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Factors Influencing the Adoption of Construction Waste Management Practices in Sustainable Building Projects in Osogbo, Nigeria

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Abstract

The rapid expansion of construction activities in developing urban centres has intensified the generation of construction waste, creating significant environmental and sustainability challenges. This study investigates the factors influencing the adoption of Construction waste management practices in sustainable building project in Osogbo, Osun State, Nigeria. A quantitative survey research design was employed, focusing on construction professionals comprising architect, engineers, quantity surveyors and builders. Data were collected through structured questionnaires, administered to 135 respondents, with 110 valid responses analyzed using descriptive statistic and inferential analysis. The findings revealed that the availability of skilled labour and the cost of implementation are the most influential factors of adoption. Leadership commitment and organizational culture were also ranked highly, indicating the importance of internal organizational dynamics. Regression results showed that skilled labour availability ($\beta = 0.301$; $p = 0.012$), cost of implementation ($\beta = 0.245$; $p = 0.021$) and regulatory policies ($\beta = 0.226$; $p = 0.050$) have a significant positive effect on the adoption of construction waste management practices adoption, while other factors such as awareness level ($\beta = 0.008$; $p = 0.950$), technological advancement ($\beta = -0.042$; $p = 0.719$) and client pressure ($\beta = 0.004$; $p = 0.972$) were found to be statistically insignificant. The model explains 16.5% of the variance in construction waste management practices. The study concludes that human capacity, financial considerations, and effective regulatory framework are critical drivers of construction waste management practices' adoption in the study area. The study recommends strengthened policy enforcement, focusing on capacity development through regular training and stakeholder collaboration to enhance sustainable building project.

Keywords: Construction Waste Management, Sustainable Construction, Waste Reduction Practices, Adoption Determinants, Regulatory Policies, Nigeria Construction Industry.

Introduction

Globally, construction sector contributes tremendously to the economic and social growth of the country through infrastructure development and job creation (Bayewun et al, 2023). Similarly, The construction sector of Nigeria functions as a critical element for both economic expansion and infrastructure development of the country (Teng & Dilip, 2021; Omole et al, 2024). In recent years, the sector in Osogbo, the capital of Osun State shows significant expansion because of urban development, growing populations and rising needs for residential buildings, commercial facilities and public infrastructure. The rapid expansion of construction activities in Nigeria has created new difficulties regarding waste management in projects (Ngieng et al, 2021; Omopariola et al, 2024). The construction industry is currently thought to produce between 30% and 40% of all solid waste due to the enormous rise of construction activities globally (Bayewun et al, 2023). For the majority of construction projects, waste is a critical problem since it raises project expenses and lowers profits and frequently contains resources that can be salvaged or repurposed (Teng & Dilip, 2021). Construction waste is defined as the byproducts and materials produced at the conclusion of various tasks within building construction projects, which are deemed to be no longer useful in subsequent phases of the construction process and are discarded by the end user (Mohammed et al, 2020; Bello & Ayegba, 2024). Unfortunately, the majority of projects still pay little attention to the management of construction waste, usually viewing it as a purely quantitative issue that should be handled outside of the project management framework. This perspective makes it difficult to use construction waste management techniques to achieve a sustainable building project (Rezania et al, 2023). Woodward (2021) explains that poor construction waste management leads to environmental damage and resource depletion while creating improper disposal issues that block sustainable city development. Sustainable building practices heavily depends on proper construction waste management. Waste management practices in construction serve as essential elements for sustainability because they minimise waste materials' adverse effects on environmental systems and social structures (Omole et al, 2024). Construction waste management is the systematic process of reducing and managing the excess generation of construction waste by concentrating on its underlying causes (Teng & Dilip, 2021; Bello & Ayegba, 2024). Construction waste management (CWM) should be used at every stage of a project, from design to completion, to help the project team reduce and manage waste generation. Construction waste management can be achieved by determining the reasons for construction waste and raising the project team's knowledge of waste management

