Factors Affecting the Adoption of Alternative Materials for Construction Projects in Edo State [1]

Edosa M. Osazuwa & Martha A. Esekie

Department of Quantity Surveying
University of Benin, Nigeria

ABTRACT

The study aims to assess the factors affecting the level of adoption of alternative materials for construction. The population targets are Engineers, Quantity Surveyors, Builders and Architects, who are major stakeholders in the construction industry. The research method used was quantitative analysis, and a total of 185 responses were obtained. The findings demonstrate that materials with proven performance, familiarity, and accessibility dominate adoption, while innovative bio-based and agro-waste materials remain underexploited. Addressing cultural biases, enhancing public education, developing local processing infrastructure, and implementing supportive policies are essential for promoting sustainable construction practices in Edo State. Innovative materials such as rice husk, palm kernel shells, coconut coir, hemp, and sheep wool should be supported through pilot programs and research to build confidence in their performance. For enhancing the level of adoption, educational campaigns and technical training to increase knowledge of the benefits and proper use of alternative materials, development of local processing facilities and supply chain.

Keywords: alternative materials, sustainable, conventional materials, Edo State.

INTRODUCTION

The use of reusable materials in Nigerian Construction industry is constrained but is gaining traction. Alternative building materials, such as bamboo, lumber, laterite, and agricultural byproducts, provide substantial ecological advantages because they are readily available, biodegradable, and have low embodied energy (Olotuah & Adesiji, 2012). Despite these

[1] How to cite this paper: Osazuwa, E. M., Esekie, M. A. (2026). Factors Affecting the Adoption of Alternative Materials for Construction Projects in Edo State; *PM World Journal*, Vol. XV, Issue VI, June.

advantages, their adoption in Nigeria remains limited, largely due to perceived or actual cost implications, lack of awareness, technological constraints, and inconsistent policy support (Eze E.C, 2023).

The rising cost of building is a source of concern to most Governments in the world, especially in countries still developing. One possible cause is the rising cost of building materials since a larger portion is incurred from building materials (Yalley & kwan, 2008).

There is an acute lack of affordable houses which is largely due to the high cost of the conventionally processed construction materials such as steel and Portland cement. The importance of alternative materials in sustainable construction cannot be overstated. Traditional building materials, such as concrete, steel, and brick, have significant environmental footprints due to their high energy consumption and carbon emissions during production. In contrast, innovative materials offer more sustainable alternatives that can help reduce the environmental impact of construction (Nturanabo, Masu & Kirabira, Okoduwa, et. Al., 2024, 2019, Omaghomi, et. Al., 2024). Alternative materials play an important role in the betterment of energy efficiency of building.

Furthermore, money is still a major consideration when choosing a building project in Nigeria, where financial constraints and budget overruns are frequent problems (Aibinu & Jagboro, 2002). As a result, a better knowledge of the cost dynamics associated with alternative resources is critical. This comprises not just the original purchase price, but also lifetime costs, maintenance, and long-term economic advantages. According to research, while some alternative materials may have greater upfront prices, their long-term savings and environmental benefits can surpass these initial investments (Asif, Muneer, & Kelley, 2007).

As Unegbu et al. (2017) emphasizes, renewability is only the first step, true sustainability considers the entire life cycle to ensure lasting environmental benefits.

This study seeks to address that gap by investigating the financial viability, market accessibility, and long-term economic ramifications of alternative construction materials in Nigeria.

LITERATURE REVIEW

Alternative materials are derived from resources that can regenerate within a human lifetime, such as bamboo, timber, straw, recycled materials, and other bio-based products. These materials are often biodegradable, energy-efficient to process, and have lower embodied carbon compared to conventional options like concrete and steel (Kibert, 2016). Their use in construction promotes environmental sustainability, cost-effectiveness, and resource efficiency.

In line with global goals for climate resilience and sustainable development, as well as local initiatives to reduce construction-related carbon footprints, the construction industry in Edo State, Nigeria, is undergoing a model shift towards sustainability, with a key component being the increased use of alternative materials—resources that are naturally replenished and have a lower environmental impact than traditional building materials.

