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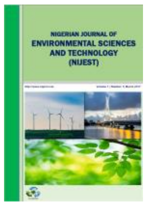

Adoption of Alternative Construction Materials: Estate Surveyors and Valuers' Views

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ABSTRACT

The construction industry is regarded as the lifeline of a country's economy because it affects all facets of human activities. Despite all the positive attributes of the construction industry to the economy, its negative impact on the environment cannot be over-emphasized. This study examined the perception of Estate Surveyors and Valuers' (ESVs) on the adoption of Alternative Construction Materials (ACMs). The objectives of the study are to investigate ESVs' level of awareness of ACMs and to ascertain their perception of the benefits and barriers to the use of ACMs. Eighty-two ESVs in Ikeja, Lagos were sampled using a questionnaire and sixty-one (representing 74.39%) were found useful for analysis. Data was analysed with descriptive and inferential statistics. The results of the analyses indicate that though 'ACMs' is not a new term among the ESVs in the study area, their level of awareness of the usage for construction purposes is low (46%). The results of factor analysis further showed that three (environmental protection, waste reduction, and reduction in cost of construction) out of the ten benefits accounted for 66.984% of the overall variability. Finally, the study revealed that the major barriers to using ACMs include: stakeholders' satisfaction with conventional building materials (RII=0.938); lack of policies to support sustainable construction (RII=0.928) and inadequate encouragement and support from professional bodies (RII=0.885). Among other suggestions, the study makes a case for the introduction and implementation of government policies that support the use of ACMs, since their adoption can only work with the full support of the government.

Keywords: Alternative Construction Materials, Building Materials, Construction Industry, Conventional Building Materials, Sustainable Development

1.0. Introduction

The construction industry is considered the lifeline of a country's economy because it affects all facets of human endeavours (Ayangade et al., 2009); the construction industry in Nigeria is not an exception. Not only does it have a significant impact on a nation's economy, it is also crucial to achieving national socio-economic development goals of providing housing, infrastructure, and employment (Anaman and Osei-Amponsah, 2007). Its contribution ranges from facilitating the purchase of goods and services, to the construction of buildings and other infrastructure, all of which provide job opportunities to the workforce while contributing significantly to Gross Domestic Product (GDP). Regardless of all the positive contributions of the construction industry to the economy, its negative impact on the environment cannot be overlooked (Bueren and Jong, 2007; Berardi, 2013; Son et al., 2011). In particular, various studies have shown that Conventional Building Materials (CBMs) cause acute and severe health challenges to building occupants, who are exposed to short- and long-term risks. Yet in many regions of the world, less emphasis is placed on addressing these issues (Joseph and Tretsiakova-McNally, 2010; Wilt et al., 2011).

Zarina et al. (2012) encouraged people associated with the construction sector to find fitting ways to secure a sustainable future for the general public, by bringing down side effects while reducing costs. To ensure the construction industry's long-term viability, Asif et al. (2007) suggested using a multi-disciplinary approach to address issues such as: energy protection, better utilization of materials, material waste minimization, and contamination and emanations control.

Delivery projects using alternative construction materials (ACMs) are expected to replace those using CBMs (Marut et al., 2020; Zinecker, 2022). ACMs, otherwise known as alternative building materials, unconventional building materials, or sustainable building materials, can play a significant role in the Nigerian building construction industry (Anigbogu, 1999). ACMs are building materials that completely or partially replace CBMs or their components in order to save costs, solve environmental concerns, or make up for a lack of conventional materials (Marut et al., 2020a; Marut et al., 2020b). Unlike CBMs, ACMs are distinctive in that they are sustainable (Morela et al., 2001). The benefits of ACMs over conventional materials cannot be overemphasised; they include environmental protection (Marut et al., 2020a; Marut et al., 2020b), energy efficiency (Marut et al., 2020a), reduction in construction cost and waste reduction (Alohan and Oyetunji, 2021), among others. Hence, authors around the globe have suggested the use of sustainable materials for construction (Akadiri et al., 2012; Opoku and Fortune, 2013; Anuar et al., 2014; Abdulmageed and Ogwuche, 2014; Spisakova and Mackova, 2015; Tunji-Olayeni et al., 2018; Marut et al., 2020a; Ifije and Aigbavboa, 2020). For instance, the work of Opoku and Fortune (2013) in the UK, emphasized the quest for sustainability in the construction industry as a result of pressure from the government and the general public on construction companies to improve their project delivery patterns, which are currently unsustainable. Another study by Anuar et al. (2014) in Malaysia noted that a successful project planning process has to integrate the various sustainability principles so as to minimize the challenges and barriers of a sustainable building. Another study in Slovakia by Spisakova and Mackova (2015) provided an overview of traditional, sustainable building materials’ potentials in modern methods of construction. The outcome of the study showed that lack of interest, information and knowledge about traditional building materials are the major barriers to their adoption.

