

## **Drivers and Barriers to the Implementation of Green Building Development<sup>1</sup>**

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### **ABSTRACT**

The dependent nature of the construction industry on energy and resources coupled with the unsustainable utilization of these resources has resulted in environmental and health hazards coupled with declining availability of resources. With a growing housing deficit, energy challenges and environmental hazards, developed economies are moving to more sustainable methods of building, however, it is unclear the preparedness of the Nigerian built environment in moving with the times. This paper presents an assessment of the preparedness of the Nigerian construction industry for the adoption of sustainable construction and green buildings by unearthing its drivers and barriers. The research employed a survey research method in data gathering and the population of the study comprises of construction professional. Convenience sampling technique was used in data administration with a response of 69 questionnaires used for the analysis. Descriptive statistical tools were used for analyses. The study revealed that a reluctance arising from the need to avoid risk and increased cost associated with green building is a major barrier to its adoption, lack of awareness, inadequate green products, absence of government support to drive the process and lack of green building tools were also identified as barriers. Also, it was found that the drivers to invigorate the adoption of sustainable building are; government's support, provision of labeling standard, financial incentives, increased awareness and a sustainable housing policy. The study concluded that while there is sparse knowledge on the life-cycle benefits of green building, a tripartite involvement of government, clients and professionals is vital to drive its implementation.

**Keywords:** Barriers, Drivers, Green buildings, Sustainable construction,

### **1.0 INTRODUCTION**

The world has seen in recent times, increasing global alert on the unsustainable consequences of human activities on the environment, though the blame has been shifted to a broad range of industrial activities, the construction industry is not left out of this quagmire. This is unsurprising as it has been discovered that the construction industry is directly responsible for a large portion of energy consumption, biodiversity loss, waste generation and pollution (CIOB,

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<sup>1</sup> How to cite this paper: Onososen, A.O.; Osanyin, O.; Adeyemo, M.O. (2019). Drivers and Barriers to the Implementation of Green Building Development; *PM World Journal*, Vol. VIII, Issue IX, October.

2004). This challenge has surfaced at a time developing economies such as Nigeria and China are experiencing increasing construction project to cope with the high demands of a surge in population growth and growing economic activities (Zhang, Wu, Shen and Skitmore, 2013). Though there is an increasing housing deficit in the country, government efforts in combating this menace must however be done in an environmentally friendly, socially responsible and economically supportive way (Oni, 2015). This then calls for a need for governments to look beyond mass conventional building systems to adopting a much more sustainable approach to providing the much needed surplus housing. In response to this challenge, the construction industry has looked into processes, methods and means of revitalizing its construction activities and these efforts has led to the conception of green buildings. Constructing sustainable buildings reduces raw materials and lad, minimizes the consumption of energy and water and by extension reduces emission of hazardous pollutants in the environment (McMahon, Marks and Wallace 2015).

However, though this new wave of construction process is taking on a growing popularity backed by government policies in advanced economies, it has been lethargic in developing economies such as Nigeria. Failure to accommodate sustainable principles in these current times renders any attempt at housing an exercise in futility in the long run as future generations will bear the consequences of unsustainable practices in vogue today (Oni, 2015). The apparent lack of preparedness for the adoption of green buildings in Nigeria has been associated with the would-be drivers of the system present in countries who have successfully adopted the new approach but might be absent in Nigeria (Aghimien, Adegbenbo Awodele, & Aghimien, 2018), also there are barriers to the adoption of this system which threatens its survivability and dampens the preparedness of the Nigerian construction industry to adopt this new and environmentally friendly concept.

Though there is still a dearth of literature on the adoption of green buildings in the Nigerian built environment, this paper focused on examining drivers and barriers to the implementation of green building development. The result of this study will help inform policy makers in the construction industry on the strategy to adopt in ensuring the introduction of green building development into the Nigerian built environment.

