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Benefits and Drivers of Green Building Projects Implementation in Nigeria

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ABSTRACT: *This study examined the benefits and drivers of implementing green building projects in Nigerian. Data was obtained through the distribution of questionnaire to professionals among the selected construction companies. Descriptive statistics and RII were utilized for the data analysis. Findings from the study revealed a high awareness of GB benefits and drivers among various construction participants in the industry. Among the environmental, economic, and social benefits revealed in this study include: reduced greenhouse gas emission, reduced energy consumption, low operating cost, high property value, knowledge transfers and community improvement, etc. Therefore, the study concluded that the most effect approach to holistic adoption of this panacea of global imbalance and degradation is the involvement of government in promoting the campaign on GB while considering promulgating policies and financial motivations.*

KEYWORDS: construction industry, green building, sustainable development, sustainability

INTRODUCTION

The bye product of building construction has remained a solution to one of the human basic needs; shelter. However, the environment and human existence have equally remained in a gigantic jeopardy owing to the inherent negative effect on both the habitat and human health by construction activities. Dalibi et al., (2017) maintains the opinion of other researchers that the environment can be sustained if no attempt is made to build. Though, it is believed that living without construction might be miserable and unsafe; and that what is desirable is a dynamic equilibrium which is devoid of any form of danger especially to the environment. Combining these difficulties resulted in the development of a novel idea known as "green buildings" for the design, construction/renovation, operation, and maintenance of buildings in accordance with "sustainable practices for buildings."

The fundamental concern of green building/sustainable development from an environmental judgment suggests the effective control and management of natural occurring materials so as to uphold and conserve them for the future. In the very early stages of seeing a building with environmental certification, layman's discernment is determined by the need for sustainability and belief in the building's level of certification. This is because it shows the environmental aspects of the design (Mansour & Radford, 2014).

According to Ismaila etal (2021), the focus of sustainability was initially on technical issues such as materials, building components, construction methods and energy-related design concepts. But attention is also shifting to non-technical matters, economic and social sustainability concerns, and the cultural heritage of the construction industry (Abolore, 2012). Each project or development comes with its own benefits, tasks and obstacles to success, and green construction projects in Nigeria are no exception (Workbook, 2017).

Theoretical Foundation

Theoretically, the framework of this study is hinged on the ***'carrying capacity theory.*** From the environmental perspective, the carrying capacity theory assert that the prognosticated upsurges in population unchecked can double the degree of exploitation, resulting to the phasing out of numerous ecosystems which support human existence. (Daily, Gretchen, Ehrlich and Paul, 1992). Carrying capacity has been defined as the utmost inhabitants' size of a certain species which can be supported comfortably within an area; it measures the number of renewable resources in the environment which can sustain the organisms within it. So, the carry capacity theory supports the economic development models that evaluated the boundaries levied by the carrying size of the earth. This of course suggests that the continued growth in terms of population, activities around the industries, resources utilization and pollution of the environment could result in the decline of living standards and this has given rise to the advent of green development as a mechanism which guarantees future generations survival with regards to the activities and considerations of the present generation.

According to World Green Building Council, the salient structures/dimensions of a green facility include among other things:

- Energy productivity
- Water proficiency
- Indoor air/environment quality
- Materials efficiency and waste management

Regardless of the concept or nature of any building, the presence of above listed measures confirms it to be green.

Energy Efficiency/Productivity

Research has shown that buildings consume nearly 76% of energy generated. This energy finds application in heating, cooling and buildings operations. Since much of the energy used to construct, operate and maintain structures emanates from burning fossil fuels, this discharges an immeasurable degree of greenhouse gases(Wood, 2017). Basically, Wood, (2017) agrees to the tripodal energy that are typically associated throughout a building life time:

• Initial encapsulated energy – This energy is always required to extricate and handle raw resources, transform or mold them into building elements, move them to site location, and mount them into the building.
• Recurrent encapsulated energy – The energy is required to preserve, update or exchange, and eventually disassemble and carting away of materials and components all through the benefit life of the facility.
• Operational energy – This energy is essential and required to warm, cool, and ventilate the structure, and of course afford hot water, illumination and power for services and equipment on a regular basis.

