceptual tool emulating models derived from natural ecosystem and a frame work for conceptualizing environment and technical issues (Anne-mare 1991). Although the earlier invention inclined energy adjusting the ecological balance, the latest population growth after industrial revolution led to change ecology abnormally (John 1968).

Ecological Design Issues and the Role of Designers

Since industrial revolution many proposition in design field were raised on the unsafe environment. The architect designer Victor (1965) suggested that industrial design has murdered by creating new species of permanent garbage and by choosing materials and

processes that pollute the air. For these issues R. Buckminster Fuller who was invited as university professor at southern Illinois University in Carbondale in 1960s demonstrated how design could play a central role in identifying major world problems between 1965 and 1975. That included following contents:

i. Review and analysis of world's energy resources.
ii. Defining more efficient uses of natural resources such as metals.
iii. Integrating machine tools into efficient systems of industrial production.

Advantages of ecological conscious design

- Environmental Benefits
  a. Enhance and protect ecosystem and biodiversity.
  b. Improve air and water quality.
  c. Reduce solid waste.
  d. Conserve natural Resources.

- Economic Benefits
  a. Reduce operating cost.
  b. Enhance asset value and profit.
  c. Improve employee productivity and satisfaction.
  d. Enhance asset value and profit.
  e. Optimize life cycle economic performance.

- Health and Community Benefit
  a. Improve air, thermal and acoustic environment.
  b. Enhance occupant comfort and health.
  c. Minimize strain on local infrastructure.
  d. Contribute to overall quality of life. (LEED 2011).

However given the diversity of location in terms of the economic, cultural and ecological settings, it is difficult to apply each of these criteria to the concept of designing an academic library. The ecological factors of each location vary on that ground it might be unrealistic to expect unattended colleges and university of the state government to attach much importance to long time environmental sustainability as the more comfortably placed proponents colleges or universities of the federal government.

Research Context and Method

The Case

The city of Yola is the capital and administrative centre of Adamawa State, in Nigeria (figure), it is located in the upper Benue valley at the north eastern part of Nigeria on the latitude 9.14^0 and longitude 12.8^0, the city has a tropical climate marked by dry and rainy seasons, the Hamattan, the driest months of the year is January and February when the

relative humidity drops to 15^0, however this sometimes varies, the maximum temperature is 46^0, River Benue pass through it. The city has three high institutions.

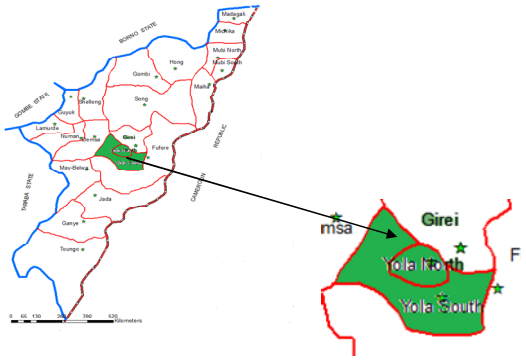

Figure 1: Map of Adamawa State Showing the location of Yola (Ministry of land and survey (2003)

Academic Library

Numerous studies have been carried out on ecological conscious design across the globe: US department of energy 2009; GZ Brown et al 2000; Victor Margolin 1988 etc. These studies have generally addressed and grouped consideration of ecological factors into the following adopted attributes of sustainable architecture formed by the Green Builders council (2003) as follows: Sustainable Energy use, Sustainable building materials, waste management, Building Characteristics.

As a result of awareness and publications by government and nongovernmental agencies such as: AIA, NIA, AARCHES, United Nations, US Green building council and etc. Attention has been paid all across the globe by researchers, professionals, decision makers etc, to ecological factor consideration benefits that is: passive energy strategies, low energy measures, cost, indoor climate etc, and to the design that will induce these factors. Within the city three selected academic libraries namely: Gen Ibrahim Badamasi Babangida library MAUTECH, Professor Mustafa Abba library FCE, HRH Dr Muhammadu Barkindo Aliyu Mustapha Library SPY were assessed in terms of the presence of the adopted attributes of sustainable architecture, since Government (State and Federal) are the main developers of high institution academic libraries in Yola the case areas are selected on that basis.

Methodology

For the purpose of this research, both qualitative and quantitative data collection methods were used. A questionnaire survey was used for collecting quantitative data collection, the case areas were analysed in terms of the availability of the adopted attribute of sustainable architecture: sustainable energy use, sustainable building materials, waste management, building characteristics. The interview was collected around August 2012 by the first author under the supervision of the second author.

A total of 180 questionnaires were distributed using "Drop and Collected" method of the 180, 60 to each of the case and the response rate was 85% in general. The interview schedule included questions that tap at people's personal information that is: sex, occupation, age, marital status, duration of use of library. Table 1 shows the questionnaire content and their relationship to ecological conscious design of academic libraries. Indicators used for analyzing the selected cases were developed through indicators/ guidelines for ecological conscious design by the world green builder's council (WGBC) and Leadership energy and Environmental Design (LEED).

