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STAKEHOLDER MANAGEMENT AND SUSTAINABILITY OF SOLID WASTE MANAGEMENT PROJECTS IN KENYA

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ABSTRACT

The purpose of this research was to examine the influence of stakeholder management on sustainability of solid waste management projects with project leadership as moderator in Kenya. Additionally, the research examined the moderating influence of project leadership on the relationship between stakeholder management and sustainability of solid waste management projects in Kenya. The theoretical framework was informed by the resource-based theory. The research employed the correlational cross-sectional survey design. The proportionate stratified random sampling technique was used to select a sample size of 23 county chief officers, 23 directors, 23 deputy directors and 139 sub-county officers from a target population of 47 county chief officers, 47 directors, 47 deputy directors and 290 sub-county officers in charge of solid waste management projects in Kenya. A cross-sectional survey-based approach was used. A self-administered structured questionnaire was used to collect primary data. The collected data was processed and entered into the statistical package for social sciences (SPSS) version 26 to create a data sheet to be used for analysis. The descriptive statistics and inferential statistics were used for data analysis. The correlation results showed that stakeholder management had a positive and significant relationship with sustainability of solid waste management projects. The regression results showed that stakeholder management had a positive and significant influence on sustainability of solid waste management projects. The results indicated that project leadership had a significant moderating influence on the relationship between stakeholder management and sustainability of solid waste management projects in Kenya. Managers and policy makers should to focus on strengthening stakeholder management to foster the sustainability of solid waste management projects. Future research could examine the moderating influence of project leadership on the relationship between stakeholder management and project sustainability in other sectors.

***Key words*:** *Project Leadership, Stakeholder Management, Sustainability of Solid Waste Management Projects, Kenya*

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INTRODUCTION

The role of solid waste management in achieving sustainable development is emphasized in several international development agendas, charters, and visions (Kanade, Joseph, Ansari, Varghese, & Savale, 2024). Effective solid waste management mitigates adverse health and environmental impacts, conserves resources, and improves the livability of cities (Hemidat *et al.*, 2022). However, unsustainable solid waste management practices, exacerbated by rapid urbanization and financial and institutional limitations, negatively impact public health and environmental sustainability (Abubakar *et al.*, 2022; Al-Dailami *et al.*, 2022). The waste management failure can be associated with an unchecked, rising population, indiscriminate consumption of resources, lack of awareness about hygiene, the poor policies implemented by the government, and public irresponsibility in abiding by the rules (Reddy, Khamparia, & Waghmare, 2022).

Solid waste management continues to dominate as a major societal and governance challenge, especially in urban areas overwhelmed by the high rate of population growth and garbage generation (Abubakar *et al.*, 2022). In most countries, solid waste management is characterized by lack of planning, improper disposal, inadequate collection services, inappropriate technologies that suit the local conditions and technical requirements, and insufficient funding (Hemidat *et al.*, 2022). Solid waste management is an emerging concern for countries around the world, particularly developing nations with limited financial resources, lack of technologies, and an absence of policy framework (Pheakdey, Quan, Khanh, & Xuan, 2022). In most developing countries, solid waste management is mainly limited to collection, transportation, and disposal (Ravichandran & Venkatesan, 2021). Therefore, the provision of an efficient and sustainable waste management system that takes into account the potential impact on public health and the environment is critical to most governments (Bui, Tseng, Tseng, & Lim, 2022).

As the world grapples with environmental and social challenges, the role of project management in driving sustainable outcomes becomes increasingly vital (Malik, Ali, Latan, & Jabbour, 2023). The shift is driven by the increasing recognition of the environmental, social, and economic impacts of projects, necessitating a holistic approach that balances these dimensions for the benefit of current and future generations (Gupta, 2023). The integration of sustainability into project management practices is increasingly seen as a critical factor for the long-term success and viability of projects, especially in the context of global challenges such as climate change and social inequality (Orieno, Ndubuisi, Eyo-Udo, Ilojianya, & Biu, 2024). By addressing stakeholder management effectively and exploring emerging trends and research areas, organizations can advance towards more sustainable and resilient project outcomes (Adebayo, Ikevuje, Kwakye, & Esiri, 2024). However, many organizations continue to struggle due to lack of knowledge and practical guidance on how to integrate sustainability dimensions within project management processes (Santos & Fernandes, 2024).