Lemaire, (2008) defines energy proficiency of a building as the degree to which the energy utilization per square meter of floor area of the building commensurate to the built-up energy utilization benchmarks for that specific nature of building under characterized climatic conditions. According to Arup, (2016), Energy proficient buildings are those which devour less energy whereas keeping up or indeed improving the consolation conditions for their users compared to standard buildings. Energy productive buildings result not as it were in less impact on the ecosystem but are moreover financial economical and flexible. Energy efficiency is so fundamental in such manner that all other green features may become inconspicuous if it is not demonstrated in any green building. This opinion is in consonance with the view of Howe, (2017) who maintains that buildings may integrate greenest characteristics, but if the energy consumption is without regard to efficiency, then it becomes problematic to showcase that they are truly green.

The probable paybacks that will emerge from energy efficient ventures in buildings include inter alia: less energy usage for space warming and/or cooling and water heating; decreased power consumption for illumination, office equipment and household appliances; lower upkeep necessities; improved luxury; improved property value (Lemaire, 2008)**.** According to Arup, (2016), energy devoured by domestic buildings amounts to over 50% of the over-all energy utilized in the nation. He further opines that procuring an energy efficient facility begins with the proper plan style, giving attention to the definite microclimate situations of the site, aligning and determining the building frame, a cognizant choice of building materials and envelope frameworks pointing to reduce building warm picks up. Based on this, any dynamic framework sought to be chosen on the premise of high proficiency (e.g., highly proficient lighting framework) or to permit a diminishment of cooling loads suitable for the climate.

Water Efficiency
Water efficiency is a pointer to mindful utilization of fresh water and limiting the general utilization of water and curtailing wastewater. It also focuses toward utilizing latest innovations, enhanced practices and know-hows which convey equal and/or even healthier life service with less water usage.

From the postulation of the United State Green Building Council, three key components of water efficiency are directly associated with green buildings; these include: lessen indoor consumable water utilization, reducing water utilization in order to spare energy and enhance natural well-being. Here, the idea is to adopt measures and strategies which improve water efficiency in the building. In Green building, (2017), the measures include the following:

- Reducing the overall water usages
- Rainwater harvesting
- Recycling of wastewater
- Water efficient landscaping

Student & Engineering, (2015) sharing similar view, postulates water proficient know-hows in buildings primarily to integrate water sparing fittings, rain water reaping and reuse of grey water. The increasing demand for water in the building cannot be overemphasized. However, in the view of Oluwadare, (2018), handling the usage of water is of course of a basis mandate of green building.

Indoor Air/Environment Quality

Indoor air quality pops up the idea with regards to the air quality available in and around facilities, particularly as it is evidenced on the health and consolation of facility users Oluwadare, (2018). Improved air quality has remained one of the prime considerations of green building design. Wang et al., (2018) holds the view that green building emphasizes on the standard of the available indoor environment, owing to the fact that the motive of air-conditioning manufacturers is to strike a balance between the interior and exterior habitat. It is not specious to support the view that sensitivity to indoor air pollutants is the primary feature in debilitated building disorder. Therefore, according to Wang et al., (2018), natural aeration should be absorbed to deliver non-contaminated air, eradicate air contamination within the interior by adjusting the air temperature and humidity indoor so as to to guarantee the emotional necessities of connection between with habitants and nature. Energy efficiency is improved through the utilization of natural ventilation towards ensuring improved internal air quality in green buildings.

Materials Efficiency and Waste Management

It is worth noting that green building requires distinct materials and frameworks to integrate sustainability compared to non-sustainable structure. Sheth, (2016) postulate that green building resources ought to be resource-efficient, energy-proficient, affordable and promote improved indoor air quality. They further maintain that consideration for sustainable materials should be contingent on:

• Material renewability and efficiency.
• support for an improved environmental health.
• Suitability with regards to its application

According to Oluwadare, (2018), it is the opinion of many writers that planning and designing with industrial materials and reusing construction and demolition materials produced from projects promotes green building projects.

In the view of World Green Building Council, minimizing waste and maximizing reuse can be encouraged by incorporating highly durable material-resources that generates a smaller amount of waste and emphasizing on the need for building occupants always adopt renewable and biodegradable materials.

Benefits and Drivers of GB

A plethora of benefits and drivers are associated with green building projects. Many researchers hold common and non-divergent opinions on the humongous benefits attributable to going green in the built environment. Sustainable et al., (2019) posits that the primary advantages include; reductions in energy usage, greenhouse gas discharges and air contaminants, improvements to dwellers' wellbeing, fulfilment and productivity. In the view of Onososen et al (2019), green buildings provide substantive benefits which include inter alia: better building users' well-being through improved indoor quality which leads to the development of more energy-efficient products and services. Alohan & Oyetunji (2021) argue that green buildings promote human well-being by improving environmental quality, reducing energy and water consumption, and improving economic performance over the life cycle.

