Prospects for Adoption of Green Building Strategies in Abakaliki Metropolis of Ebonyi State, Nigeria

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Abstract

Prospects for Adoption of Green Building Strategies in Abakaliki Metropolis of Ebonyi State, Nigeria" was a study carried out with the sole aim of determining the prospects for the adoption of green building strategies in Abakaliki Metropolis of Ebonyi State. It has two specific objectives as follows: to identify the benefits of green buildings; and to appraise the existing government policies on planning regulation for the adoption of green building strategies in Abakaliki Metropolis of Ebonyi State, Nigeria. Two research questions and two null hypotheses were formulated and tested by the study. The study used descriptive survey design. The area of study was Abakaliki Metropolis of Ebonyi State. Abakaliki is the capital of Ebonyi State and the biggest town in the state. The population of the study was 56 architects who were registered members of the Nigerian Institute of Architects, Abakaliki Branch. There was no sample size as the whole population was used for the study. The two research questions were analysed using mean and standard deviation while the two null hypotheses were tested using Chi-square statistic at 0.05 level of significance. The results of the study showed that: there are significant benefits of green building for its adoption in Abakaliki Metropolis of Ebonyi State ($\chi 2 = 28.88$ at $P<0.05$); and there are significant government policies on planning regulation for the adoption of green building strategies in Abakaliki Metropolis of Ebonyi State($\chi^2 = 28.88$ at $P<0.05$). The study recommended that the Federal Government of Nigeria should organize seminars in all the states and major cities and towns in Nigeria to create awareness of the existence of the concept and benefits of green building. Secondly, the Federal Government of Nigeria and States should enact specific laws on adoption of green building concepts and strategies in Nigeria. .

Keywords: Prospects, Adoption, Green Building and Strategies

Introduction

Background of the Study

Green Building (GB) was defined by the Organisation for Economic Co-operation and Development (OECD, 2003) as those buildings that have minimum adverse effects on the built and natural environment, in terms of the buildings themselves, their immediate surroundings and the broader regional and global setting. According to OECD, a green building is designed to minimize the total environmental impact of its materials, construction, operation and deconstruction while maximizing opportunities for indoor environmental quality and performance. Green buildings are constructed and operated in ways that enhance their impact on the building occupants while reducing impacts on the environment. Jain (2009) defined green building as one which adopts the best practices of environmental technology for optimizing the use of natural resources for providing clean and cost effective working ambience. Green buildings minimize the consumption of materials and maximize their reuse; create quality buildings that are commercially viable;

minimize energy consumption and greenhouse gas emissions; adopt environmentally sound and healthy work practices and during construction.

Green building is also known as sustainable building. It is both structure and the application of processes that are environmentally responsible and resource-efficient throughout a buildings life-cycle: from planning to design, construction, operation, maintenance, renovation and demolition (Wiki, 2021). A sustainable building is a structure that is designed, built, renovated, operated or reused in an ecological and resource efficient manner. According to Jain (2009), sustainable design strategies use the standard elements of a building-walls, windows and floors to collect, store and release the energy from the sun for heating, lighting and cooling.

The green building concept has gained momentum in developed and developing nations because of the negative impact of carbon dioxide and other dangerous gases emissions into the atmosphere from conventional buildings which have resulted in global warming and their negative impacts worldwide especially changes in weather and climate on Earth. In this study, prospect is defined as the possibility that an idea or something might be successful; adoption means the decision to start something such as an idea or plan; and a strategy is a plan intended to be used to achieve a given task or goal (Hornby,2015).

The study was justified and significant because it would help architects in Abakaliki to start designing sustainable buildings. Builders in the city would also adopt green building strategies during construction, Ebonyi State Government and its building regulatory agencies would bring policies that would encourage adoption of green building strategies thereby reducing negative environmental impact from carbon emission in Abakaliki Metropolis and other urban areas in the state.