The Case Studies

Case 1:

Gen Ibrahim Badamasi Babangida Library MAUTECH is located along Yola-Mubi road, Girei local Government. It is a federal university library which is a storey building with server cafe, book reserve, 2 reading spaces, toilets and office. It is targeted at students, faculties and staff of the university (figure 2a-2b).

Figure 2a-2b: Ibrahim Badamasi Babangida Library (MAUTECH).
(I. Ayuba archive)

Case 2:

Professor Mustafa Abba Library FCE is located along Jimeta – Yola road in Yola North Local Government. It is a federal college library; it has 2 reading areas, book reserve and offices. It is targeted at students, faculties and staff of the college (figure 3a-3b).

Figure 3a-3b: Professor Mustafa Abba Library (FCE).
(I. Ayuba archive)

Case 3:

HRH Dr Muhammadu Barkindo Aliyu Mustapha library SPY is located along bank road-police round about, Yola north local Government. It is a State Polytechnic Library with Book reserve, a single reading area and office. It is targeted at students, faculties and staff of the polytechnic. (figure 4a-4b).

Figure 4a-4b: HRH Dr. Muhammadu Barkindo Aliyu Mustapha Library (SPY)
(I.Ayuba archive)

Research Finding

The finding of the study includes the following indicators classified into two groups: Natural lighting and Natural ventilation.

a. Natural Lighting: It was predicted inside the building by the use of average day light factor. Only Professor Mustafa Abba library FCE was found to be effectively

naturally lightened were as Gen Ibrahim Badamasi Babangida library MAUTECH was design with plenty opening but the span and internal partition have completely compromised the effort and HRH Dr Muhammadu Barkindo Aliyu Mustapha Library SPY is totally not effective because the limited opening were covered with curtain walls.

b. Natural Ventilation: It was predicted through the building opening by the use of the ventilation rate formula, only Professor Mustafa Abba Library FCE was found to be effectively ventilated due to the size, position, number of opening, span of reading area, and position of internal partitions were as Gen Ibrahim Badamasi Babangida Library MAUTECH was designed with plenty windows but the span and internal partitions have completely compromised the effort and HRH Dr Muhammadu Barkindo Aliyu Mustapha Library SPY is totally not effective because the limited openings are been covered with curtain walls.

Recommendation

The specific approach and design of ecologically conscious building will vary base on the building, geographical location and other ecological factors which should be critically analysed in the design and the fact should be used throughout the design stage to the construction.

Therefore the following are the design criteria or recommendations for effective ecological conscious building at large:

a. Proper site analysis should be carried out to treat all environmental impact from the design stage.
b. During the construction proper supervision should be done in order to implement all the decision taken from the design.
c. Each building should be built to suite its environment.
d. Renewable energy technique should be used in all building.
e. Sustainable building materials should be encourage as to suite the environment better and it should have effect on both the environment and user.
f. Waste management techniques should be incorporated in the design of building because it reduces the maintenances cost of a facility.

Conclusion

Although numerous ecological consciousness technique have be adopted and implemented over the last decades, the empirical evidence suggest that most of the ecological consciousness technique are lacking the five important attribute of sustainable architecture and ecological consciousness will always be a problem of library design in the foreseeable future.

Based on the findings of our multi-methods research: in order to achieve natural lighting and ventilation in academic library design? It is important to consider the site analysis

(Climatic and Infrastructural), span of the building, internal partitions, orientation of the building, and number of opening, size of opening and position of opening.
As the priorities for each city in relation to sustainability and development inevitably vary, there are no simple, readymade or uniform solutions to ecological conscious design problems. However for academic library design the priority should be the attainment of: Natural lighting, Natural ventilation, renewable energy, sustainable building materials and waste management.

References

Anne-Marie Willis (1991), "An International Eco Design" Conference. "About Builders Challenge." - March 2008. Energy Efficiency and Renewable Energy, U.S. Department of Energy. Retrieved 7 March 2008.

Annualized Geo-Solar Heating, Don Stephens- Accessed 2009-02-05. "[ARCHIVED CONTENT] Insulating and heating your home efficiently : Directgov - Environment and greener living". Direct.gov.uk. http://www.direct.gov.uk/en/Environmentandgreenerliving/Greenerhome/DG_064374. Retrieved 2010-03-16.

"BERC - Airtightness". Ornl.gov. 2004-05-26. http://www.ornl.gov/sci/roofs+walls/whole_wall/airtight.html. Retrieved 2010-03-16.

Brower, Michael; Cool Energy, The Renewable Solution to Global Warming; Union of Concerned Scientists, 1990.

Building Emissions Study Accessed at California Integrated Waste Management Web Site (2001).