concepts and techniques (Teng & Dilip, 2021). In essence, construction waste management implementation lowers construction costs and resource consumption, enhances project delivery, and helps the environment (Rezania et al, 2023; Omole et al, 2024). Despite the numerous benefits of construction waste management, its adoption in Nigeria construction sector is at a slow pace due to several factors of determinants. In Osogbo, Nigeria, informal disposal methods dominate due to limited technical capacity, inadequate infrastructure, and weak policy enforcement (Olakanmi et al, 2021). Understanding the specific factors that influence the adoption decision is essential for designing interventions that promote sustainable building delivery. This study therefore assesses factors influencing the adoption of construction waste management practices in sustainable building project in Osogbo, Nigeria. The specific objective of the study is to assess the factors that influencing the adoption of construction waste management practices in sustainable building projects and to examine the effect of each factor on the construction waste management practices

Literature Review

Weak regulatory frameworks and enforcement are among the most cited factors influencing the adoption of proper and effective construction waste management practices, particularly in developing economies. In Nigeria, the absence of specific government legislation on construction waste contrasts sharply with developed countries like the United States, where disposal is strictly regulated under federal codes (Bayewun et al, 2023; Babalola & Harinarain, 2024). This regulatory gap undermines sustainable practices. However, evidence from other regions underscores the potential impact of strong policy. Research in China found that stringent government policies were significant factors in determining the application of waste management practices. Nevertheless, a critical weakness was found in the implementation systems especially in rural areas where the implementation of the policies was not uniform (Elkhider & Eltahir, 2022; Oke et al, 2024). Similarly, in the UK, constructive contribution of policy pressure to the design practices directed to the reduction of waste was shown to positively influence architects' design practices towards waste reduction (Osmani et al, 2021). These studies collectively suggest that while policy is a powerful lever, its effectiveness is contingent on robust enforcement and integration into project governance.

Awareness, education, and organizational culture constitute another critical influencing factors. Studies consistently highlight that the success of CWM practices is based on the knowledge and attitude of stakeholders. Gangolells and Macarulla (2024) identified increased environmental awareness and training as key opportunities for improving waste management on sites. This is supported by Udawatta et al. (2019), who reported that trained staff was able to raise the recovery of materials by 40 percent. Furthermore, a sustainability-oriented cultures is strongly correlated with successful CWM implementation. Tam and Le (2020) argued that integration of sustainability principles into their core values of construction companies are more likely to adopt effective practices. A view echoed by Osmani et al. (2021), who noted that firms with sustainability-focused mission statements achieved better waste management outcomes. Leadership commitment is pivotal in fostering this cultural shift, as top-down

support is necessary to mandate and resource environmental management strategies (Allen, 2023).

Economic and technical factors present both barriers and incentives. The cost of implementing CWM practices is frequently identified as a primary obstacle, especially for small and medium-sized construction company (Enobie et al, 2024). Contractors are often reluctant to incur additional expenses for waste segregation, collection, or advanced disposal services (Yahaya & Abidin, 2023). Conversely, effective CWM can generate significant economic benefits, including cost savings from reduced material purchase, lower disposal fees, and improved resource efficiency (Bayewun et al, 2023; Bello &Ayegba, 2024). Similarly, Chileshe et al. (2020), who noted that construction projects which conformed to **c**orporate environmental responsibility enhanced efficiency recycling rates of 20 per cent which enhanced more sustainable building practices. From a technical standpoint, the availability of infrastructure such as defined collection points, recycling facilities, and suitable equipment for waste handling is fundamental. Research in Ghana highlighted poor infrastructure in waste disposal was a hindrance to proper waste management. (Agyekum et al, 2024). This challenge is mirrored in Nigeria, where inadequate facilities lead to illegal dumping (Ajayi et al, 2020; Oke et al, 2024). Conversely, regions with well-developed waste infrastructure, like Catalonia, Spain, see higher adoption of authorized waste management channels (Gangolells et al, 2024).

The roles and influence of various stakeholder's further shape CWM adoption. Client demand and stakeholder pressure are increasingly recognized as powerful external drivers. Studies indicate that client requirements for sustainable or green-certified projects can compel contractors to adopt formal waste management plans (Poon et al, 2020; Oke et al, 2024b). Beyond external pressure, the involvement and motivation of on-site personnel are crucial. Kareem et al, (2021) found that operatives' willingness to participate in reuse and recycling initiatives is often tied to direct benefits or clear managerial encouragement. A sense of collective responsibility, fostered through inclusive planning and incentives, is therefore essential for on-ground implementation (Adekunye & Oke, 2024).

