

Residents' Awareness of Green Building Features in Ibadan Municipality, Nigeria

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Abstract: This study examined residents' awareness of green building features in Ibadan municipality Nigeria with a view to providing information for policy makers, developers, and investors in real properties on the extent to which residents are aware of green building and its features. Systematic random sampling was adopted because of the large population of residents within the five local government within Ibadan municipality. A total of 270 samples were selected for survey appraisal and questionnaires were administered to household heads in each situation. Descriptive statistics was used to analyse the obtained data. The study confirms that only 34.8% of the residents were aware of green building features and 65.2% were not aware. The study also revealed that the major sources of awareness were through the television and the internet. It was established that residents have knowledge of features like indoor air quality (2.93), energy conservation (2.59), site selection, design and land ecology (2.62), owner occupant education (2.55), water conservation (2.75) and material conservation (2.49). Furthermore, the study reveals that residents were moderately aware of green building features across the three residential zones and the level of awareness increased from low density zone to high density zone. Although, the awareness level was low among uneducated folks of the population. Therefore, it was recommended that there should be proper advocacy by policy makers for the adoption of green features in the residential buildings from low to high density areas.

Keywords: Awareness, Environmental degradation, Green buildings, Green features, Ibadan Municipality.

I. Introduction

The discourse on green building has been ongoing for decades in the Nigerian real estate market. Hence, embracing green building has become pertinent. This is because environmental problems such as climate change, global warming, and environmental degradation poses threats to humans and the natural environment. To resolve environmental related problems permanently, attention was drawn to sustainable building initiative globally, launched by the

United Nations at a conference in 1992 held in Rio de Janeiro Brazil on environmental sustainability. In the same vein the African nations fostered their own initiative in 2010 at a conference held in Nairobi, Kenya to promote green building also known as sustainable building ratings in African cities to reduce the effect of climate change. As this draws more attention to green building initiatives in both developed and developing countries.

Research revealed that developed and developing nations are aware of and have embrace the concept of green building, [1, 2]. According to the World Green Building Council [3], green building is a building whose design, construction, and operations, moderates or eliminates adverse effects to creates a positive effect on the climate, and natural environment, preserving natural

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resources, improving quality of life, and produce a building that will serve its creative purpose. More so, rating agencies such as LEED, BREAM, proposed that certain features must be present to some degree in a building before a building can be certified as green. For example, LEED identified about six features, namely: energy conservation, waste conservation, good environmental air quality, material conservation, landscape design and construction, occupant education on designs that suit the quality of life, and flexible design that enables the adaptation to a changing environment. For the building to be fully certified as a green building, it must possess all the above-listed features. As these features help to eliminate the negative impact on the environment and reduce the energy rate of consumption, [4].

Despite the importance of green building and its features, developing nations like Nigeria are yet to fully embrace it. Where environmental crises are worrisome because of construction activities. [5] observed that environmental problem such as flooding, pollution, climate change, and global warming are resulting to environmental damages in urban residential zones. Hence, there is a need to draw attention to the adoption of green buildings like other nations have done and are still doing. This can only be achieved primarily if the strategies to be adopted come from the demand side, which represents the end-users of this conceptual product (green building). Therefore, the need to establish the residents' knowledge of this concept cannot be degraded, as awareness represents existing knowledge, or being conscious of a situation based on information or experience about something or an event. [6] defines green building with the understanding that the built environment can have profound effects both positive and negative on the natural environment, green building tries

to amplify positive impacts and mitigate the negative side of these effects throughout the life cycle of a building. Green building, according to [7], is a building that is energy efficient, conserves water, uses materials in a resource-efficient manner, provides average indoor air quality, is site-friendly, as small as possible, reduces pollution in any form, and has design operations that minimize environmental impact.