Also, in Nigeria, Akadiri et al. (2012) designed a framework aimed at implementing sustainability strategies in the construction industry. The framework was designed to change the way construction professionals think about delivering projects so as to boost the use of ACMs and thereby improve sustainability in the building industry. A further study by Abdulmageed and Ogwuche (2014) focused on encouraging the use of non-conventional, sustainable building materials. The authors emphasized that sustainable development meets current demand for local materials without depleting stocks for future generations. Furthermore, Tunji-Olayeni et al. (2018) discovered that many construction firms do not utilize any sustainability principles due to lack of awareness about sustainability challenges in the construction industry; hence, the authors advocated for institutional policies to foster use of ACMs and, consequently, sustainability.

In view of the above reviews, it is evident that utilising ACMs in the construction industry is a vital element of a sustainable economy. However, the majority of these studies did not specifically seek the opinion of ESVs, one of the key participants in the construction industry who advise property investors and who usually have close contact with the occupiers of properties that may be adversely affected when CBMs are adopted. They are one of the most important stakeholders because they help people make property investment decisions (Patel, 2019). Nevertheless, there exists some earlier studies that sampled the opinion of ESVs, but their focus was on their perception of users' preference for green buildings (Komolafe and Oyewole, 2015), ESVs' views on the use of green building practices in commercial buildings (Ola and Adjekophori, 2018), and obstacles and benefits to the implementation of green buildings in Benin City (Alohan and Oyetunji, 2021); while Okoye et al. (2021) sampled the opinion of just two ESVs (as part of other construction industry participants) on their level of awareness of the benefits of sustainable construction practices. Although, these studies form the bedrock for this current one, the aims are divergent. Hence the rationale for this study that centres on this crucial stakeholder.

Based on the foregoing, this study determines how savvy ESVs in Lagos State are with different types of ACMs for construction purposes as well as the benefits and barriers to their adoption. This study on adoption of ACMs is justified based on 3 out of the 17 Sustainable Development Goals (SDGs) of United Nations (UN). This study is expected to enhance the knowledge of the public on, first, construction materials that can improve health and well-being (SDG 3); second, construction materials that are innovative and are used to produce more resilient buildings (SDG 9); and finally, the importance of creating sustainable cities and communities (SDG 11).

1.1. Literature Review

1.1.1 Alternative Construction Materials (ACMs)

The main drivers of alternative building materials are reduction of construction costs and the negative consequences CBMs have on the environment. This is because it was discovered that many of the building materials used for construction have adverse effects on the environment (Anigbobu, 2011). Marut et al. (2020b) asserted that ACMs are a modified version of CBMs. Joseph and Tretsiakova-McNally (2010) view ACMs as construction materials that have a variety of benefits, such as a reduced level of harmful substances, enhanced longevity of materials, and a reduced level of green house gases emitted during use. They are materials that provide alternatives to the traditional construction materials in the form of entire or partial replacement of conventional materials or their attributes for the purpose of lowering construction cost, promoting sustainability or coping with the unavailability of conventional materials (Marut et al., 2020a). According to Joseph and Tretsiakova-McNally (2010), ACMs are sustainable building materials that cause little or no harm to the environment, and the materials should meet the following criteria: have a low toxicity; be able to reduce waste in the environment; be able to conserve water, and many more. Building materials considered to be sustainable include recycled metals, recycled stone, straw, bamboo, and other materials that are recyclable, reusable and non-hazardous to the environment (Islam et al., 2015).