## **2.0 LITERATURE REVIEW**

Sustainability studies has attracted numerous and diverse interests since its inception both from the academics, professionals, government and the general public (Aghimien et al, 2018;) while these debates soar on, the impact of the construction industry in contributing to the unsustainable nature of global climate has undoubtedly be attributed to the construction industry as one of the contributing industries amongst many others. The construction industry is a tool used by governments to provide necessary infrastructural facilities for its citizens (Aghimien et al, 2018). The construction industry as stated by Ayodele and Alabi (2011) significantly contributes to the development of the economy of any nation, its activities; provision of infrastructure and economic contribution to the GDP makes it a force to reckon with. The construction Industry like other industries is not without significant impact on the environment.it has been revealed to

be one of the largest contributor to indoor and outdoor environmental pollution (Ding, 2008; Geng and Doberstein, 2008. it is responsible for 36% of energy-related CO2 emissions in industrialized economies (Nassen et al. 2007), these issues of environmental pollution, use of energy and use of resources are growing concerns globally (Berg and BenDor 2011). The major environmental issue facing Nigeria can be highlighted as land degradation, air and water pollution (Fed.Min of Environment, 2012; Oladapo, 2008a, b). These adverse effects can be traced to the activities of the construction Industry. Ijigah et al (2013) listed these main areas of pollution as to air, water and noise pollution. During the building process, activities such as site preparation caused through land clearing causes soil erosion that leads to sediment pollution, the use of diesel engines of mechanical plants, demolition of works and use of toxic products pollutes the air, land and water (Ijigah et al 2013).

## 2.1 Environmental Sustainability

Sustainability or sustainable development is defined by the Brundtland Commission’s Report as “the development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (WCED, 1987). The increasing clamour is a result of concerns that the ever rising population and resource utilization poses a tremendous threat to the fast declining natural resources as warranted calls for business to be socially and environmentally responsible necessitates the importance and significance of sustainable construction.

**Table 1.0** Principles of Sustainability.

Principles of sustainability	Effects	References
<b>Environmental</b>	Land Shortages	Gavilan & Bernold (1994); Nagapan <i>et al.c</i> (2012)
	Environmental pollutions	Yunpeng (2011); Lu, Nagapan <i>et al.</i> (2012); Lihua <i>et al.</i> (2013).
	Excessive resource consumption Illegal dumping	Jayamathan & Rameezdeen (2014); Gavilan & Bernold (1994); Guerrero <i>et al.</i> (2013); Yeheyis <i>et al.</i> (2013)
<b>Economic</b>	Increased cost of project Time overrun	Fernández-Solis & Rybkowski, (2015). Ndiokubwayo & Haupt, (2009)
	Increased cost of materials	Jayamathan & Rameezdeen (2014)
	Increased cost of waste transportation	Nagapan <i>et al.</i> (2012); Fernández-Solis & Rybkowski, (2015).
	Reduction in the Gross Domestic Income (GDI) of the society	Guerrero, Maas, & Hogland (2013); Fernández-Solis & Rybkowski, (2015).
<b>Social</b>	Risk to human health	Nagapan <i>et al.</i> (2012)
	Reduction in the Gross Domestic Production (GDP) of the society	Yunpeng (2011); Ndiokubwayo & Haupt, (2009)

**Source:** Solanke (2015).

## **2.2 Green Building**

Green building can also be said to be a process which integrates techniques and processes that reduces buildings energy use and enhance human health (Qian, Chan, & Khalid, 2015).

Green building also known as sustainable construction is a subset of sustainable development. Green building as opined by Feltes (2007) is not a viable alternative if it is not economically efficient over other conventional construction methods. In a study carried out by Tsai, Lin, Lee, Chang and Hsu (2013), the following factors and criteria were deemed important to attain sustainability in green building;

**2.2.1 Environmental Quality:** Well-planned green buildings emphasize the quality of the indoor/outdoor environment which provide sustainable performance and reduce pollution (Kubba, 2010). The prefabrication method of construction has been found to reduce environmental impact compared to on the site construction works (Chen et al. 2010).

**2.2.2 Energy Efficiency:** Ensuring overall energy efficient products requires the use of renewable sources and energy saving devices (Kuba, 2010).

**2.2.3 Resource Conservation:** Waste minimization and resource conservation are increasingly important factors for sustainable construction processes (Jaillon et al, 2009). Different resources used on site have diverse impacts on the environment (Tsai et al, 2013).

**2.2.4 Cost Reduction:** cost reduction on a project is the focus of the client and the most critical factor when planning a building project (Wey and Wu, 2008; Jaillon et al, 2009).

Previous studies have shown, sustainability level in developing countries like Nigeria is low (Alabi, 2012; Aje, 2016; Baron and Donath, 2016).

## **2.3 Barriers and Drivers of Green Building**

The campaign for stakeholders to adopt the sustainable building approach to developmental projects is not without hindrances; however, the hindrances are not as a result of lack of technologies and assessment methods as stated by Hakkinen & Belloni (2011). Previous researches on challenges of sustainable building in developing countries around the world have been carried out such Abolore 2012; Studer et al.