Prequel to this research, there exist studies locally and internationally on the level of awareness of stakeholders, professionals, and residents on green buildings. [8 - 21]. But none of these studies has examined the level of residents' awareness of green building features, particularly in Ibadan municipality. For instance, international studies such as [8], investigated issues inducing adoption of green building technology in different areas such as barriers, drivers, and strategies to foster the adoption of green building. The work was centred on green building technology, while the present work focuses on green features. Also [9] studied review of operating performance in green building in China and United State. The research revealed that green building has higher occupancy satisfaction than conversional building. Local studies like [11] elucidated the perception of stakeholders on the awareness of the green building rating system and the derivable benefits of green building in Nigeria. The study fails to establish their source of awareness as this will have an implication on the genuineness of the research and determine the right medium to use for effective awareness. The work of [13] revealed the operational challenges of existing green building-related features. The study found out that users faced significant operational challenges with existing features, though residents were willing to pay a premium for upgrading to green building. In the same vein,

[12] ascertained that the main aim of awareness is to get people enlightened. The study was based on the level of professionals' awareness of green building. The study found that most building construction professionals are familiar with green building principles and establishes that there is no significant difference in the level of awareness of green practice among professionals in the built environment. The study explores the representation of the supply chain. [17] examined the level of awareness, medium of awareness, and perception of office property users about green building features. Though the study is like the current work, it fails to capture residents' characteristics. Similar study was also carried out by [18]. The study explored willingness to pay for green building features in the medium-income residential market of Makurdi in Nigeria. The findings revealed that the respondents found green features essential. [20] assessed factors influencing users' preference for green building features in Ibadan, Nigeria and established that factors relating to socio-economic characteristics such as knowledge regarding the benefits of green building education and income affect users' preference for green building features. In view of the foregoing, this study seeks to provide answers to the following questions: Who live in the study area? What are the residents' understanding or knowledge of green building features, and where did they learn about them? Therefore, answers to the stated questions will help to explain the level of residents' awareness of green building features with reference to Ibadan municipality, as this will be done to sensitize the public on the advantages accruable from embracing the model of green building features. Information gotten from this study would be a useful guide for real property developers and investors in providing green buildings in the study area and other cities in

developing countries with similar economic, social, and physical, features, and would serve as a tool for environmental sustainability.

II. Materials and Methods

The data for this study were gathered through the distribution of questionnaires. The focused group to be sampled were the residents of Ibadan municipality, which includes tenants and owner-occupiers in the five urban local government areas identified in the historical city of Ibadan. Through an exploratory survey, 2,700 residential buildings were identified in the study area. One out of every tenth building was chosen from where household heads were surveyed for questionnaire administration using systematic sampling. This accounted for 10% of all residential buildings explored in the study area. Evidently, the sample size was 270. The questionnaire sought information on residents' characteristics, residents' levels of awareness of green building, sources of awareness, and knowledge of green building features. The data was analysed using descriptive statistics. For questions on residents' characteristics, sources of awareness, and residents' level of awareness, frequency was used as the method of analysis. Furthermore, only respondents that were aware of green buildings and their features were asked about their extent of knowledge of green building features. The question was asked on a five-point Likert scale ranging from 1 to 5. Where 1 = fully not aware, 2 = not aware, 3 = moderately aware, 4 = aware, and 5 = fully aware. In arriving at the mean score, the total weighted value for each attribute is taken through the sum of the product of the responded number for each rating attribute and the corresponding weight value divided by the sum of the ratings as shown in equation.

Mathematical expression

$$\text{Mean} = \frac{\sum_{i=1}^s P_i}{TWV} \quad (1)$$

P_i is equal to the number of respondents rating a factor

While TWV = Total Weighted Value.

In explaining the result of the analysis, a mean score table was prepared on the knowledge of residents of green building features. According to [33], a mean score of 1.00–1.79 represents being fully unaware, this implies that respondents do not understand the concept of green building, even with an explicit explanation. A mean score of 1.80–2.59 was tagged as not aware, which means that the respondent can understand the concept if explained. A score of 2.60–3.39, neither aware nor not aware, indicates that respondents understand some of the aspects. For the mean score of 3.40–4.19, the author opined that the respondent can adequately understand, while for the mean score of 4.20–5.00, the respondents possess high knowledge of the concept.