Clive Dilnot (1982), "Design as a Society Significant Activity: An Introduction", Design Studies 3:2. pp.144

Chiras, D. The Solar House: Passive Heating and Cooling. Chelsea Green Publishing Company; 2002.

"Cold-Climate Case Study for Affordable Zero Energy Homes: Preprint" (PDF). http://www.nrel.gov/docs/fy06osti/39678.pdf. Retrieved 2010-03-16.

Doerr Architecture, Definition of Sustainability and the Impacts of Buildings [1]

Duurzaam en Gezond Bouwen en Wonen by Hugo Vanderstadt,

"EERE Radiant Barriers". Eere.energy.gov. 2009-05-28. http://www.eere.energy.gov/consumer/your_home/insulation_airsealing/index.cfm/mytopic=11680. Retrieved 2010-03-16. Energystar.gov

Feist, Dr. Wolfgang. "What is a Passive House?". Passivhaus Institute. http://www.passivehouse.com/English/PassiveH.HTM. Retrieved 2010-05-02. "Florida Solar Energy Center - Skylights".

"Glazing". Archived from the original on December 15, 2007. http://web.archive.org/web/20071215075543/http://www.greenhouse.gov.au/yourhome/technical/fs18a.htm. Retrieved 2011-11-03.

G.Z. Brown, Mark DeKay. Sun, Wind & Light. 2001

Gipe, Paul; Wind Power: Renewable Energy for Farm and Business; Chelsea Green Publishing, 2004

"Introductory Passive Solar Energy Technology Overview". U.S. DOE - ORNL Passive Solar Workshop. http://www.passivesolarenergy.info/#S1. Retrieved 2007-12-23.

"Industrial Technologies Program: Industrial Distributed Energy". Eere.energy.gov. http://www.eere.energy.gov/de/passive_solar_design.html. Retrieved 2010-03-16.

John McHale (1969), "An Ecological Overview", in The Future of the Future, New York; George Braziller, pp.66-74.

John Randolph and Gilbert M. Masters, 2008. "Energy for Sustainability: Technology, Planning, Policy," Island Press, Washington, DC.

James, J.P., Yang, X. Indoor and Built Environment, Emissions of Volatile Organic Compounds from Several Green and Non-Green Building Materials: A Comparison, January 2004.[4] Retrieved: 2008-04-30.

J. Contreras, M. Lewis, H. Roth, "Toward a Rational Framework for Sustainable Building Materials Standards", Standards Engineering, Vol. 63, No. 5, p. 1, September/October 2011

John Ringel., University of Michigan, Sustainable Architecture, Waste Prevention [5]

Mark Jarzombek, "Sustainability - Architecture: between Fuzzy Systems and Wicked Problems", Blueprints 21 (1): 6–9, http://web.mit.edu/mmj4/www/downloads/blueprints21_1.pdf,

"Rating tools". Archived from the original on September 30, 2007. http://web.archive.org/web/20070930015551/http://www.greenhouse.gov.au/yourhome/technical/fs110.htm. Retrieved 2011-11-03.

Springer, John L. (December 1954). "The 'Big Piece' Way to Build". Popular Science 165 (6): 157. http://www.popsci.com/archive viewer?id=1yADAAAAMBAJ&pg=157&query=1955.

"Solar Heat Gain Through Glass". Irc.nrc-cnrc.gc.ca. 2010-03-08. http://irc.nrc-cnrc.gc.ca/pubs/cbd/cbd039_e.html. Retrieved 2010-03-16.

"Sustainable Architecture and Simulation Modelling", Dublin Institute of Technology, [2] Time: Cementing the future. (2010).

Taieb, Amine Hadj et al., (2010). "Sensitising Children to Ecological Issues through Textile Eco-Design". International Journal of Art & Design Education, vol. 29, 3. p313-320.

United States Green Building Council. (2003). U.S. Department of Energy, Energy Efficiency and Renewable Energy, Solar Water Heaters, March 24, 2009 [3]

"U.S. Department of Energy - Energy Efficiency and Renewable Energy - Passive Solar Building Design". http://www.energysavers.gov/your_home/designing_remodeling/index.cfm/mytopic=10250. Retrieved 2011-03-27.

Van der Ryn S, Cowan S. (1996). "Ecological Design". Island Press, p.18.

Victor Papanek (1972), "Design for the Real World: Human Ecological and Social Change", Chicago: Academy Edition, IX.

Victor Margolin (1997), "Design for a Sustainable World", Design Issues, Vol. 14, 2. Pp. 85.

Victor Margolin (1988), "Design for a Sustainable World", Design Issues, Vol. 14, 2. Pp. 91.

Reference to this paper should be made as follows: Ayuba B.I. and Jallaludeen M. (2013), Challenges and prospects for ecological consciousness in the design of academic library: The case of tertiary institutions in Yola, Nigeria, *J. of Education and Policy Review, Vol.5, No.1, Pp. 70-79.*