**Table 2.0** Barriers of Green Building Implementation

<b>Barriers of Green Building Implementation</b>		
<b>Hakkinen and Belloini(2011)</b>	<b>Abolore (2012)</b>	<b>Studer et al.</b>
<b>Steering mechanisms</b>	Lack of enforcement	Not a legal requirement
<b>Cost</b>	Lack of Government intervention	No demand from customers
<b>Client understanding</b>	Education vs. Experience	Not seen as priority by senior management
<b>Process</b>	Cost factor	Lack of incentives
<b>Procurement and tendering</b>	Pointing fingers	No demand from stakeholders
<b>Timing</b>	Passive culture	Lack of resources
<b>Cooperation and networking</b>		Costly
<b>Underpinning knowledge</b>		Corporate inertia
<b>Knowledge and common language</b>		Lack of in-house knowledge/skills
<b>Availability of methods and tools</b>		Creates competitive disadvantage
<b>Innovation</b>		

**Table 3.0** Drivers of Green Building

<b>DRIVERS OF GREEN BUILDING</b>	
<b>Pitt et al., (2009)</b>	<b>Studer et al.</b>
<b>Financial incentives</b>	Environmental management system
<b>Building regulations</b>	Designated staff for environmental matters
<b>Client awareness</b>	Published policy statement on environmental matters
<b>Client demand</b>	Supply chain management
<b>Planning policy</b>	Verification / accreditation of environmental performance
<b>Taxes/levies</b>	Extended producer responsibility initiatives
<b>Investment</b>	Engagement with stakeholders
<b>Lack of labeling/ measurement standard</b>	Voluntary initiatives with industry and/or government
	Support of local environmental initiatives

### 3.0 RESEARCH METHOD

This study investigates the drivers and barriers of sustainable construction/green buildings as to how it impacts the preparedness of the Nigerian construction industry in adopting the emerging construction method. The research is underpinned by a review of extant literature to extract taxonomy of variables in the relevant domains; and empirical survey using quantitative and techniques. The questionnaire survey aspect of this study was conducted through a self-administered questionnaire to 90 respondents drawn from construction professionals in the construction Industry. The sampling technique employed is convenience sampling with the population of the respondents been the construction professionals who are managing partners of consulting firms which included Architectural firms, mechanical and electrical engineering firms, quantity surveying firms, Estate surveying firms and builders. Lagos was chosen because it is the Centre of commercial activities in the country. In order to test the consistency of the Construct variables, reliability test was conducted for variables adopted in the questionnaire which resulted in a Cronbach's alpha values of 0.889 and 0.849 respectively indicating a good level of reliability and consistency of the construct validity (Doloi, Iyer and Sawhney, 2011). Data collected through the questionnaire survey were analyzed using basic descriptive statistical tools.

### 4.0 RESULTS, ANALYSIS AND DISCUSSION

#### 4.1 Distribution of Questionnaires

The research instrument was administered to all construction professionals since they are involved in the execution of green buildings.

**Table 4.0 Distribution of Questionnaires**

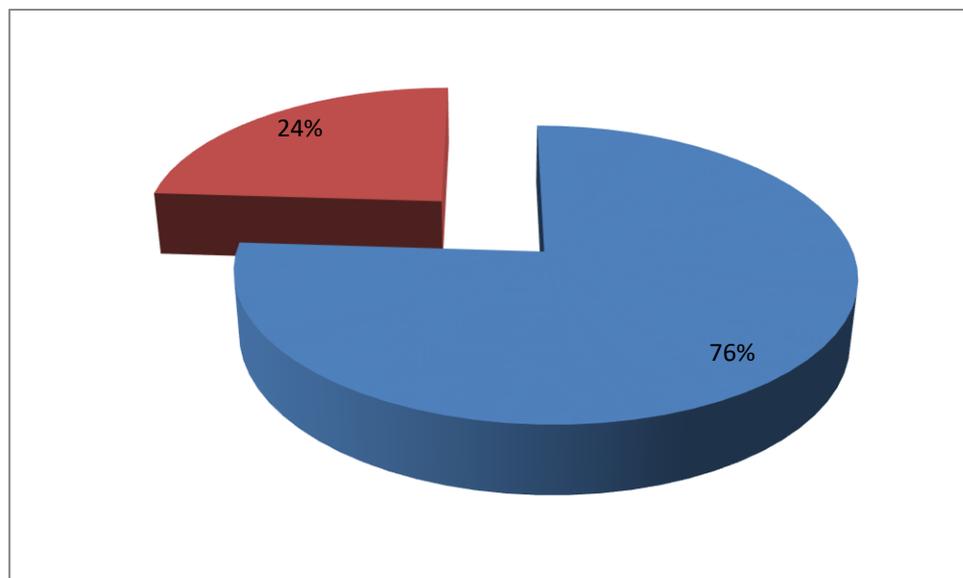
<b>Number Distributed</b>	<b>90</b>
<b>Number Properly Completed and Returned</b>	<b>69</b>
<b>Percentage Response</b>	<b>77%</b>