Table 1: Score Table for Knowledge of Green Building Features

Mean score	Mean tag	Description
1.00-1.67	Not aware	Residents do not have any knowledge of green building and its features
1.68-3.34	Moderately aware	Residents have a slight knowledge of green building and its features
3.35-5.00	Fully aware	Residents are highly aware of green building and its features

The [33] score was, however, adopted and readjusted into three (3) score tables. Hence, for the purpose of this study, a mean score of **1.00–1.67** represents not aware, a mean score of **1.68–3.34** was tagged as moderately aware, and the

mean score of **3.35–5.00** represents fully aware. See Table 1 for more information.

The above table was then used to explain residents' awareness of green building features in the study area.

III. Results and Discussion

Table 2 below presents the users' characteristics, including gender, age, marital status, education, and level of income. Findings reveal that 54.4% were male while 45.6% were female. This further confirmed the general assertion that males are household heads, and they are in the right position to make decisions, represent and defend their family anywhere. It was indicated that 68.1% and 11.9% were single and married, respectively. 12.9%, 3.7%, 1.9%, and 1.5% were widows, widowers, divorcees, and complicated relationship respectively. While the age distribution showed that 11.1% of the residents were within the category of 20 to 29 years, while 27%, 31.9%, and 23.3% of the users were in the age brackets of 30-39, 40-49, and 50-59 years, respectively. Those in the age category of 60 years and above accounted for 6.7%. From this finding, it can be inferred that all age groups were adequately represented. It also shows that most of the respondents were within the age range of 40–49 years of age. As such, they are expected to be able to handle the information contained in the questionnaire.

The result also reveals that 30.4%, 24.8%, 34.4%, 7.8%, and 2.6% of residents had secondary school certificates, National Diplomas, Higher National Diplomas/First degrees, masters, and PhD respectively.

The result showed that the modal category of education status was HND/BSc, which was more evident in the medium density zone, followed by residents with secondary school

certificates, as this was reflected higher in the high-density zone of the study area. Given this educational status, the residents are expected to be able to understand the information contained in the questionnaire and supply more informed answers, especially in the medium density zone.

It can also be inferred that level of education can be attributed to either a high or low level of awareness of green building features. [20, 34], found that educational background affects level of awareness and factors with a high degree of influence on users' preference for green features in residential buildings are the educational factor and the income factor.

Table 2: General Characteristics of Users

Characteristics	Frequency	Percentage (%)
Gender		
Male	147	54.4
Female	123	45.6
Total	270	100.0
Marital Status		
Single	32	11.9
Married	184	68.1
Widow	35	12.9
Widower	10	3.7
Divorcee	5	1.9
Complicated	4	1.5
Total	270	100.0
Age Groups		
20-29	30	11.1
30-39	73	27.0
40-49	86	31.9
50-59	63	23.3
60 and above	18	6.7
Total	270	100.0
Educational Status		
O' level certificate	82	30.4
ND	67	24.8
HND/BSc	93	34.4
Masters	21	7.8
PhD	7	2.6
Total	270	100.0

Note: ND: National Diploma, HND: Higher National Diploma, BSc. Bachelor of Science, PhD: Doctor of Philosophy.