Statement of the Problem

Solid waste management is one of the most important environmental challenges facing countries. Solid waste poses a significant threat to both the global economy and ecosystems (Kanade *et al.*, 2024). Global estimates suggest that 2.01 billion tons of municipal solid waste are generated each year, of which 33% remains unmanaged, posing a serious challenge to the environmental sustainability (Khan *et al.*, 2022). In developing countries, most cities collect only 50-80% of generated waste after spending 20-50% of their budgets, of which 80-95% are spent on collecting and transporting waste (Muheirwe, Kombe & Kihila, 2022). In African countries, solid waste management still remains a serious challenge with available data showing that, the Sub-Saharan Africa alone generates approximately 180 million tons annually and yet only 11% is disposed properly (Munayi, 2023; Odhiambo, 2022).

The unsustainable solid waste management is attributed to the rapid growth of the population, a booming economy, rapid urbanization, and high standards of living in the community, which have significantly accelerated the rate of solid waste generation (Pheakdey *et al.*, 2022). The increase of human population and

urbanization trends, projections suggest that the surge of solid waste generation could reach 3.40 billion tons by 2050 (Pudcha *et al.*, 2023). Of the generated municipal solid waste, approximately 47% is directed to landfills, 31% undergoes recycling, and the remaining 22% is incinerated (Mor & Ravindra, 2023). Nearly 70% of municipal solid waste is not recycled or repurposed, representing significant loss of valuable supplies, placing a substantial strain on primary resources (Pisuttu *et al.*, 2024). The unsustainable solid waste management practices, exacerbated by rapid urbanization, financial and institutional limitations, negatively impact to public health and environmental sustainability (Al-Dailami *et al.*, 2022).

Despite its growing importance, the integration of sustainability into project management practices is not without challenges (Moreno-Monsalve *et al.*, 2022). Some of which includes, lack of standardized guidelines and metrics for measuring sustainability outcomes in projects, creating difficulties in examining the true sustainability impact of projects and the comparing of different projects sustainability parameters (Orieno *et al.*, 2024). Many organizations continue to struggle due to lack of knowledge and practical guidance on how to integrate sustainability dimensions within project management processes (Santos & Fernandes, 2024). There is a lag in incorporating sustainability in core project management practices such as the selection of project delivery methods (Ahmed & El-Sayegh, 2024). Notwithstanding a compelling need for reform, sustainability remains a peripheral matter within the project management field (Fathalizadeh *et al.*, 2021). The relationship between project management and sustainability concepts is still widely discussed, but inconclusive (Ferrarez *et al.*, 2023).

Objectives of the study

The general objective of this study was to examine the influence of stakeholder management on sustainability of solid waste management projects with project leadership as a moderator in Kenya. The study was guided by the following specific objectives:

- To determine the influence of stakeholder management on sustainability of solid waste management projects in Kenya.
- To establish the moderating influence of project leadership on the relationship between stakeholder management and sustainability of solid waste management projects in Kenya.

Research Hypotheses

In this research, two null hypotheses were tested.

$H_0$1: Stakeholder management has no significant influence on sustainability of solid waste management projects in Kenya.

$H_0$2: Project leadership has no significant moderating influence on the relationship between stakeholder management and sustainability of solid waste management projects in Kenya.

LITERATURE REVIEW

Theoretical Framework

Resource-Based Theory

The resource-based theory (RBT) of the firm (Barney, 1991; Penrose, 1959; Peteraf, 1993; Wernerfelt, 1984) posits that firms' competitiveness even in the same industry varies based on a firm's resources and capabilities (Zulkiffli *et al.*, 2022). The RBT of the firm provides an explaination as to why some organizations are performing better and how an organization can perform better (Wu, Yan, & Umair, 2023). The RBT of the firm provides a relevant underpinning theory for the research model to examine the influence of stakeholder management on sustainability of solid waste management projects with project leadership as a moderator in Kenya. The RBT of the firm postulates that firms gain competitive advantage through bundles of valuable and rare resources and sustain that advantage over time when such resources are difficult to imitate or non-

substitutable by stakeholder managements (Sharma, Alkatheeri, Jabeen, & Sehrawat, 2022). Despite the broad application of the RBT of the firm in multiple disciplines, the theory has attracted certain criticisms which led to the evolution of the dynamic capability theory (Teece, 2023).

Stakeholder Theory

The stakeholder theory (Freeman 1984) identifies the typologies of stakeholders in terms their power, the extent to which they are able to impose their will in a relationship, their expected structures or behaviors and the criticality of their claims (Tom, 2023). The stakeholder theory posits that the project management's sole motivation should be to map and advance its shareholders' interests (McGahan, 2023). The stakeholder theory is a relevant theoretical framework that explains the influence of stakeholder management on sustainability of solid waste management projects in Kenya. The stakeholder theory is a theory of organizational management and business ethics that accounts for multiple constituencies impacted by business entities like employees, suppliers, local communities, creditors, and others (Zuro, 2024). The principle of the stakeholder theory is to make it possible to analyze and understand the implications of controversial stakeholders in any project undertaking (Suanne, 2022).