**Table 4.1      Profession of Respondents**

Profession	No of Response(s)
Architects	20
Builders	9
Engineers	10
Estate Surveyors	7
Quantity Surveyors	20
Town Planners	3
<b>Total</b>	<b>69</b>

Table 4.1 shows the distribution of the response from the construction professionals. Architects and Quantity surveyors had an even number of response which was the highest followed by Engineers which are the services Engineers, followed by the Builders and the Town Planners.

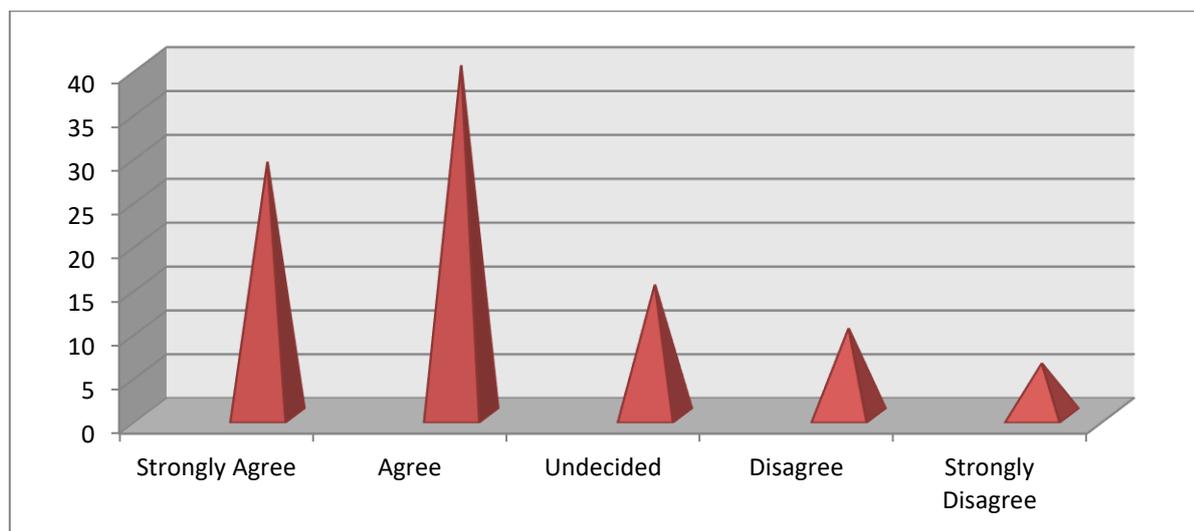
**4.2      Preparedness of the Nigerian construction industry to adopt green building**



**Figure 1:** Preparedness of the Nigerian Construction Industry to adopt green building

Figure 1 shows diagrammatically the response of the respondents when asked if the Nigerian built environment is prepared for the adoption of green buildings. It is shown that 76% of the respondents feel the sector is unprepared while 24% opines otherwise.

### 4.3 Capacity building of professionals on the technicalities of green buildings



**Figure 2: Capacity building of professionals on the technicalities of green buildings**

When asked on the availability of a guiding policy or framework for improvising the capacity of professionals to provide technical advice on green building, most of the respondents agreed it is non-existent while few agreed otherwise.

Most of the respondents agree that there is low capacity building of professionals as regards the technicalities of green buildings.

### 4.4 Drivers of Sustainable/green buildings in Nigeria.

**Table 4.2** Drivers of sustainable construction/green buildings with mean.

Drivers of Sustainable Construction/green building	Mean
Awareness on resources conservation	4.12
Government policy/regulations	4.06
Financial Incentives	3.99
Clients Requirements/Demand	3.91
Reduced long term cost	3.76

<b>Environmental impact/management</b>	3.52
<b>Urban planning policies</b>	3.33

In the table 4.2 above, the drivers of sustainable construction/green building from the respondents are awareness on resources conservation, government policy regulations, financial incentives, clients' requirements, reduced long term cost and urban planning policies.