A. Residents Awareness of Green Building

[35] ascertained that the acceptability level of green building is being determined by the residents' level of awareness. In view of this, it is imperative to first investigate residents' level of awareness. The Table 3 below shows the residents' level of awareness of green buildings across the three residential zones of Ibadan municipality. The finding shows that 23% of residents were aware of green buildings, and 77% of residents in the high-density area were not aware of green building features. The reasons for this can be attributed to the low level of literacy in this zone as established by [20, 32] that a low level of awareness of green building features can be attributed to low educational factors and level of exposure. In the medium density, 39.3% were aware, while 60.7% were not. In the low-density area, findings revealed that 44.4% were aware, while 55.6% of the residents were not aware. Aggregating the three residential zones, 34.8% and 65.2% were aware and not aware, respectively. According to the results below, the low level of awareness in the high density is due to a low level of educational factor. In view of the foregoing analysis, it is convincing that most of the residents were not fully aware of green building features, and this validates the results of [36, 37, 38], that green building assumes a low level of awareness in Nigeria.

B. Source of Awareness of Residents on Green Building

Reviewed in Table 4 are the sources of awareness of residents of green building features. The results revealed that in high density zones, 13%, 1%, 4%, and 5% of the users were aware through television, newspapers, radio, and the internet. 77% do not respond to the question, which follows that the level of awareness of green building features, as shown in the previous table,

is low. Meaning that in high-density areas, the major source of awareness was through television, adding to the findings of [17], as the study shows that most of the residents were not aware.

Table 3: Residents Level of Awareness of Green Building

Level of Awareness	Residential Zones			Ibadan Municipality
	High density f (%)	Medium density f (%)	Low density f (%)	
Aware	23 23%	35 39.3%	36 44.4%	94 34.8%
Not aware	77 77%	54 60.7%	45 55.6%	176 65.2%
Total	100 100%	89 100%	81 100%	270 100%

The result further established that low-density residents learned about green building features through television (6.2%), magazines (2.5%), newspapers (2.5%) and the internet (30.8%). whereas 55.5% of users gave no response. The finding reveals that the major source of awareness for those that were aware of green building features across the three residential zones was through the internet, which accounted for 18.5%. As this was also revealed in the study of [31] the major source of awareness among professionals was the internet. As per the study by [8, 10], the major sources of awareness of green products is through promotional activities like billboards, banners, handbills, posters, and advertisements.

Lastly, 65.1% of the respondents gave no response, which might be attributed to a lack of awareness as evident across the zones in the study area (See Table 3). This can be owed to the levels of exposure and educational background

Table 4: Sources of Awareness on Green Building

Sources of Awareness	Residential Zones			Ibadan Municipality
	High Density f (%)	Medium Density f (%)	Low Density f (%)	
Sales office/model home	0 0%	0 0%	0 0%	0 0%
Builder supplier	0 0%	0 0%	0 0%	0 0%
Real estate agent	0 0%	0 0%	0 0%	0 0%
Parade of homes	0 0%	0 0%	0 0%	0 0%
Home	0 0%	0 0%	0 0%	0 0%
Television	13 13%	10 11.2%	5 6.2%	28 10.4%
Magazines	0 0%	3 3.4%	2 2.5%	5 1.9%
Newspapers	1 1%	2 2.5%	2 2.5%	5 1.9%
Radio	4 4%	0 0%	0 0%	4 1.5%
Internet	5 5%	20 22.5%	25 30.8%	50 18.5%
Friends and family	0 0%	0 0%	0 0%	0 0%
Brochure	0 0%	0 0%	2 2.5%	2 0.7%
Others	0 0%	0 0%	0 0%	0 0%
No response	77 77%	54 60.7%	45 55.5%	176 65.1%
Total	100 100%	89 100%	81 100%	270 100%

of the residential building users. This information will help other stakeholders in the built environment, especially policymakers, know the right medium to reach out to residents

across the residential zones for effective public education on green building practice.