1.1.2 Features of Selected ACMs

A large number of viable ACMs have been developed over the years to curtail the negative effects of CBMs. Some of these ACMs are highlighted in Table 1. The selection is based on cost, availability and practicality (Peckenham, 2016; Sarker and Mahmud, 2018; Mahajan, 2019; Clyne and Hull, 2019 and Barbulianno, 2020). This study is therefore restricted to these selected ACMs.

Table 1: Features of Some Selected ACMs

S/N	Sources	ACM	Use	Benefit
1	Peckenham (2016); Thorsby (2019); Barbulianno (2020)	Recycled plastic	Walling, ceiling and tiling	It is great at retaining sound and very durable. It will reduce waste in the long run
2	Peckenham (2016); Onyegiri and Iwuagwu (2016); Brown (2018); Alade et al. (2018); Thorsby (2019); Barbulianno (2020); Ali et al. (2020); Gbonegun (2021); Samson (2021); Dordick (2022)	Bamboo	Walling, ceiling and tiling	It has very high strength due to its fibres running axially
3	Sarker and Mahmud (2018)	Thermal	Walling	It has the attributes of sound

		blocks		and thermal insulation
4	Hull and Clyne (1996); Hussain et al. (2011); Clyne and Hull (2019)	Glass fibre-reinforced plastics	Windows and doors	Glass fibre-reinforced plastics are corrosion resistant, lightweight, easy to handle and have high tensile strength
5	Mahajan (2019); Ghosh (2020); Team McCoy Mart (2021)	Fly-ash bricks	Walling	It has a high compressive strength, is less expensive, lighter in weight, and absorbs less water than clay bricks
6	Peckenham (2016); Brown (2018); Barbulianno (2020)	Ashcrete	Walling	It is stronger than Portland cement
7	Thorsby (2019); Barbulianno (2020)	Cork	Walling, ceiling and flooring	It is a tough material that can withstand moisture and liquids while also absorbing vibrations. It can serve as a hedge against global warming
8	Thorsby (2019); Barbulianno (2020)	Sheep’s wool	Walling and ceiling	It is an outstanding home insulator, easy to source and has excellent energy-saving features
9	Peckenham (2016); Brown (2018); Thorsby (2019)	Rammed earth	Walling and tiling	It has a high fire-resistance, is non-toxic, low maintenance, durable and has a high level of pest protection
10	Peckenham (2016); Thorsby (2019); Barbulianno (2020)	Hempcrete	Walling	It is a non-porous, non-shrinking material, so it does not make any crack lines even when it is dry. It is also pest and fire proof, as well a good insulator
11	Peckenham (2016); Brown (2018); Thorsby (2019); Barbulianno (2020)	Mycelium	Flooring and door cores	They are resistant to water, mold and fire
12	Peckenham (2016); Thorsby (2019); Barbulianno (2020)	Timbercrete	Walling	It is highly fire-resistant and very durable
13	Peckenham (2016); Brown (2018); Thorsby (2019); Barbulianno (2020)	Ferrock	Walling and flooring	It is excellent at absorbing and binding CO2 as well as reducing pollutants in general
14	Peckenham (2016); Onyegiri and Iwuagwu (2016); Brown (2018); Thorsby (2019); Barbulianno (2020) Ali et al. (2020); Dordick (2022)	Straw	Walling and ceiling	It is an excellent insulator in both hot and cold climates

1.1.3 ACMs’ Adoption: Benefits and Barriers

Many authors - both local and international - have tried to identify some of the benefits and barriers that are linked to the adoption of ACMs. From the existing literature, some of the barriers and benefits associated with the adoption of ACMs are summarised in Table 2. These benefits and barriers were examined in this study.