#### **4.5 Barriers to sustainable construction/green building with mean**

**Table 4.3:** Barriers to sustainable construction/green building with mean

<b>Barriers to Sustainable Construction/green building</b>	<b>Mean</b>
<b>Inadequate awareness/knowledge on green buildings</b>	4.35
<b>Perceived high cost of green buildings</b>	4.28
<b>Government attitude/policies</b>	4.10
<b>Low/limited client Demand</b>	4.05
<b>Absence of incentives</b>	3.76
<b>Poor knowledge of green building methods among professionals</b>	3.62
<b>Inadequate education/training on sustainability</b>	3.56
<b>Reluctance to introduce it by Firm owners/managers</b>	3.49
<b>Supply chain management process</b>	3.38
<b>Unavailable legislation</b>	

Table 4.3 highlights the barriers to the adoption of green building/sustainable construction in the Nigerian built environment. As indicated by the respondents, the barriers are; inadequate awareness, low client demand, absence of incentives, poor knowledge of green building methods among professionals, inadequate education, reluctance to introduce it by owners of firms, supply chain management process and unavailable legislation.

#### **4.6 Strategies to prepare the Nigerian construction Industry for the adoption of green building/sustainable construction**

**Table 4.4** Strategies to prepare the Nigerian construction Industry for the adoption of green building/sustainable construction.

Strategies	Mean
Increased awareness, publicity and campaign for green buildings	4.21
Reduced initial construction cost	4.11
Support and legislative framework from government	4.05
Provision of incentives such as reduced taxes	4.02
Participation and education of professionals	3.97
Provision of economically efficient alternative green products	3.87

Table 4.4 presents recommended strategies for the adoption of green buildings/sustainable construction in the Nigerian construction industry. The strategies includes, increased awareness, publicity and campaign for green buildings, reduced initial construction cost, support and legislative framework from government, provision of incentives such as reduced taxes, participation and education of professionals, provision of economically efficient alternative green products.

## 5.0 DISCUSSION OF FINDINGS AND RECOMMENDATIONS

A majority of the respondents agreed that the Nigerian built environment is unprepared for the adoption of green buildings/sustainable construction. This might be due to the absence of green building assessment tools, lack of legislation and an absence of government drive. Danla (2014) affirms this when he opined that the conditions to facilitate green building exist in Nigeria but the absence of an enabling environment might have a disparaging effect.

The study also discovered that there is little or no availability of a guiding policy to improve the technical capability of construction professionals in participating in green building as compared with their counterparts in developed economies. This is as a result of an absence of enthusiastic and visionary support from the government. More than half of the respondents agree that trainings, seminars, workshops and conferences on this new concept are not enough. There is no sufficient training, seminars, conferences and workshops on green building knowledge for professionals.

However, the drivers to enable the adoption of green buildings were found out to be most importantly, awareness on resources conservation, government policy regulations, financial incentives, clients' requirements, while others such as reduced long term cost and urban planning policies though not as important are necessary.

Also, likely mitigating factors such as inadequate awareness, low client demand, absence of incentives, poor knowledge of green building methods among professionals were found to be major barriers while others such as inadequate education, reluctance to introduce it by owners of firms, supply chain management process and unavailable legislation were identified by the respondents.

Therefore, to strategically prepare the Nigerian built environment for the infiltration of green/sustainable building, the government is advised to increase awareness, publicity and campaign for green buildings through active support and engagement of all stakeholders in the built sector. Support for legislative framework to enable strict compliance with a formidable green policy. Provisions of incentives to private clients, who build sustainably, education and training for professionals, provision of economically efficient alternative green products.

## 6.0 CONCLUSION

This study revealed the drivers and barriers of green building preparedness in Nigeria. The most critical drivers were found to be awareness on resources conservation, government policy regulations, financial incentives and clients' requirement while the most critical barriers highlighted are, inadequate awareness, low client demand, absence of incentives and poor knowledge of green building methods among professionals. However, to strategically prepare the country's built environment for sustainable building, it was fundamentally discovered that the government has to lead and take initiative. This is important as the listed strategies is vital to policy and decision makers in drafting a plan for the adoption of green building in the Nigerian built environment.

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