C. Residents' Awareness of Green Building Features

Ascertaining the level and source of residents' awareness of green building features, it is essential to determine the residents' knowledge of green building features across the zones. As established from Table 5, Findings revealed that, on average, residents in high density zones had moderate awareness of green building features, as evident from the average mean score of 1.90 (see Table 2). Explicitly, as regarding each feature, findings established that residents were not aware of material use and conservation (1.33) as well as owner-occupant education (1.65). However, the residents were moderately aware of water conservation (1.81), site selection, design, and land ecology (2.00), energy conservation (2.02), and indoor air quality (2.55). [10], based the analysis of the study on mean score ranking and concluded that features regarding water efficient fittings were ranked higher than other features, being seen as one of the most important features among other features.

In the medium density, an average mean score of 2.57 was arrived at. This indicated that, the high-density zone, the residents were moderately aware of green building features in the study area. Supported by [16]. As regards each feature, it was evident from their mean score that the residents were moderately aware of all the green building features. For instance, owner occupant education accounted for (2.02), water conservation (2.52), material use conservation (2.55), indoor air quality (2.73), energy conservation (2.74), site selection, design, and land ecology (2.87). But [18], find features like indoor environmental quality and sustainable site energy efficiency,

among other factors, as the most significant features for medium-income earners.

Table 5: The Awareness of Residents on the Features Green Building

Green building Features	Residential Zone			Ibadan Municipality
	High Density	Medium Density	Low Density	
	Mean	Mean	Mean	Mean
Site selection, design, and land ecology	2.00	2.87	3.00	2.62
Material use and conservation	1.33	2.55	3.58	2.49
Indoor air quality	2.55	2.73	3.50	2.93
Energy conservation	2.02	2.74	3.01	2.59
Water conservation	1.81	2.52	3.92	2.75
Owner occupant education	1.65	2.02	3.99	2.55
Total	1.90	2.57	3.50	2.66

Furthermore, in the low-density zone, the mean score averaged 3.50. This indicated that the residents were fully aware of the green building features in the area. Explaining each feature, residents were moderately aware of site selection, design, and land ecology (3.01) and energy conservation (3.00). Regarding material use and conservation (3.58), indoor air quality (3.50), water conservation (3.99) and energy conservation (3.92), the residents were fully aware of the features. The findings of the analysis show that in Ibadan municipality, the level of awareness was moderate (2.66). More so, the

residents' level of awareness of green building features was on the increase moving from high to low-density zones in Ibadan Municipality, and awareness of each feature also varied in each residential zone, corroborating [19, 31] that awareness of the rating system requirements of LEED on green features varies across categories. And the reasons for this could include socio-economic characteristics, social factors, economic factors, and environmental factors. The findings are consistent with those of [31, 11]. It also discovered that stakeholders were aware of green building and the extent of incorporation was moderate for features such as energy efficiency and indoor environmental quality, which ranked highest among other features, and the major source of awareness is through the internet. The analysis was, however, based on stakeholders, equating to professionals in the built environment.

IV. Conclusion

The study examined the level of residents' awareness of green building features in the Ibadan municipality, Nigeria. Attaining this information, residents' characteristics were explored, the level of awareness and sources investigated, and residents' knowledge of green building features was established in three residential densities representing high, medium, and low. Findings revealed that residents had a low level of education, especially in the high-density zones, low levels of awareness and their major sources of awareness were television and the internet. The residents were moderately aware of green building features in Ibadan Municipality. Though the level of residents' awareness of green building features increases from high-density to low-density zones, residents were more aware of features like indoor air quality and water conservation, among other

features. The result of this study has policy implications: policymakers should make use of the right channel to pass the information on green building features to the residents, as it was evident in the study that television and the internet were the major sources of awareness of green building features, as this will help in embracing the concept. The study recommends that the right medium to pass information on green building features should be adopted by both policymakers and other stakeholders involved in the built environment. Also, at the grassroots level, property owners and occupiers should be educated on the advantages of incorporating green building features. The study is, however, limited because it focuses on users of residential property, while many other types of property exist. The study is also limited in terms of geographical coverage; other locations can be explored. The extent of the knowledge of residents about green features in different ecological regions can be explored to broaden the body of knowledge.

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