Table 2: Benefits and Barriers to the Adoption of ACMs

BENEFITS		
S/N	**Author/Year**	**Benefits**
1	Onyegiri and Iwuagwu (2016); Martut et al. (2020a); Alohan and Oyetunji (2021)	Environmental protection
2	Islam et al. (2016); Alohan and Oyetunji (2021)	Waste reduction
3	Abdulmageed and Ogwuche (2014); Onyegiri and Iwuagwu (2016); Alohan and Oyetunji (2021)	Reduction in cost of construction
4	Onyegiri and Iwuagwu (2016)	Affordability and Availability
5	Onyegiri and Iwuagwu (2016); Alohan and Oyetunji (2021)	Reusability
6	Onyegiri and Iwuagwu (2016)	Biodegradability
7	Onyegiri and Iwuagwu (2016); Marut et al. (2020a); Alohan and Oyetunji (2021)	Energy efficiency
BARRIERS		
SN	**Author/Year**	**Barriers**
1	Tunji-Olayeni et al. (2018); Ola and Adjekophori, 2018; Akinshipe et al. (2019); Shamanth (2019); Koko and Bello (2020); Alohan and Oyetunji (2021)	Low level of awareness
2	Opuku and Fortune (2013); Akinshipe et al. (2019); Shamanth (2019)	Public attitude to the use of alternative materials
3	Spisakova and Mackocva (2015); Muazu and Alibaba (2017); Koko and Bello (2020)	Satisfaction with the use of CBMs, which makes it difficult for stakeholders to use alternative construction materials
4	Gbadebo (2014); Mohammed and Abbakyari (2016); Tunji-Olayeni et al. (2018); Shamanth (2019); Koko and Bello (2020); Alohan and Oyetunji (2021)	Lack of policies to support Sustainable Construction
5	Akinshipe et al. (2019); Shamanth (2019)	Inadequate encouragement and support from professional bodies to use ACMs
6	Opoku and Fortune (2013); Okoye et al. (2022)	Misconception of construction cost overrun
7	Muazu and Alibaba (2017); Akinshipe et al. (2019); Shamanth (2019); Koko and Bello (2020); Alohan and Oyetunji (2021)	Lack of technical know-how and skills to implement sustainability
8	Muazu and Alibaba (2017)	Clients' unwillingness to use alternative construction materials
9	Mpakati-Gama et al. (2012); Koko and Bello (2020)	Absence of information promoting the benefits of alternative materials
10	Tunji-Olayeni et al. (2018); Akinshipe et al. (2019); Shamanth (2019)	Lack of willingness and commitment to the use of alternative construction materials by clients, professionals and stakeholders in the built environment

According to Table 2, previous research have addressed the benefits and barriers of using ACMs. However, studies on the opinions of ESVs, who are one of the crucial participants in the building industry, and professional property consultants and experts (Ayandeji, 2016), are limited. Though some studies exist that sample the opinions of ESVs (Komolafe and Oyewole, 2015; Ola and Adjekophori, 2018; Alohan and Oyetunji, 2021; Okoye et al., 2021), there is still a dearth of empirical literature that centres on the views of ESVs on the adoption of ACMs in Nigeria. It is against this backdrop that this study examined the perception of ESVs on the adoption of ACMs. This research is expected to fill a gap in literature as well as add to the compendium of knowledge.