DEMOGRAPHIC INFORMATION

Category		**Frequency**	**Percentage**
Professional	Quantity Surveying	32	17.30%
	Engineer	52	28.10%
	Architect	39	21.10%
	Builder	62	33.50%
	Tota	**185**	**100%**
Years of professional experience	0-5 years	95	51.35%
	6-10 years	46	24.86%
	>10 years	44	23.78%
	Total	**185**	**100%**
Highest level of education attainment	B.SC/B.TECH	93	50.30%
	M.SC	49	26.50%
	HND	5	2.70%
	PHD	22	11.90%
	ND/OND	8	4.30%
	PGD	8	4.30%
	Total	**185**	**100%**
Membership of professional organisation	MNIQS	32	17.30%
	MNSE	52	28.10%
	MNIA	39	21.10%
	MNIOB	62	33.50%
		185	**100%**

FACTORS AFFECTING THE ADOPTION OF ALTERNATIVE MATERIALS FOR CONSTRION PROJECTS

Table 1 presents the key factors influencing the adoption of alternative construction materials in Edo State, as identified from literature and empirical findings.

Table 1

SN	Factors	References
1	Cultural and perception issues	Mogaji (2024); Olaniyan (2023)
2	Lack of public awareness and education	Eze et al. (2023); Mogaji et al. (2024)
3	Absence of strong government policies and standards	Mogaji et al. (2024)
4	Weak industrial and processing infrastructure	Ojonimi et al. (2018)
5	Cost challenges and lack of scale	Wibowo et al. (2020)
6	Technical challenges and skill gaps	Agboola et al. (2024)
7	Supply chain limitations	Ramage et al. (2017)
8	Resistance to change	Agboola et al. (2024)
9	Economic instability	Ramage et al. (2017)
10	Safety and durability concerns	Ramage et al. (2017)
11	Inadequate research and development	Agboola et al. (2024)
12	Perception of inferior quality	Emodi et al. (2014)
13	Client and market demand	John Olusegun
14	Poor standardization of materials	Emodi et al. (2014)
15	Corruption in procurement processes	Eze et al. (2023)
16	Lack of industry collaboration	Eze et al. (2023)
17	Building codes and standards	Agboola et al. (2024)
18	Lack of economic incentives and taxes	Emodi et al. (2014)

Table 2: Coefficient Matrix

	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13	F14	F15	F16	F17	F18
F1	1																	
F2	0.39	1																
F3	0.444	0.564	1															
F4	0.428	0.545	0.535	1														
F5	0.375	0.401	0.441	0.505	1													
F6	0.341	0.561	0.567	0.536	0.497	1												
F7	0.24	0.196	0.126	0.128	0.238	0.253	1											
F8	0.183	0.308	0.254	0.226	0.177	0.306	0.462	1										
F9	0.587	0.483	0.467	0.47	0.464	0.583	0.265	0.361	1									
F10	0.422	0.45	0.455	0.475	0.516	0.498	0.268	0.22	0.453	1								
F11	0.457	0.55	0.546	0.613	0.556	0.568	0.223	0.302	0.581	0.55	1							
F12	0.245	0.316	0.322	0.302	0.235	0.302	0.261	0.322	0.326	0.259	0.372	1						
F13	0.363	0.352	0.245	0.372	0.287	0.28	0.347	0.346	0.345	0.283	0.441	0.354	1					
F14	0.208	0.296	0.252	0.263	0.214	0.193	0.377	0.363	0.304	0.279	0.312	0.302	0.309	1				
F15	0.154	0.216	0.213	0.279	0.315	0.177	0.294	0.206	0.204	0.35	0.29	0.203	0.215	0.299	1			
F16	0.238	0.292	0.257	0.295	0.238	0.294	0.239	0.254	0.273	0.214	0.356	0.272	0.276	0.139	0.352	1		
F17	0.135	0.169	0.214	0.247	0.153	0.211	0.148	0.251	0.23	0.26	0.201	0.202	0.213	0.266	0.254	0.384	1	
F18	0.188	0.191	0.112	0.127	0.203	0.167	0.273	0.138	0.232	0.272	0.292	0.056	0.235	0.232	0.285	0.213	0.3	1

Table 3: Communalities

	Initial	Extraction
Cultural and perception issues	1.000	0.474
Lack of public awareness and education	1.000	0.569
Absence of Strong Government Policies and Standards	1.000	0.613
Weak Industrial and Processing Infrastructure	1.000	0.624
Cost Challenges and Lack of Scale	1.000	0.565
Technical Challenges and Skill Gaps	1.000	0.606
Supply Chain Limitations	1.000	0.667
Safety and Durability Concerns	1.000	0.615
Resistance to change	1.000	0.595
Economic instability	1.000	0.59
Inadequate research and development	1.000	0.675
Perception of inferior quality	1.000	0.534
Client and market demand	1.000	0.435
Poor standardization of materials	1.000	0.471
Corruption in procurement processes	1.000	0.502
Lack of industry collaboration	1.000	0.63
Building codes and standards	1.000	0.621
Lack of Economic incentives and taxes	1.000	0.63

Extraction Method: Principal Component Analysis.