Statement of the Problem

Studies in the United States of America have found that every conventional building is producing 40% of carbon dioxide in the environment. Carbon dioxide produces green house effects by depleting the ozone layer (Shabrin and Kashem, 2017). Conventional buildings also consume too much energy in terms of electricity and this affects the finances of occupants negatively. Maintenance and operational costs increase as the buildings get old. Abakaliki Metropolis of Ebonyi State is in dire need of environmentally friendly and affordable houses for its teaming population. The need for more housing estates from both the federal, state and private developers in the city cannot be overemphasized. As the stakeholders in large scale urban housing development in the metropolis grapple with high cost of conventional building materials, there is need to go green in building as the world is shifting to green buildings. Adopting green building strategies in Abakaliki metropolis of Ebonyi State will require providing answers to the following questions: What are the benefits of green buildings?
What are the existing government policies on planning regulation? Given the above situation, and the need to construct environmentally friendly houses to reduce the problems of conventional buildings, it became imperative to undertake the study on "Prospects for Adoption of Green Building Strategies in Abakaliki Metropolis of Ebonyi State, Nigeria."

Aims and Objectives of the Study

The main aim of the study was to determine the prospects for adoption of green building strategies in Abakaliki Metropolis of Ebonyi State, Nigeria. The specific objectives of the study were:

- To identify the benefits of green building for its adoption in Abakaliki Metropolis of Ebonyi State;
- To appraise the existing government policies on planning regulation for the adoption of green building strategies in Abakaliki Metropoli of Ebonyi State.

Scope of the Study

This study covers the following:

- Academic scope-concepts of green building, benefits of green buildings and government policies on planning regulation.
- Geographical scope- Abakaliki metropolis in Ebonyi State, Nigeria.

Research Questions

The following research questions guided the study:

- What are the benefits of green building for its adoption in Abakaliki Metropolis of Ebonyi State?
- What are the existing government policies on planning regulation for the adoption of green building strategies in Abakaliki Metropolis of Ebonyi State?

Research Hypothesis

The study tested the following null hypotheses at 0.05 level of significance:

HO_1: There are no significant benefits of green building for its adoption in Abakaliki Metropolis of Ebonyi State;

HO_2: There are no significant government policies on planning regulation for the adoption of green building strategies in Abakaliki Metropolis of Ebonyi State, Nigeria;

2.0 Literature Review

2.1 Conceptual Review

Benefits of Green Buildings

According to Davies (2006), Sarma (2014) and Dahiru, Dania and Adejoh (2014), green buildings have these benefits: reduce energy consumption, reduce water consumption. They are cost efficient to run, reduce operational costs, preserve natural resources, reduce greenhouse emissions and improve the quality of life and health of occupants. Other benefits of green buildings according to experts (Jain, 2009; Giduthuri and Vanakuru, 2017 and Ismaila, et al, 2021) are as follows:

- Green buildings have lower running costs by using natural ventilation, energy saving lighting, heating and cooling systems resulting in savings.
- They have lower maintenance costs by using intelligent and sophisticated technology for monitoring all devices installed in the building and so can alert the occupants of imminent faults thus, saving more costly maintenance at a later date .
- Increased productivity-by providing an environment that is capable of adapting to individual or collective requirements thereby producing a comfortable work environment that help people to raise their productivity at work.
- It adapts to changes in the environment because of its robust design and so can respond to personal or group changing requirements, mood and taste.
- Economically, a green building may cost more up front but saves costs through lower operating costs over the life of the building.
- Other benefits are that they improve the health of the occupants, comfort, reduce pollution and landfill wastes.
- They minimize the consumption of materials and maximizes their reuse; creates a quality building that is commercially viable; minimizes energy consumption and greenhouse gas emissions; adopts environmentally sound and healthy work practices, during both construction and occupancy.
- They have higher occupancy rate and lower tenant turnover; they protect and conserve the environment; average increase in building value is about 7.5% (McGraw Hill, 2006). According to Green Building Council of Australia (2006), green buildings have higher relative return on investment (minimum of 14%).

Given the financial and economic benefits of green building in other parts of the world especially in developed nations as revealed by literature, there is a need to examine the challenges of its adoption in Abakaliki Metropolis of Ebonyi State.