2.0. Methodology

A survey research design was adopted for this study of ESVs within Ikeja, Lagos State, Nigeria. The limitation to Ikeja was to prevent results from being overgeneralized. Ikeja was also selected because it is one of the three main strata of the Lagos property market (Akeju et al., 2021). To arrive at the study population, reference was made to the 2020 online NIESV directory of registered firms. According to the directory, there are eighty-two firms located in the study area. This study administered questionnaires to one ESV per firm to seek their views on the adoption of ACMs. Moreover, the study purposely restricted the sampled ACMs to 14 namely: recycled plastic, bamboo, thermal blocks, glass fibre-reinforced plastics, fly-ash bricks, ashcrete, rammed earth, hempcrete, cork, sheep's wool, mycelium, timbercrete, ferrock and straw. This is because they are the most cost-effective, practical and available ACMs (Peckenham, 2016; Sarker and Mahmud, 2018; Mahajan, 2019; Clyne and Hull, 2019 and Barbulianno, 2020). The questionnaire was drawn using a 5-point Likert type scale. From the eighty-two questionnaires distributed to the ESVs, sixty-one questionnaires were retrieved, resulting in a response rate of 74.39%. The data was analysed with descriptive (percentages and Relative Importance Index) and inferential statistics (factor analysis). Percentages were used to show the participants' level of awareness of the selected ACMs and factor analysis was adopted to analyse questions on the benefits of using ACMs. This study adopted factor analysis in order to reduce the benefits of ACMs to the most crucial ones (Bartholomew et al., 2011; Yong and Pearce, 2013; Hadia et al., 2016). Finally, Relative Importance Index (RII) was adopted to examine the barriers to the use of ACMs. Specifically, RII was utilised in order to identify and prioritise the most significant barriers (Meisaroh et al., 2021). The RII result was interpreted following the suggestion of Fernando (2014) as follows: low level (RII $< 50\%$); medium level ($50\% \geq$ RII $< 70\%$) and high level (RII $\geq 70\%$). The results of the analyses are displayed in tables, chart and a graph.

3.0 Results and Discussion

3.1 Level of Awareness of Alternative Construction Materials (ACMs)

In a bid to ascertain the knowledge base of the ESVs on ACMs, they were told to state their degree of awareness of ACMs generally. This was done with a view to ascertaining their understanding of the term and also to confirm that they were capable of providing correct responses to achieve the aim of the study. Their responses are as shown in Figure 1.

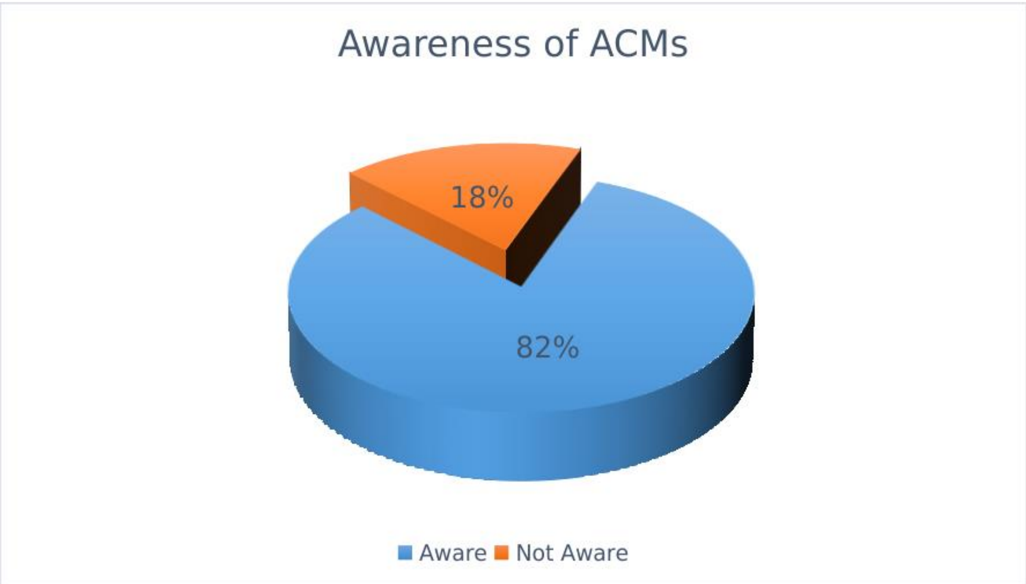

Figure 1: Awareness of ACMs

According to the chart, 82% of the ESVs in the study area are aware of what the term "ACMs" means. This indicates that the term is not new to them.