Table 4.7 shows the number of factors affecting the adoption of alternative construction materials and their respective eigen values. The latent root or Kaiser's criterion of retaining challenges factors with eigen values exceeding 1.0 was employed. However, four factors with eigen values exceeding were retained, resulting in 6.555, 1.68, 1.174 and 1.006 selected which explains 36.415, 9.335, 6.524 and 5.59 percent of the variance respectively. This infers that the first cluster of challenges factors accounted for 36.415 percent; the second cluster of challenges factors accounted for 9.335 percent, the third cluster accounted for 6.524 percent and the fourth cluster accounted for 5.59 percent. These four clusters of adoption factors together have a cumulative percentage of 57.863 percent of the total importance, which highlights their significance from the eighteen factors shown.

Table 4: Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.555	36.415	36.415	6.555	36.415	36.415	4.881	27.119	27.119
2	1.68	9.335	45.75	1.68	9.335	45.75	2.428	13.489	40.608
3	1.174	6.524	52.274	1.174	6.524	52.274	1.645	9.139	49.747
4	1.006	5.59	57.863	1.006	5.59	57.863	1.461	8.116	57.863
5	0.861	4.783	62.647						
6	0.809	4.496	67.143						
7	0.774	4.302	71.444						
8	0.682	3.788	75.232						
9	0.628	3.49	78.723						
10	0.609	3.383	82.106						
11	0.52	2.89	84.996						
12	0.502	2.79	87.786						
13	0.446	2.479	90.264						
14	0.428	2.38	92.644						
15	0.398	2.211	94.855						
16	0.387	2.153	97.008						
17	0.295	1.641	98.649						
18	0.243	1.351	100						

Extraction Method: Principal Component Analysis.

An inspection of the scree plot on Figure 4.1 reveals a break after the first factor (Cultural and perception issues (F1)) and another after the second factor (Lack of public awareness and education (F2)), followed by a third break after the third factor (Absence of Strong Government Policies and Standards (F3)) and a final break after the fourth factor (Weak Industrial and Processing Infrastructure (F4))

The steep slope shows the large factors while the gradual trailing off shows the rest of the factors that have an eigen value less than 1. The three large cluster factors, which are positioned on the steep slope were retained. To aid the interpretation of these three factors, varimax was performed which gave rise to the pattern matrix as shown in Table (NR)