According to Chen & Luo, (2020), Carbon emissions are the chief reason for extinguishing the natural advantage of the environment and that under the concept of green buildings, conservation of building vitality and ecological conservation projects the ecological and environmental protection value of buildings. The benefits and drivers of green building projects cannot be overemphasized as British Columbia Forest Facts, (2011) conscientiously summarized them into: economic, social and environmental benefits.

Environmental Benefits

From the view point of Environmental Protection Agency (EPA), over 39% of total energy use, 12% of total water consumption, 68% of total electricity utilization and 38% of carbon dioxide discharges are traceable to buildings. This indicates that construction is tied to global warming. The ecological paybacks of green conception include inter alia: mitigation of Green House Gas emission, pressure on water usage, natural occurring resources, improve air and water excellence, reduced ecosystem deterioration and biodiversity extinction. Green buildings are ecofriendly as they incorporate bio-climatic features such as natural ventilation and shading, light-colored roofs, courtyards, solar power as well as locally available materials for construction.

Economic Benefits

Economic prospects of green construction have become one of the major considerations for green building projects. The benefits under economic subset include:

- Employment generation
- Initial and Operating cost
- Property valuation and future values

Employment Generation

According to National Bureau of Statistics, unemployment among young people in Nigeria as at second quarter of 2022 floats within the range of 33.3% which at the same time continues to skyrocket. Evidently, the need to create decent jobs becomes critical. International Training Center of the International Labour Organization and World Green Building Council recently collaborated and provided a week-long training course in Turin, Italy, providing an all-inclusive overview of how better job opportunities could be created through green building and construction.

WGBC suggests "the green building industry can deliver long term employment, stimulate economic growth across multiple sectors, and address the need for decent work opportunities that consider occupational health and safety, local employment and training, gender equality and equity of access to employment".

However, there is a conspicuous obstacle: with the ever-increasing consciousness hovering green construction, the outweighing paucity of data to justify the economic returns of green building resulting to better employment security disputes the employment creation potentials of green building. Notwithstanding, over 9443 green jobs which have already been created through Energy and Environmental Partnership Project in the African continent as reported by World Green Building Council have indeed cleared the doubt.

In addition, the World Green Building Council believes that the green building sector will be a window for innovation and technological progress that will increase productivity in the informal sector and create jobs in the formal sector. The spillover effect of investments in the green construction sector cannot be overstated in terms of increasing the potential for job creation and impacting rural and urban households.

The Nigeria economic fortunes can be boosted via investment in green building. Nigeria, being one of the largest dischargers of greenhouse gases has carefully recognized need for change, and the nation has pledged to achieve a 20% drastic reduction in its greenhouse gas emissions by 2030 - 45% with international support (UNHCR, 2011). This objective, of course can be achieved through green construction. Over the last few years in Nigeria, major green projects have been embarked on, which beside other meaningful objectives also can deliver long term job privileges and put the economic fortunes on the speed lane of various sectors. Notable of these green projects include: Eko Atlantic City, Centenary City, and Port of Onne Complex. On one hand for example, Centenary City is a planned city in Nigeria. The ongoing construction being overseen by Centenary City FZE is projected to be part of Nigeria's struggle to own smart cities. It is believed that upon completion, the project will attract a mouth-watering $18 billion in foreign direct investment (FDI) and create 250,000 direct jobs. On the other hand, Eko Atlantic City which has in its core objectives to provide clean and eco-friendly urban infrastructures stands to also create direct 150,000 jobs upon completion.

Social Benefits

The social contributive drive of green building projects cannot be over emphasized. In accordance with the opinion of World Green Building Council, many of these social benefits revolve basically in connection with the health and wellbeing of the end users. These include: occupant wellbeing, worker productivity, community improvement and local infrastructure. Simpeh & Smallwood (2018) argue that the social and community facets of green buildings increase employment prospects for local people. WDBG (2001) argues that the social advantages of green buildings are related to improved quality of life, health and well-being, and that these benefits can be achieved at different scales, including buildings, communities and societal level in general. At the project level, the focus continued on the health, consolation and well-being of the residents. At the community or societal level, knowledge is transferred, ecological quality is improved, neighborhoods are rehabilitated, and health risks are reduced; and all these become a major drive or consideration. The knowledge transfer and neighborhood

restoration potentials of green projects are certainly evidenced in Eko Atlantic City Project; in the sense that the new foundations of the EAC was founded to reclaim lost lands that have been wiped out by the Atlantic Ocean's stormy waves over the past 100 years, facilitating the restoration of neighboring areas. Meanwhile, the planning and erection of the Great Wall of Lagos has been able to provide effective marine engineering explanations and this will help to stop more land from being lost from the Nigerian coast; so, the EAC project provides and promotes knowledge transfer for similar potential projects.