To further probe into their knowledge of ACMs, they were given 14 ACMs identified from the literature review; they were required to rate their degree of awareness of the selected ACMs for construction purposes. Their responses are shown in Table 3.

Table 3: Level of Awareness of Selected ACMs

ACM	Aware	Not Aware	Ranking
Bamboo	48 (79%)	13 (21%)	1st
Recycled plastic	48 (79%)	13 (21%)	1st
Thermal blocks	40 (66%)	21 (34%)	3rd
Glass fibre reinforced plastics	38 (62%)	23 (38%)	4th
Fly-ash bricks	37 (61%)	24 (39%)	5th
Timbercrete	32 (52%)	29 (48%)	6th
Ashcrete	32 (52%)	29 (48%)	6th
Straw	31 (51%)	30 (49%)	8th
Sheep's wool	29 (48%)	32 (52%)	9th
Ferrock	21 (34%)	40 (66%)	10th
Rammed earth	13 (21%)	48 (79%)	11th
Hempcrete	10 (16%)	51 (84%)	12th
Cork	8 (13%)	53 (87%)	13th
Mycelium	5 (8%)	56 (92%)	14th
Total Percentage	642%	758%	
Average Percentage	642%/14 = 46%	758%/14 = 54%	

Results from the survey showed that out of the 61 respondents, 48 (79%) of them were aware of the use of bamboo and recycled plastic, 40 (66%) of thermal blocks, 38 (62%) of glass fibre-reinforced plastics, 37 (61%) of fly-ash bricks, 32 (52%) of timbercrete, 32 (52%) of ashcrete and 31 (51%) of straw for construction purposes. However, most of the respondents were not conversant with sheep's wool (52%), ferrock (66%), rammed earth (79%), hempcrete 51 (84%), cork (87%), and mycelium (92%) as ACMs. It is evident from this outcome that only a few (46%) of the respondents were really aware of the selected ACMs for construction purposes. As a result, it can be deduced that the level of awareness of ACMs among ESVs in the study area is very low. This is also the conclusion of the works of Tunji-Olayeni et al. (2018); Akinshipe et al. (2019) and Shamanth (2019).

3.2 Benefits of Using Alternative Construction Materials (ACMs)

To determine the benefits of using ACMs, 10 items were explored using factor analysis, as shown in Table 5 and Graph 1. Before this, the Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy test and Bartlett's Test of Sphericity were utilized to see if the data set was appropriate for factor analysis. The sampling is said to be adequate if the value of the K.M.O. is larger than 0.5 (Field, 2000; Hadia et al., 2016). According to Table 4, the KMO is 0.595, which is more than the recommended 0.5. As a result, factor analysis was found appropriate for surveying the data.

Table 4: K.M.O. and Bartlett's Test

K.M.O		0.595
Bartlett's Test of Sphericity	Approx. Chi-Square	223.421
	df	45
	Sig.	.000

Table 5 shows that three factors with an Eigenvalue larger than one accounted for 66.984% of the total percentage of variance. The three factors are the benefits of the adoption of ACMs from the perspective of ESVs in the study area.

Table 5: Benefits of Using Alternative Construction Materials

S/N	Benefits	Initial Eigenvalues			Rotation Sums of Squared Loadings		
		Total	% Variance	% Cumulative	Total	% Variance	% Cumulative
1	Environmental Protection	3.038	30.379	30.379	3.038	30.379	**30.379**
2	Waste Reduction	2.441	24.407	54.786	2.441	24.407	**54.786**
3	Reduction in Cost of Construction	1.220	12.197	66.984	1.220	12.197	**66.984**
4	Affordability and Availability	.892	8.919	75.903			
5	Quality of materials	.806	8.060	83.963			
6	Reusability	.586	5.855	89.818			
7	Biodegradability	.399	3.987	93.805			
8	Flexibility in adapting to future changes	.268	2.683	96.488			
9	Duration of overall construction	.199	1.990	98.477			
10	Energy efficiency	.152	1.523	100.000			