Contingency Theory

The contingency theory (Fiedler, 1967; Wooton, 1977) suggests that leaders can use the contingency approach to develop strategies that influence the design of management processes to evaluate leadership characteristics, abilities, and interactions in situations (Baporikar, 2024). The contingency theory (Fiedler, 1964; Woodward, 1965) postulates that no single strategy may be used to manage a situation or organization (Benmira & Agboola, 2021). The contingency theory principles may help to develop effective management practices influenced by opportunities presented through the interaction of internal and external environmental contingencies (Hud, Arham, & Hanapiyah, 2024). The contingency theory suggests that the effectiveness of leadership, innovation, creative management, and situational competence warrant further research to determine the level of interdependency in decision-making (Muzorewa, 2024). The contingency theory assumes that there is no best way to manage an entity (Samkange, Ramkissoon, & Amponsah, 2024). Therefore, the contingency theory provides an appropriate theoretical framework to examine the influence of project leadership on sustainability of solid waste management projects in Kenya.

Triple Bottom Line Theory

The triple bottom line (TBL) theory (Elkington, 1997; Elkington, 2004; Elkington & Rowlands, 1999) posits that a business should look beyond the one bottom line of profits to achieve sustainability (Aytac, Bautista-Puig, Orduña-Malea, & Tran, 2023). The TBL theory is a theoretical framework for a business model of sustainable development focusing on profit, environment, and people rather than just maximizing profit (Shim, Moon, Lee, & Chung, 2021). The TBL theory is centered on three words: people, planet and profit (Pereira & Martins, 2021). The study employs the TBL theory as a theoretical foundation to examine the sustainability of solid waste management projects in Kenya. Therefore, the TBL theory provides an appropriate theoretical framework to examine the moderating influence of project leadership on the relationship between stakeholder management and sustainability of solid waste management projects in Kenya.

Conceptual Framework

The sustainability of solid waste management projects is conceptualized as the dependent variable. Stakeholder management is conceptualized as the independent variables. Project leadership is conceptualized as the moderating variable.

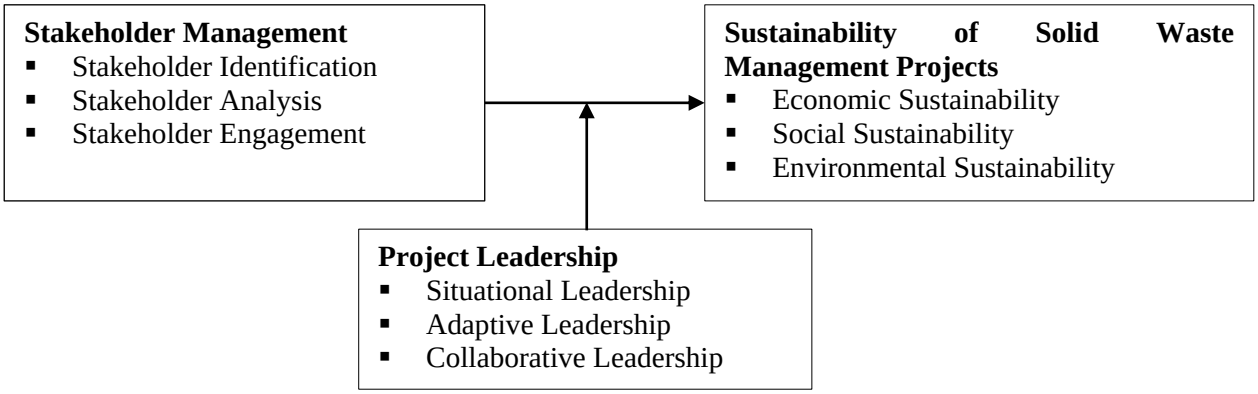

Figure 1: Conceptual Framework

Stakeholder Management

Stakeholder management has gained substantial attention and become a critical area in project management. Stakeholder management forms the last knowledge area, which while closely related to project communication management, focuses less on information exchange and more on ensuring the right level of stakeholder engagement (Plattfaut, 2022). Stakeholders are individuals or groups that can influence the development of a project, positively or negatively, due to a vested interest (Blak Bernat, Qualharini, & Castro, 2023). Driving a circular economy in project management necessitates a holistic approach that integrates effective stakeholder management with circular principles (Uzougbo, Ikegwu, & Adewusi, 2024).