Material and Methods

The study employed a quantitative survey research design which involves the use of a structured questionnaire for data collection. The self-administered questionnaire used in this study was structured based on constructs identified from previous literature on construction waste management and sustainable construction practices. To ensure the reliability of the research instrument, a reliability test was conducted using Cronbach's Alpha through IBM SPSS statistical software. Cronbach's Alpha measures the internal consistency of the questionnaire items used in the study. The overall reliability coefficient obtained for the instrument was 0.82 which is above the acceptable threshold of 0.70, indicating that the questionnaire items demonstrated adequate internal consistency and were therefore suitable for data collection. The questionnaire items were measured using a five-point Likert scale, ranging from 1=Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, and 5 = Strongly Agree. This scale allowed respondents to express their level of agreement with statements

relating to factors influencing construction waste management practices. The area of the study was Osogbo, Osun State. The study population comprises of 204 registered construction professional members (engineers (67), builders (54), quantity surveyors (48) and architects (35)) as obtained from their professional bodies in Osogbo, Osun State, Nigeria. The study purposively obtained a sample of 135 construction professionals in the study area using Taro Yamane formula. The collected data were coded and analyzed using IBM SPSS statistical software. The analysis was conducted using both descriptive and inferential statistical techniques. Descriptive statistics techniques including mean and mean ranking were used to examine and rank the factors influencing the adoption of construction waste management practices among construction professionals in the study area. The mean values were used to determine the relative importance of each factor based on respondents' perceptions. Furthermore, multiple linear regression analysis was employed as an inferential statistical technique to determine the effect of the identified influencing factors on the adoption of construction waste management practices in sustainable building projects. The regression coefficient table was used to examine the statistical significance of each construct in the model. A construct was considered statistically significant when the p-values was less than 0.05 ($p < 0.05$) at a 95% confidence level.

Results and Discussion

Factors Influencing the Adoption of Construction Waste Management Practices in Sustainable Building Projects

Table 1 indicates the mean and the ranking of the major factors that influence the construction industry in Osogbo to undertake Construction Waste Management Practices (CWMP). Having analyzed it relying on the views of the experienced construction professionals, there is a clear hierarchy of drivers and barriers, with the availability of skilled labor in waste management being the most influential factors with a mean 4.3727, which determines one of the primary operational facts, the lack of the right people to implement, even the best policies and newest technologies will not provide much value. This is in alignment with Udawatta et al. (2019), who argued that practical experience of construction professionals is a pillar towards successful on-site implementation of sustainable practices.

The second top ranking was the cost of implementation (2nd, Mean = 4.3545) as a hindrance is a universal hindrance in the field of construction. The high initial cost of training, the new equipment, and process re-engineering will often put off the adoption, which Enobie et al. (2024) effectively reported by revealing that the economic feasibility is one of the key factors in deciding whether to implement waste reduction strategies. The good performance of Leadership commitment (3rd, Mean = 4.3000) and Cultural and Organizational attitude (4th, Mean = 4.2545) reflects the invaluable importance of top-down support and a corporate culture oriented to innovation and environmental responsibility. This reiterates the fact that sustainability should be more than a policy, it should be a value. According to Osmani et al. (2021), such a change as the need to address the established culture in a male-dominated industry cannot be realized without a strong leadership that will initiate the process. The

consciousness regarding environmental concerns determined the application of waste management systems within the study area was rated 5th with a mean score of 4.2182. This high positive response (way beyond the neutral mark of 3.0) shows that among construction professionals in Osogbo, awareness is identified as a strong, but not leading force towards the adoption of sustainable waste management practices. The mean value is high indicating that most in the industry have agreed that knowledge and understanding about the environmental impact of construction and demolition waste are critical antecedents of action.