Table 5 also shows the variance that has been well-defined by the initial solution (initial eigenvalues) and rotation sums of squared loadings. The eigenvalues greater than 1 were extracted and this showed that the first three principal components (environmental protection, waste reduction and reduction in cost of construction) shape the extracted solution making up for 66.984% of the overall variability, inside the unique 10 additives (variables) so that the complexity of the statistics set may be drastically reduced with the use of the extracted additives. This outcome is in support of previous studies (Abdulmageed and Ogwuche, 2014; Onyegiri and Iwuagwu, 2016; Islam et al., 2016; Martut et al., 2020a) which revealed environmental protection, waste reduction and reduction in cost of construction as the benefits of adopting ACMs.

The factor analysis' Scree plot of the 10 items is depicted in Figure 2. A closer look at the Scree plot shows that any deviation from linearity corresponds to a 3-factor outcome, indicating that, according to the ESVs in the study area, only 3 of the items are major benefits of adopting ACMs.

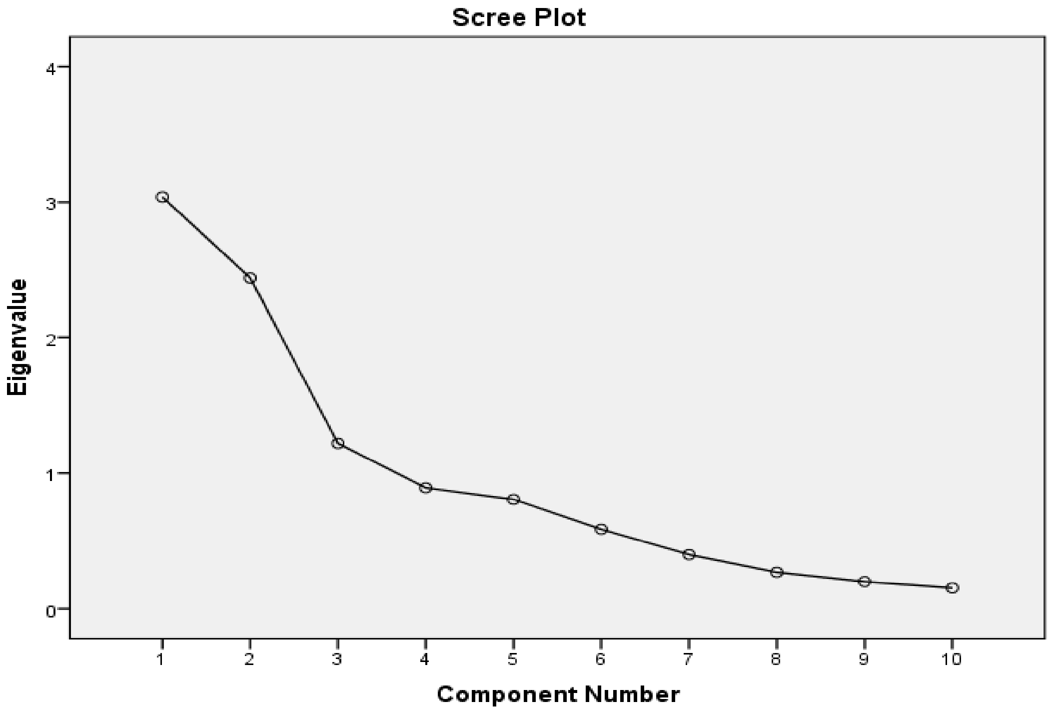

Figure 2: Scree Plot

3.3 Barriers to the Adoption of Alternative Construction Materials (ACMs)

In a bid to uncover the obstacles to the use of ACMs in the study area, the researchers listed eight barriers derived from the literature review. To analyse the responses (obtained via the questionnaires), the researchers assigned 1 to “Strongly Disagree” and 5 to “Strongly Agree”. The outcome of the analysis using RII is as shown in Table 6.