Government Policies on Planning Regulation

Land use planning regulations are rules that govern how land in a particular area can be applied and developed. In Nigeria, it originated from the British colonial masters that formed Nigeria on 1st January, 1914. The British colonial masters used two town planning laws in Nigeria, namely: 1917 Township Ordinance and the 1946 Town and Country Ordinance. The 1946 Town and Country Ordinance was repealed and replaced by the Nigerian Urban and Regional Act, Cap 88 of 1992 which was later amended as Decree No.18 of 1999 (Ogbonna, Obinka and Aguguo, 2017). The law contains three types and levels of physical

development plan. The three types of plans are federal, states and local government physical development plans. In addition to the planning regulations mentioned above, builders and developers in every state in Nigeria are required by law to obtain building control approvals from the State Ministry of Housing and Urban Development. The Building Regulations are a set of minimum requirements designed to secure the health, safety and welfare of occupants and tenants in and around buildings and conserve fuel and energy; and to provide access and facilities for disabled people (Tricker and Algar, 2006).

Aside government policies on planning regulation, there are also government environmental policies for the protection of environment which will affect the adoption of green building strategies in Abakaliki Metropolis of Ebonyi State. The 1999 Constitution of the Federal Republic of Nigeria contains the basis of environmental policy in Nigeria. According to Makinde, Adeyoke and Oyebode (2007), Section 20 of the 1999 Constitution empowers the Nigerian State to protect and improve the environment and to safeguard the water, air, land, forests and the wildlife of Nigeria. These environmental policies are contained in the Environmental Laws of Nigeria which are applicable and adopted by states in Nigeria including Ebonyi State. Some of the relevant environmental laws to protect the Nigerian environment generally and the built environment in particular according to Budnukaeku and Oku (2021); and Makinde, Adeyoke and Oyebode (2007) are: **Harmful Wastes Special Criminal Provision Act Cap 165 (LFN) 1990:** This Act makes it an offence to carry, deposit, dump, be in possession for the purpose of carrying, depositing or dumping any harmful waste anywhere in Nigerian soil, inland water and sea, including Exclusive Economic Zone of Nigeria.

Land Use Act Cap 350 (LFN) 1990:

This Act was aimed at providing land easily available for development and agricultural purposes, by vesting land in a state in a State Governor; requiring his consent for the transfer or alienation of interest in land and conferring him with power to revoke the right of occupancy for over-riding public interest. **Mineral Act Cap 286 (LFN) 1990:** This Act regulates non-oil mining of minerals and prohibits mining operations from cutting or taking protected trees without consent, pollution of water course, unauthorized exploitation of water, water bodies, sacred areas and other objects of veneration.

National Environmental Protection (Protection Abatement in Industries and Facilities Generating Water) Regulations, Cap 49 (LFN) 1991:

This Act regulates and bans the unauthorized handling of toxic wastes, discharge of effluents, industrial and solid wastes etc, in drains, water bodies and municipal landfills etc. It requires industries to install pollution monitoring devices with a view to making report of intended and accidental discharge of solid, gaseous or liquid wastes. It also empowers the Federal Environmental Protection Agency (FEPA) to require existing industries to conduct environmental audit or environmental impact assessment (E.I.A.) for new projects or to prevent start-up of any new industry or facility that will constitute a new source of pollution.

En vironmental Impact Assessment Decree No. 85 of 1992:

This Decree requires proponents of development projects to assess the impact of such project on the environment, designing mitigation measures as may be necessary and to refrain from executing such projects unless FEPA is satisfied that such impacts are negligible and that adequate measures have been taken to mitigate the damages to the environment**.**

Criminal Code Act Cap 77 (LFN) 1997: The Act contains the basic criminal law offences that relate to damage to the environment, public health and natural resources.

2.2 Empirical Review

Ismaila, Egbo, Kigun and Ayoola (2021), conducted a study on "The Challenges and Prospects of Green Building Construction for Sustainable Urbanisation in Jos Metropolis,

Nigeria." They found that green building was not being adopted and constructed in Jos Metropolis despite the need because there was no awareness on green building concept and developers preferred conventional buildings to green buildings. The study also identified the benefits of green buildings as preservation of natural resources and increase in health and productivity of occupants.