Client and stakeholder pressure (6th, Mean = 4.1636) was found to be a strong driver, meaning that the market need of green buildings is starting to have an impact on contractor behavior, which is to be expected in more established markets and will now manifest in Osogbo. The poor score (8th, Mean = 4.0455) in regards to waste disposal facilities indicate the high level of infrastructural gap. The unavailability of approved and accessible recycle or safe disposal facilities means that the companies resort to less sustainable alternatives in an effort to practice what is best, thereby making it logistically difficult. Equally, Regulatory policies was the least ranked at position 9 (Mean = 3.7909) is a critical observation. It implies that policies might be in place, but they are most probably ineffectually enforced, or the motivating factors to compliance are small enough to stimulate any significant change. This is in line with the assessment of Elkhider and Eltahir (2022) as well as Adkunye and Oke (2024) which hold that regulations do not have much impact in encouraging sustainable construction practices without well-established enforcement mechanisms and real economic incentives.

Table 1: Factors influencing the adoption of construction waste management practices

Influencing Factors	N	Mean	Mean Ranking
Regulatory policies and regulations influence the adoption of construction waste management practices in the study area.	110	3.7909	**9th**
Availability of waste disposal facilities plays a significant role in adopting waste management practices.	110	4.0455	**8th**
The cost of implementing waste management practices is a key barrier for construction companies in the study area.	110	4.3545	**2nd**
The level of awareness about environmental issues influences the adoption of waste management practices in the study area.	110	4.2182	**5th**
Availability of skilled labour in waste management is a major factor in the adoption of sustainable practices.	110	4.3727	**1st**
The pressure from clients and stakeholders encourages the adoption of waste management practices.	110	4.1636	**6th**
Technological advancements and innovations in waste management influence the adoption of practices in construction projects.	110	4.1636	**6th**
The commitment of construction companies' leadership to sustainability influences the adoption of waste management practices.	110	4.3000	**3rd**

Influencing Factors	N	Mean	Mean Ranking
Cultural and Organizational attitude towards innovation, sustainability and environmental responsibility influences the adoption of waste management practices	110	4.2545	4th

Source: Researcher's fieldwork (2025)

Test of Hypothesis

H_{01}: Influencing factors have no effects on the adoption of construction waste management practices in sustainable project in the study area.

The null hypothesis assumed that Influencing factors have no effects on the adoption of construction waste management practices on sustainable building projects in the study area. Inferential statistical method, multiple linear regression was used to determine the relative contribution of independent variables to the model. The independent variable, influencing factors derived from past literatures such as regulatory policies and regulations, availability of waste disposal facilities, cost of implementation, level of awareness, availability of skilled labour, pressure from client and stakeholders, technological advancement, leadership commitment to sustainability, cultural and organizational attitude was regressed on the dependent variable, construction waste management practices. Output from regression analysis in table 2 shows R^2 value of 0.165 under model summary indicates that influencing factors captured with the abovementioned constructs explains 16.5% variance in construction waste management practices in Osogbo, Osun State. Although the model is statistically significant, the relatively low explanatory power suggests that the other factors not included in this study may also contribute to the adoption of construction waste management practices. These factors may include institutional support, technological infrastructure, government incentives, and project management strategies. Future studies should therefore explore additional variables that may improve the explanatory strength of the model. This connotes that, influencing factors captured in this study drive the adoption of construction waste management practices in the study area by just 16.5%.

Table 2: Model Summary of factors influencing the adoption of construction waste management practices

Model Summary[b]				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.406[a]	.165	.090	.46565

a. Predictors: (Constant), Cultural and Organizational attitude, regulatory policies and regulations, availability of skilled labor, pressure from clients and stakeholders, level of awareness, Technological advancements and innovations, commitment of construction companies' leadership, availability of waste disposal facilities, cost of implementing waste management practices

b. Dependent Variable: Construction waste management practices

According to Pallant (2016), a construct is significance when P value is less than 0.05 (P<0.05) at 95% confidence level but however not significant when P-value greater than 0.05 at 95% confidence interval. Figures from table 3 show that the constructs, availability of skilled labour, cost of implementing waste management, and regulatory policies with P-values 0.012, 0.020 and 0.050 respectively are the only significant constructs of factors influencing the adoption of construction waste management practices while "availability of waste disposal facilities", "level of awareness" , "pressure from client and stakeholders", "technological advancement", "leadership commitment to sustainability", "cultural and organizational attitude" have insignificant P-values of 0.573, 0.950, 0.972, 0.719, 0.833 and 0.325 respectively.