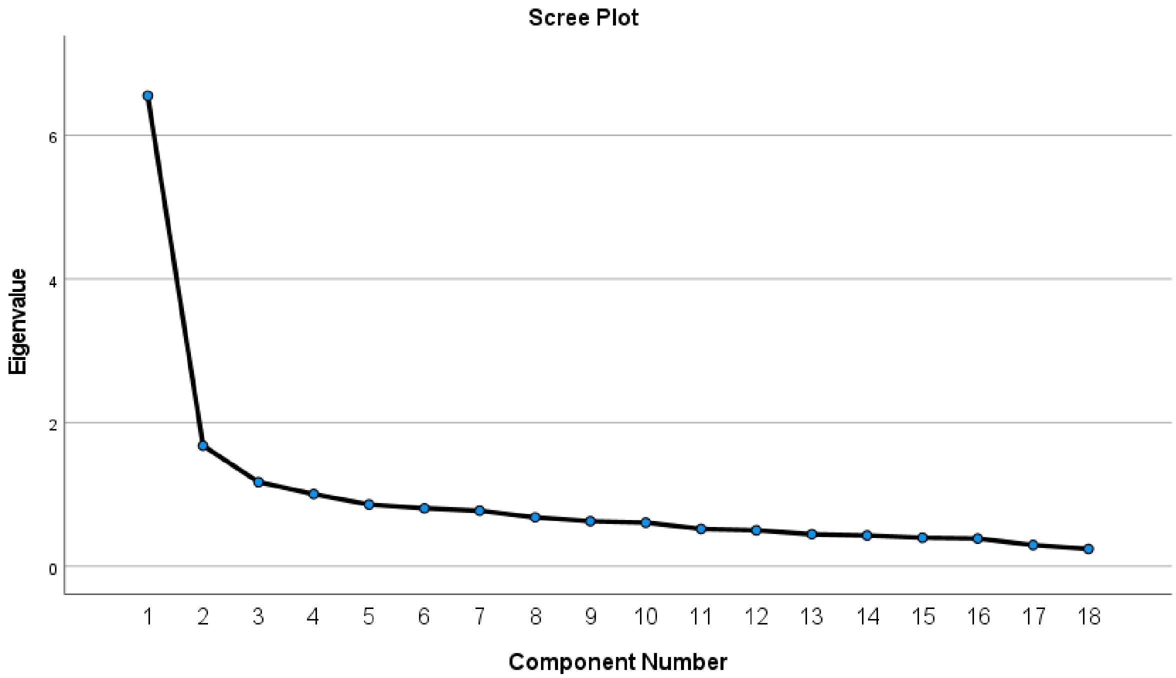


Figure 1: Scree Plot

Table 5: Rotated Component Matrix

	Component			
	1	2	3	4
Inadequate research and development	0.76			
Weak Industrial and Processing Infrastructure	0.747			
Absence of Strong Government Policies and Standards	0.747			
Technical Challenges and Skill Gaps	0.746			
Lack of public awareness and education	0.702			
Resistance to change	0.697			
Cost Challenges and Lack of Scale	0.684			
Economic instability	0.652			
Cultural and perception issues	0.63			

Safety and Durability Concerns	0.741		
Supply Chain Limitations	0.737		
Poor standardization of materials	0.614		
Client and market demand	0.547		
Perception of inferior quality	0.516		
Lack of industry collaboration		0.741	
Building codes and standards		0.74	
Lack of Economic incentives and taxes			0.755
Corruption in procurement processes		0.408	0.525

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
A Rotation converged in 7 iterations.

RESULTS AND DISCUSSIONS

The study identified 18 factors influencing adoption, with: Lack of public awareness and education, Weak industrial and processing infrastructure, Resistance to Change, as the most critical. This supports Mogaji, I. J., (2024), Eze E.C (2021), and Ojonimi et al. (2018), who noted that societal attitudes, insufficient knowledge, and poor local processing facilities limit the uptake of alternative materials. Lower-ranked factors such as Building codes and standards, Supply Chain Limitations, and Safety and Durability Concerns, play a supportive role, indicating that adoption is primarily influenced by perception, knowledge, and material familiarity rather than policy alone. In summary, the findings demonstrate that materials with proven performance, familiarity, and accessibility dominate adoption, while innovative bio-based and agro-waste materials remain underexploited. Addressing cultural biases, enhancing public education, developing local processing infrastructure, and implementing supportive policies are essential for promoting sustainable construction practices in Edo State.

CONCLUSION

The factors affecting adoption include cultural perceptions linking alternative materials to poverty, lack of public awareness and education, weak industrial and processing infrastructure, technical skill gaps, supply chain limitations, and cost challenges. Lower-ranked factors such as corruption, building codes, and lack of economic incentives have a minor but supportive effect. These findings highlight that both socio-cultural attitudes and systemic constraints significantly influence whether alternative materials are accepted and utilized in construction projects.

RECOMMENDATION

Policy reforms, public education, and investment in research and infrastructure are recommended to improve adoption levels.

REFERENCES

Agboola, S. A., Idowu, F. A., Yusuf, F. M., & Musa, A. K. (2024). Barriers to sustainable green building practice in Nigeria. FUDMA Journal of Sciences, 7(6), 157–163.

Emodi, V. N., Yusuf, S., & Boo, K. (2014). The necessity of the development of standards for renewable energy technologies in Nigeria. Smart Grid and Renewable Energy.

Eze, E. C., Sofolahan, O., & Omoboye, O. G. (2023). Assessment of barriers to the adoption of sustainable building materials. Frontiers in Engineering and Built Environment, 3(3), 153–166.

Kibert, C. J. (2016). Sustainable construction: Green building design and delivery. Wiley.

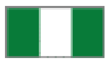
Mogaji, I. J., Mewomo, M. C., & Bondinuba, F. K. (2024). Assessment of barriers to the adoption of innovative building materials. Engineering, Construction and Architectural Management.

Wibowo, A., Gao, Z., & Gao, Y. (2020). Barriers to the adoption of sustainable construction materials. Sustainability, 12(17), 7099.

About the Authors

Edosa Mark Osazuwa

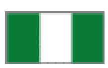
Benin City, Nigeria



Edosa Mark Osazuwa, B.Tech, MTech (Quantity Surveying) serves as a Lecturer I in the Department of Quantity Surveying, Faculty of Environmental Sciences, University of Benin, Benin City, Edo State, Nigeria. He can be contacted at osazuwaedosamark@gmail.com

Martha A. Esekie

Benin City, Nigeria



Martha Aitekere Esekie is a recent graduate of the Department of Quantity Surveying at the University of Benin, Nigeria. She has demonstrated a strong commitment to academic excellence and professional development within the built environment sector. During her time at the University of Benin, she served in student leadership roles, contributing to student representation. Her research interests include sustainable construction, construction cost and project management, and Adoption of alternative building materials for sustainable development. She is passionate about advancing innovative and environmentally responsible practices in the construction industry.