Zhao, Wang, Qiu, Qu and Zhang (2018), carried out a study titled, "Research on the Application of Green Building Materials in China." The study found that companies and individuals that wanted to apply green building materials faced challenges of lack of enough green building materials; high cost of technological inputs and raw materials for the production of green building materials; and lack of government support to those that want to construct green buildings.

Ogbonna, Obinka and Aguguo (2017), carried out a study on "Property Development and Land Use Planning Regulations in Nigeria." The area of study was Abia State in Nigeria. The study found that the level of compliance to building regulations was insignificant and that the level of compliance to building regulations between buildings constructed in urban areas and those constructed in sub-urban areas was significant. They recommended that Abia State Government should prepare up-to-date land use plans for various categories of towns in urban and rural areas of the state.

Dahiru, Dania and Adejoh (2014), conducted a study on "An Investigation into the Prospects of Green Building Practice in Nigeria," and found that green building was not practiced in Nigeria due to lack of awareness; harsh economic conditions and lack of enabling environment in form of government policy or legislation. It identified health and increase in productivity as benefits of green building.

The study by Sarma (2014) on "Problem, Progress and Prospect of Green Building as a means of Sustainable Urbanization with special reference to Guwahati City of Assam, India," found that green building construction would benefit Guwahati City by reducing energy consumption, bring economic and financial growth and gains; reduce wastes and would make buildings cost efficient to run.

3.0 Methods

The study used survey design. The area of study was Abakaliki Metropolis. Abakaliki is the capital of Ebonyi State, Southeast Region in Nigeria. The population of study was 56 architects who were registered members of Nigerian Institute of Architects, Abakaliki Branch. There was no sample size as the whole population was used. The instrument for data collection was a questionnaire containing two sections with 6 items per section making it 12items. It was structured on a five point Likert Type scale of Strongly Agree (SA), Agree (A), Undecided (UD), Strongly Disagree (SD) and Disagree (D).They were assigned weights of 5,4,3,2 and 1 respectively. The research questions were analysed using mean and standard deviation while the null hypotheses were tested using Chi-square statistic. 56 copies of the questionnaire were distributed to the respondents but only 50copies were returned. The return rate was 89.29%. Analysis of the research questions were based on 50 copies. Criteria for accepting that respondents agreed on an item was that the calculated mean value should be equal to or greater than 3.00 while standard deviation score should be less than 1.0. In the test of hypothesis, null hypothesis or Ho, was accepted if the Chi-square table value was greater than Chi-square calculated value at 0.05 significant level and at appropriate degree of freedom.

4.0 Results Presentation of Data Relating to Research Questions

Research Questions 1: What are the benefits of green building for its adoption in Abakaliki Metropolis of Ebonyi State?

Table 4.1: Summary of respondents' views and mean scores of significant benefits of green building showed that there were six benefits of green building, namely: lowers running and maintenance costs, improves health of occupants, reduces environmental pollution and landfills, minimizes consumption of materials and maximizes their reuse, increases productivity of occupants, minimizes energy consumption and green house

emissions. Mean score for each benefit was greater than 3.0 and were 4.52, 4.46, 4.38, 4.36, 4.24 and 4.60 respectively. Grand mean value was 4.44. Standard deviation value for each benefit was less than 1.0. It ranged from 0.60 to 0.68. Grand standard deviation value was 0.64. The standard deviation values clustered about the mean, showing homogeneity in agreement by the respondents. They agreed that green building had the six benefits

Table 4.1: Summary of respondents' views and mean scores on significant benefits of green building

S/N	Benefits of Green Building	SA	A	UD	SD	D	Total	X	SD	Rmk
1	Lowers running and maintenance costs	26	24	0	0	0	50	4.52	0.66	Agree
2	Improves health of occupants	25	23	2	0	0	50	4.46	0.64	Agree
3	Reduces environmental pollution and land fill wastes	25	24	1	0	0	50	4.80	0.65	Agree
4	Minimizes consumption and maximizes reuse of materials	20	28	2	0	0	50	4.36	0.62	Agree
5	Increases productivity of occupants	18	26	6	0	0	50	4.24	0.50	Agree
6	Minimizes energy consumption and green house emissions	30	20	0	0	0	50	4.60	0.68	Agree
	Grand Total							**26.66**	**3.85**	
	Grand Mean							**4.44**	**0.64**	

Source: Field Survey, 2021

Research Questions 2:
What are the existing government policies on planning regulation?