Awareness level and technological advancement were found to be statistically insignificant despite having relatively high mean scores of in the descriptive analysis. This result suggests that although construction professionals may possess awareness of environmental issues and construction waste management technologies, such awareness may not necessarily translate into practical implementation. This may be due to financial constraints, limited access to appropriate technologies, and inadequate institutional support within the construction industry. Therefore, awareness alone may not be sufficient to drive the adoption of construction waste management practices without complementary policy enforcement and economic incentives.

Based on the significant column (Sig.) under the coefficient table that presents the relative significance of each of the constructs of influencing factors on construction waste management practices in the study area. Therefore, the null hypothesis is rejected, the alternative hypothesis is accepted. It implies that influencing factors such as availability of skilled labour, cost of implementing construction waste management practices and regulatory policies have a positive significant effect on the adoption of construction waste management practices in Osogbo, Osun State.

Table 3: Regression Coefficient of factors influencing the adoption of construction waste management practices

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	3.257	.378		8.627	.000		
	Regulatory policies and regulations	.104	.052	.226	1.988	.050	.646	1.548
	Availability of waste disposal facilities.	.043	.075	.070	.565	.573	.539	1.854
	The cost of implementing waste management practices	.168	.092	.245	1.834	.020	.468	2.139
	The level of awareness	.005	.077	.008	.063	.950	.519	1.926
	Availability of skilled labor	.200	.089	.301	1.251	.012	.547	1.828
	The pressure from clients and stakeholders	.003	.074	.004	.035	.972	.545	1.833

Coefficients[a]								
	Technological advancements and innovations	-.025	.068	-.042	-.361	.719	.606	1.651
	The commitment of construction companies' leadership to sustainability	.017	.081	.025	.212	.833	.580	1.724
	Cultural and Organizational attitude	-.067	.068	-.107	-.990	.325	.709	1.411
a. Dependent Variable: Construction waste management practices								

Conclusion

The essence of this study was to investigate factors influencing the adoption of construction waste management practices in sustainable building project in Osogbo. The study focuses on influencing factors such as regulatory policies and regulations, availability of waste disposal facilities, cost of implementation, level of awareness, availability of skilled labour, pressure from client and stakeholders, technological advancement, leadership commitment to sustainability, cultural and organizational attitude. The major factors influencing the adoption of construction waste management practices as perceived by the respondents are availability of skilled workers, cost of implementation waste management practices and commitment of construction companies' leadership to sustainability with least influence of government policies in the study area. Influencing factors such as availability of skilled labour, cost of implementing waste management practices and regulatory policies have significant effect in influencing the adoption of construction waste management practices in the study area.

Recommendations

Following the outcome of this study and the conclusion, the study thereby proffers the following recommendations which will be useful to construction professionals and project stakeholders:

i. Government should establish and enforce stronger regulation on construction waste management. Clear penalties for non-compliance and incentives for compliance should be introduced, alongside investment in recycling facilities and public-private partnerships.
ii. The construction industry needs to carry out regular training and awareness programs, to enhance the technical ability of their workforce in the waste management methods in construction. Waste reduction strategies should also be incorporated in the code of practice of the professional bodies.
iii. There should be increased partnership between the clients, contractors, engineers, architects and the waste management agencies. The joint planning will assist in minimizing over-ordering and maximize reuse of materials and make sure the minimization of waste strategies are developed into the project at the beginning of the project.
iv. The construction industry must incorporate the waste management plans in their policies and give more emphasis to reuse and recycle than disposal. Monitoring

system based on technologies, which would follow the waste production and enhance resource efficiency on sites, needs to be introduced.

v. Future research ought to be on new cost-effective recycling techniques that could be relevant to the local Nigeria environment. In the future research, the practices on sustainable construction waste management in the region can also be compared to create a national framework of sustainable management on the subject.

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