METHODOLOGY

According to ***Map data, 2021***, Rivers state houses up to 107 construction companies. The population of this study is made up of One Hundred and Seven (107) construction companies operating in Rivers State. From these One Hundred and Seven (107) construction companies, fifteen (12) were chosen for this research. These companies were randomly selected on the bases that there is relatively job resemblance in the construction industry. A sample size of 82, using Taro yamen formula was obtained. Questionnaire was administered to construction professional in the selected construction companies. Data obtained was analyzed using descriptive statistics and Factor analysis.

Presentation of Research Data, Analysis and Discussion of Results.

Table 4.1 The Questionnaires (Qns) Responses by Professional Discipline

S/N	Professional Disciplines	Nr. of Qns Distributed	Nr. of Qns Returned	Percentage (%) of total Qns returned per discipline
1	Architects	20	18	21.95%
2	Builders	15	10	12.20%
3	Engineers	24	20	25.00%
4	Quantity Surveyors	19	18	21.95%
5	Town Planners	4	4	4.88%
	Total	**82**	**70**	**85.37%**

Source: *Field Data 2024.*

Table 4.1 depicts a comparison between the distributed and retrieved questionnaires. A total of 82 copies of questionnaire were sent out. However, 70 copies were returned; putting the response rate at 85.37% which is satisfactory.

Table 4.2 Education attainments of Respondents

		Frequency	Percent	Cumulative Percent
Valid	HND/B.Sc	42	60.0	60.0
	M.Sc.	26	37.1	97.1
	Ph.D.	2	2.86	100.0
	Total	70	100.0	

Source: *Field Data 2024. (SPSS Version 20.)*

Education attainments of the respondents are captured in table 4.2. 42 respondents possessed HND/B.Sc. qualification, 26 of them have M.Sc. degree while respondents with PhD stood at 2.

Table 4.3 Work experience of respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than 5yrs	5	7.1	7.1	7.1
	5yrs - 15yrs	36	51.4	51.4	58.5
	16yrs - 25yrs	21	30.0	30.0	88.5
	More than 25yrs	8	11.4	11.4	100.0
	Total	70	100.0	100.0	

Source: *Field Data 2024. (SPSS Version 20.)*

Table 4.3 shows the distribution of respondents' work experience. 5 respondents have less than 5years work experience, 36 respondents: 5-15years of work experience, 21 respondents: 16-25years and 8 respondents: more than 25 years. The respondents' years of work experience as depicted above satisfies the requirement for their suitability for the survey.

Table 4.4 Level of awareness of benefits and drivers of green building project in Rivers State

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very low	4	5.7	5.7	5.7
	Low	11	15.7	15.7	21.4
	Moderate	15	21.4	21.4	42.8
	High	40	57.7	57.7	100.0
	Total	84	100.0	100.0	

Source: *Field Data 2024. (SPSS Version 20.)*

Table 4.4 signifies distribution of respondents' view on the awareness level of benefits and drivers of green building projects in Nigeria. It can be deduced from the analyses that; 57.7% of the respondents were positive that the awareness level of green construction is 'high' while 21.4.1%, 15.7% and 5.7% opines that it is 'moderate', 'low', and 'very low' respectively.

Table 4.5 Relative Importance Index of Environmental benefits of Green Building Projects

	Benefits	**Relative Importance Index**	**Ranking**
	Environmental Benefits		
1	Reduced water stress	0.790476	5
2	Improved air	0.814286	4
3	Reduced ecosystem degradation	0.838095	3
4	Reduced greenhouse gas emission	1	1
5	Reduced energy consumption	0.990476	2
6	Better health for building occupants	0.77381	6

Source: *Field Data 2024. (SPSS Version 20.)*

Table 4.5 above depicts the ranking of the environmental benefits of green building projects. Relative importance index was used to determine the benefits and the five-point scale utilized in the questionnaire was converted to Relative importance index (R.I.I) for each factor. This uncovers and compares the relative importance of each of the factors as perceived by the respondents. Following the analyses, it was uncovered that 'reduced greenhouse gas emission is perceived to be the highest ranked environmental benefit of green construction. The relative importance index of 1 scored by this benefit suggests that all respondents agreed uniformly. The other environmental benefits were ranked in the following order: reduced energy

consumption (2), reduced ecosystem degradation (3), improved air (4), reduced water stress (5) and better health for building occupants (6).