Table 4.2: Summary of respondents' views and mean scores of existing government policies on planning regulation showed that there were six of such policies, namely: Harmful Wastes Special Provision Act Cap 165 (LFN) 1990; National Environmental Protection (Protection Abatement in Industries and Facilities Generating Water) Regulations, Cap 49 (LFN) 1991;.Land Use Act Cap 350 (LFN) 1990; Environmental Impact Assessment Decree No. 85 of 1992; Criminal Code Act Cap 77 (LFN) 1997**;** and Nigerian Urban and Regional Planning Act (CAP 88 of 1992. Mean score for each government policy was greater than 3.0 and were 4.12, 4.48, 4.64, 4.52, 4.30 and 4.42 respectively. Grand mean value was 4.41. Standard deviation value for each benefit was less than 1.0. It ranged from 0.57 to 0.69. Grand standard deviation value was 0.64. The standard deviation values clustered about the mean, showing homogeneity in agreement by the respondents. They agreed that there were six existing government policies on planning regulation

Table 4.2: Summary of respondents' views and mean scores on existing government policies on planning regulation

S/N	Government Policies on Planning Regulation	SA	A	UD	SD	D	Total	X	SD	Rmk
1	Harmful Wastes Special Provision Act Cap 165 (LFN) 1990;	18	24	4	4	0	50	4.12	0.57	Agree

2	National Environmental Protection (Protection Abatement in Industries and Facilities Generating Water) Regulations, Cap 49 (LFN) 1991	26	22	2	0	0	50	4.48	0.65	Agree
3	Land Use Act Cap 350 (LFN) 1990	32	18	0	0	0	50	4.64	0.69	Agree
4	Environmental Impact Assessment Decree No. 85 of 1992	28	20	2	0	0	50	4.52	0.66	Agree
5	Criminal Code Act Cap 77 (LFN) 1997	20	25	5	0	0	50	4.30	0.61	Agree
6	Nigerian Urban and Regional Planning Act (CAP 88 of 1992	22	27	1	0	0	50	4.42	0.63	Agree
	Grand Total							**26.66**	**3.85**	
	Grand Mean							**4.44**	**0.64**	

Source: Field Survey, 2021

Testing Hypotheses

Hypothesis 1

HO_1: There are no significant benefits of green building for its adoption in Abakaliki Metropolis of Ebonyi State

Hypothesis 1 was tested using data from Table 4.1 above and table 4.3 below. Table 4.1 showed that the grand mean score for respondents was 4.44 with standard deviation score of 0.64 while Chi-square calculated value was 28.88 (see table 4.3 below). With 15 degrees of freedom at 0.05 level of significance, Chi-square critical value is 24.996. Since Chi-square calculated value of 28.88 was greater than Chi-square critical value of 24.996, HO was rejected while Hi was accepted, showing that there was significant benefits of green building for its adoption in Abakaliki Metropolis of Ebonyi State. The result is statistically significant. The evidence was that "there are significant benefits of green building for its adoption in Abakaliki Metropolis of Ebonyi State." In other words, adoption of green building strategies in Abakaliki Metropolis of Ebonyi State will bring significant benefits to the adopters, occupants and users

Table 4.3: Observed and Expected Frequency for Testing Hypothesis 1

Response	Observed O	Expected E	O – E	$(O - E)^2$	$\sum(O-E)^2$
Yes	44	25	19	361	14.44
No	6	25	-19	361	14.44
Total	50	50	-	χ^2	28.88

Source: Field Survey, 2021

Hypothesis 2

HO_2: There are no significant government policies on planning regulation for the Adoption of green building strategies in Abakaliki Metropolis of Ebonyi State, Nigeria