Stakeholder management involves identifying and engaging internal and external stakeholders who influence or are affected by the project (Adebayo, Ikevuje, Kwakye, & Esiri, 2024). The key stakeholders should be mapped according to their influence and support to the project, so as to understand them and ensure they are well controlled (Plattfaut, 2022). Stakeholder management keeps decision-makers and influencers engaged and on-track which is the pathway for a successful project (Pudus & Gatobu, 2024). However, stakeholder engagement in collaborative research and innovation projects poses significant challenges, particularly in complex, multistakeholder settings addressing sustainability concerns (Santos & Fernandes, 2024). Effective stakeholder management is essential for the successful implementation of circular economy principles within project management (Uzougbo, Ikegwu, & Adewusi, 2024).

Project Leadership

For the successful completion of the project, the art and science of guiding a team could be regarded as project leadership (Kaur, Haque, & Gkasis, 2024). The role of the leader turns out to be more important in project management, because the completion of tasks relies heavily on collaboration, coordination, and teamwork (Nauman, Musawir, & Riaz, 2024; Mutua & Muchelule, 2024). Consequently, leadership emerges as a pivotal determinant in contemporary projects characterized by intricacies and volatility (Mozammel & Abdulla, 2024; Oh, Lee, & Zo, 2021).

Project leaders are constantly working to minimize project failures by adopting new leadership practices and strategies to enhance project success in the construction sector (Rehan, Thorpe, & Heravi, 2024a). Effective leaders must cultivate relationships among diverse stakeholders, ensuring that varied perspectives are integrated into project planning and execution (Hanson, Nwakile, Adebayo, & Esiri, 2024). Project leaders demonstrate different styles of leadership (Rehan, Thorpe, & Heravi, 2024b). Nonetheless, there is no conclusive evidence on which style of leadership is more efficient and effective in the completion of a successful project, especially in the field of project management (Kaur *et al.*, 2024).

Project Sustainability

The importance of sustainability in project management cannot be overstated. It represents a critical evolution in the field, aligning project objectives with the broader goals of sustainable development (Orieno *et al.*, 2024). The integration of sustainability into project management practices is increasingly seen as a critical factor for the long-term success and viability of projects, especially in the context of global challenges such as climate change and social inequality (Orieno, Ndubuisi, Eyo-Udo, Ilojianya, & Biu, 2024).

The importance of sustainability in project management is underscored by its potential to enhance project outcomes, foster stakeholder engagement, and contribute to the broader goals of sustainable development (Petrelli *et al.*, 2023). The shift is driven by the increasing recognition of the environmental, social, and economic impacts of projects, necessitating a holistic approach that balances these dimensions for the benefit of current and future generations (Gupta et al., 2021). In the realm of project management, this shift has led to a reevaluation of traditional practices, emphasizing the integration of environmental, social, and economic considerations into the project lifecycle (Stanitsas & Kirytopoulos, 2023). As the world grapples with environmental and social challenges, the role of project management in driving sustainable outcomes becomes increasingly vital (Gupta, 2023).

Empirical Review

Miano (2023) examined the effect of project stakeholder management on sustainability of agribusiness projects in selected counties in Kenya. The results indicated that project stakeholder management had a positive and significant relationship with sustainability of agribusiness projects. The results showed that project stakeholder management had a positive and significant effect on sustainability of agribusiness projects.

Blak Bernat *et al.* (2023) examined the role of stakeholder engagement in enhancing sustainability in project management in Portugal. The research examined the crucial correlation between stakeholder engagement sustainability in project management, with a specific focus on the virtual environment. The findings indicated that stakeholder engagement had a positive and significant effect on sustainability practices in project management.

Kaumbulu (2021) examined the effect of project stakeholder management on sustainability of youth empowerment projects in Makueni County, Kenya. The results indicated that project stakeholder management had a positive and significant relationship with sustainability of youth empowerment projects. The results indicated that project stakeholder management had a positive and significant effect on sustainability of youth empowerment projects.

Nyaga (2022) examined the effect of project stakeholder engagement practice on sustainability of food security projects in counties within arid lands, Kenya. The results showed that project stakeholder engagement practice had a positive and significant relationship with sustainability of food security projects. The results indicated that project stakeholder engagement practice had a positive and significant effect on sustainability of food security projects.