Table 6: Barriers to the Adoption of Alternative Construction Materials (ACMs)

Barriers	5	4	3	2	1	RII	Rank	Remark
Satisfaction with the use of CBMs which makes it difficult for stakeholders to use the alternative construction materials	42	19	0	0	0	0.938	1st	High Level
Lack of policies to support sustainable construction	40	20	1	0	0	0.928	2nd	High Level
Inadequate encouragement and support from professional bodies to use ACMs	32	25	2	2	0	0.885	3rd	High Level
Low level of awareness of ACMs	22	32	7	0	0	0.849	4th	High Level
Misconception of construction cost overrun	15	33	12	1	0	0.803	5th	High Level
Misconception of the quality of ACMs	15	33	12	1	0	0.803	5th	High Level
Public attitude to the use of ACMs	10	15	20	10	6	0.643	7th	Medium Level
Lack of technical know-how and skills to implement sustainability	0	11	20	22	8	0.511	8th	Medium Level

Note: *low level = (RII < 50%); medium level = (50% ≥ RII < 70%) and high level = (RII ≥ 70%)*

Table 6 displays the findings of eight areas identified from the earlier literature review as the barriers to adopting ACMs in the study area. Based on the associated relative importance indices (RII), six challenges stood out. They include the fact that: stakeholders are satisfied with using CBMs (RII=0.938); lack of policies to support sustainable construction (RII=0.928); inadequate encouragement and support from professional bodies to use ACMs (RII=0.885); low level of awareness of ACMs (RII=0.849); misconception of construction cost overrun (RII=0.803), misconception of the quality of ACMs (RII=0.803) and public attitude to the use of ACMs (RII =0.643). However, lack of technical know-how and skills to implement sustainability (RII=0.511) is the least barrier identified by the participants. Notably, previous research efforts by Opoku and Fortune (2013); Gbadebo (2014); Spisakova and Mackocva (2015); Mohammed and Abbakyari (2016); Muazu and Alibaba (2017); Tunji-Olayeni et al. (2018) and Akinshipe et al. (2019) also identified these seven barriers revealed in this study. However, the outcome of this study contradicts that of Shamanth (2019), Koko and Bello (2020) and Alohan and Oyetunji (2021) that identified lack of technical know-how and skills to implement sustainability as being one of the crucial barriers to the adoption of ACMs.

4.0 Conclusion

The study examined the benefits and barriers to the adoption of ACMs among ESVs in Ikeja, Lagos State. The analyses vividly showed four results. First, ACMs are not a new concept among ESVs in the study area. Second, despite the fact that they are aware of the term, their level of awareness of the usage of most of the selected ACMs for construction purposes is very low. Third, the major benefits of using ACMs for construction are environmental protection, waste reduction and reduction in the cost of construction. Finally, the barriers to ACMs’ adoption are the fact that stakeholders are satisfied with using CBMs, lack of policies to support sustainable construction, inadequate encouragement and support from professional bodies, and low level of awareness of ACMs, among others. The following suggestions are proffered as a result of the study's findings:

1. To curb the issue of low levels of awareness of the usage of ACMs, ESVs should consider improving their knowledge by attending seminars and workshops organised at the branch or national levels on the different types of ACMs as well as their uses and benefits of adoption.
2. Moreover, to eradicate the barrier of lack of policies to support sustainable construction, this study suggests the introduction and implementation of government policies that support the use of ACMs. This is because sustainable construction will only be widely accepted with the full support of the government.
3. Finally, forums should be organised for keeping professionals in the built environment abreast of the benefits of using ACMs for construction. This is expected to curb the barrier of lack of encouragement and support from professional bodies on the adoption of ACMs.

As with the majority of studies, the design of the current study is subject to limitations. First, this research was carried out by administering questionnaires to ESVs in Ikeja, Lagos State. Second, the focus was on only 14 ACMs. Thus, there is a possibility that the results of the study may be different if other ACMs are included and examined in a new study. Based on this, it is suggested that further studies can be considered with more ACMs included. Furthermore, a further study could be designed to cover more ESVs in Lagos State or other geographical locations.

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