Hypothesis 2 was tested using data from Table 4.2 above and table 4.4 below. Table 4.2 showed that the grand mean score for respondents wa s 4.41 with standard deviation score of 0.64 while Chi-square calculated value was 28.88 (see table 4.4 below). With 15 degrees of freedom at 0.05 level of significance, Chi-square critical value was 24.996. Since Chi-square calculated value of 28.88 was greater than Chi-square critical value of 24.996, HO was rejected while Hi was accepted, showing that there was significant government policies on planning regulation for the adoption of green building strategies in Abakaliki Metropolis of Ebonyi State, Nigeria. The result is statistically significant. The evidence was that "There are significant government policies on planning regulation for the adoption of green building strategies in Abakaliki Metropolis of Ebonyi State, Nigeria." In other words, there are existing government policies on planning regulation for the adoption of green building strategies in Abakaliki Metropolis of Ebonyi State

Table 4.4: Observed and Expected Frequency for Testing Hypothesis 2

Response	Observed O	Expected E	O – E	$(O - E)^2$	$\sum(O-E)^2$
Yes	44	25	19	361	14.44
No	6	25	-19	361	14.44
Total	50	50	-	χ^2	28.88

Source: Field Survey, 2021

Discussion of Findings

Test of Hypothesis I

Test of hypothesis 1 found that "there are significant benefits of green building for its adoption in Abakaliki Metropolis of Ebonyi State." Six benefits were identified in analysis of Research Question 1 as follows: lowers running and maintenance costs, improves health of occupants, reduces environmental pollution and landfills, minimizes consumption of materials and maximizes their reuse, increases productivity of occupants, minimizes energy consumption and green house emissions. The finding was in line with the findings of Ismaila, Egbo, Kigun and Ayoola (2021), in their study on "The Challenges and Prospects of Green Building Construction for Sustainable Urbanisation in Jos Metropolis, Nigeria." The study identified the benefits of green buildings as preservation of natural resources and increase in health and productivity of occupants. The study by Dahiru, Dania and Adejoh (2014), on "An Investigation into the Prospects of Green Building Practice in Nigeria," found that green building improved health and increase in productivity of occupants. The study by Sarma (2014) on "Problem, Progress and Prospect of Green Building as a means of Sustainable Urbanization with special reference to Guwahati City of Assam, India," found that

green building construction would benefit Guwahati City by reducing energy consumption, bring economic and financial growth and gains; reduce wastes and would make buildings cost efficient to run.

Test of Hypothesis 2

Test of hypothesis 2 found that "There are significant government policies on planning regulation for the adoption of green building strategies in Abakaliki Metropolis of Ebonyi State, Nigeria." The study found six significant government policies (see Table 4.2) as follows: Harmful Wastes Special Provision Act Cap 165 (LFN) 1990; National Environmental Protection (Protection Abatement in Industries and Facilities Generating Water) Regulations, Cap 49 (LFN) 1991;.Land Use Act Cap 350 (LFN) 1990; Environmental Impact Assessment Decree No. 85 of 1992; Criminal Code Act Cap 77 (LFN) 1997**;** and Nigerian Urban and Regional Planning Act (CAP 88 of 1992. However, none of these government policies was specifically on green building. Lack of specific government policy legislation on green building was given as a reason for the non-adoption of green building concept in Nigeria according to one of the findings of the study by Dahiru, Dania and Adejoh (2014).

Conclusion

The conclusions drawn from the study were that: there are significant benefits of green building for its adoption in Abakaliki Metropolis of Ebonyi State; and there are significant government policies on planning regulation for the adoption of green building strategies in Abakaliki Metropolis of Ebonyi State, Nigeria.`

Recommendations

The study recommended that the Federal Government of Nigeria should organize seminars in all the states and major cities and towns in Nigeria to create awareness of the existence of the concept and benefits of green building. Secondly, the Federal Government of Nigeria and States should enact specific laws on adoption of green building concepts and strategies in Nigeria. Thirdly, the Federal Government of Nigeria should fund research on green building materials and the technology for their production in cooperation with private businesses

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