Table 4.6 Relative Importance Index of Economic benefits of Green Building Projects

	Economic related benefits	Relative Importance Index	Ranking
1	Employment generation	0.819048	5
2	Low operating cost	0.988095	1
3	High property value	0.988095	1
4	worker productivity	0.607143	7
5	Resource efficiency/conservation	0.797619	6
6	Technological advancement	0.980952	3
7	Creates, expands and shapes market for green products and services	0.938095	4

Source: *Field Data 2024. (SPSS Version 20.)*

In the ranking of the economic benefits of green building as illustrated in table 4.2.7 above, 'low operating cost' and high property value of green construction were ranked highest as both benefits scored a relative importance index of 0.988095. This was followed by 'technological advancement' (0.980952), 'creates, expands and shapes market for green product and services' (0.938095), 'employment generation' (0.819048), 'resource efficiency' (0.797619) and 'worker productivity' (0.607143).

Table 4.7 Relative Importance Index of Social benefits of Green Building Projects

	Social benefits	Relative Importance Index	Ranking
1	Improved occupants' wellbeing	0.792857	4
2	Community improvement	0.971429	2
3	Knowledge transfer	0.978571	1
4	Stakeholders' satisfaction	0.852381	3
5	Neighborhood restoration	0.766667	5

Source: *Field Data 2024. (SPSS Version 20.)*

The social benefits of green building projects were also analyzed and ranked according to determine the relative importance of each of the factors as perceived by the respondents. From the ranking in table 4.7, it can be deduced that 'knowledge transfers' was perceived by the respondents to be most important social benefit of green building projects; hence the relative importance index of 1. Other social benefits were ranked as follow: 'community improvement' (2), 'stakeholders' satisfaction' (3), 'improved occupants' wellbeing' (4) and lastly, Neighborhood restoration' (5).

DISCUSSION OF FINDINGS

The result of the analysis revealed a high level of awareness of benefits and drivers of green building in the Nigerian. This finding of course negates the view of (Ivanova et al., 2016), who maintains that inadequate knowledge and information regarding the economic benefits and prospects of green architecture also serve as a barrier to the utilization of green building. The finding suggests that the mantra of green construction has gained wide audience such that inadequate awareness level of GB can no longer constitute a major hindrance to its implementation. This position conforms to the view of (Dahiru et al., 2014), who in his study on GB maintains that the overall perception of green building from all the groups of respondents revealed that most professionals are aware of the new trend (Green Building) and enormous benefits derived from it and they see green building as a basis for appealing livable homes and preserving natural resources while taking care of their health. The analysis also uncovered the following: 'reduced greenhouse gas emission is perceived to be the highest ranked environmental benefit of green construction, in the ranking of the economic benefits of green building 'low operating cost' and high property value of green construction ranked highest; and 'knowledge transfer' was perceived by the respondents to be most important social benefit of green building projects.

CONCLUSION AND RECOMMENDATIONS

The basic role of the construction industry in the development and maintenance of facilities such as roads, bridges, railways, private and commercial real estate cannot be overemphasized. Despite the positive contribution of building construction to humanity as it provides shelter and comfort for the individual and tangible infrastructural and economic development of the society at large, they also constitute negative impacts on the environment throughout their life cycle; from the design to the demolition of the final product (Wolfe et al., 2017). The quest for minimizing the adverse impact on the environment of construction activities and its bye product has prompted the incorporation of resource efficient and environment friendly constructions across the globe. Green building is considered as an answer to the weaknesses of the conventional construction practice. Its implementation in the industry is highly contingent on mitigating factors as seen from our findings. This study examined the level of awareness of green building projects and the probable advantages of GB. The findings revealed an appreciable increase in the level of awareness of the benefits and drivers of GB. It can be concluded that the most effect approach to holistic adoption of this panacea of global imbalance and degradation is the involve of government in promoting the campaign on GB while considering promulgating policies and financial motivations.

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