METHODOLOGY

The research was anchored on a positivist research philosophy. Drawing on a quantitative non-experimental research methodology, the research utilized a correlational cross-sectional survey research design to examine the non-causal relationship between study variables.

The target population consisted of 47 county chief officers, 47 directors, 47 deputy directors and 290 sub-county officers in the department of environment in charge of solid waste management projects in Kenya. The unit of analysis consisted of the solid waste management projects, while the unit of observation consisted of the project implementation team in charge of solid waste management projects in Kenya.

The sampling frame for this study consisted of the list of the 47 county chief officers, 47 directors, 47 deputy directors and 290 sub-county officers in charge of solid waste management projects in Kenya.

The Yamane (1967)'s formula was used to determine the desired sample size at the 5% significance level:

$n = \frac{\mathrm{N}}{1+\mathrm{N}e^2)}$ $n = \frac{431}{1+431(0.05)^2)}$ = 208

Where:

n = Sample Size

N = Target Population

e = level of precision (sample error)

Therefore, the minimum recommended sample size consisted of 23 county chief officers, 23 directors, 23 deputy directors and 139 sub-county officers in the department of environment in charge of solid waste management projects in Kenya.

The proportionate stratified random sampling technique was used to select a sample size of 23 county chief officers, 23 directors, 23 deputy directors and 139 sub-county officers from a target population of 47 county chief officers, 47 directors, 47 deputy directors and 290 sub-county officers in charge of solid waste management projects in Kenya. The choice of the proportionate stratified random sampling technique was justified by the heterogeneous target population.

A self-administered structured questionnaire was the means for collecting primary data.

The simple linear regressions model was specified as:

$Y = \beta_0 + \beta_1 X + \varepsilon$ …… Equation 1

Where:

Y = Sustainability of Solid Waste Management Projects

X = Stakeholder Management

β_0 = Constant Term

β_1 = Regression Coefficients to be estimated

ε = Stochastic Error Term

The hierarchical moderated multiple linear regression models were specified as:

$Y = \beta_0 + \beta_2 X + \varepsilon$ …… Equation 2.

$Y = \beta_0 + \beta_3 X + \beta_4 Z + \varepsilon$ …… Equation 3.

$Y = \beta_0 + \beta_5 X + \beta_6 Z + \beta_7 X{*}Z + \varepsilon$ …… Equation 4.

Where:
Y = Sustainability of Solid Waste Management Projects (the dependent variable),
X = Stakeholder management (the independent variable)
β_0 = Constant (the coefficient of the Y intercept)
$\beta_2 - \beta_6$ = Regression coefficients to be determined,
Z = Project Leadership (the moderating variable),

X*****Z = Stakeholder Management***** Project Leadership (the interactive variable),
ε = Stochastic Error Term

FINDINGS

Response Rate

Out of the 208 survey questionnaires distributed for main study, only 168 usable survey questionnaires were received. Therefore, there was a valid response rate of 80.8%.

Diagnostic Results

Normality Test Results

The normality test was performed using the Kolmogorov-Smirnov test and the Shapiro-Wilk test were performed.

Table 1: Normality Test Results

	Kolmogorov-Smirnov[a]			Shapiro-Wilk			
Variable	**Statistic**	**df**	**Sig.**	**Statistic**	**df**	**Sig.**	**Decision**
Stakeholder Management (X)	.154	168	.170	.970	168	.176	Normal Distribution
Project Leadership (Z)	.093	168	.200*	.973	168	.493	Normal Distribution
Sustainability of Solid Waste Management Projects (Y)	.051	168	.090	.993	168	.207	Normal Distribution

Linearity Test Results

The linearity test results showed that stakeholder management had a strong positive and significant linear relationship with sustainability of solid waste management projects ($r = 0.769$, $p \leq 0.05$). The linearity test results indicated that stakeholder management had a moderately strong positive and significant linear relationship with project leadership ($r = 0.650$, $p \leq 0.05$). The linearity test results showed that project leadership had a strong positive and significant linear relationship with sustainability of solid waste management projects ($r = 0.852$, $p \leq 0.05$). The linearity test results suggested that the assumption of linearity was not violated (Hair *et al.*, 2021). Table 2 presents the linearity test.

Table 2: Linearity Test Results

Variable		**X**	**Z**	**Y**
Stakeholder Management (X)	Pearson Correlation	1		
	Sig. (2-tailed)			
	n	168		
Project Leadership (Z)	Pearson Correlation	.650**	1	
	Sig. (2-tailed)	.000		
	n	168	168	
Sustainability of Solid Waste Management Projects (Y)	Pearson Correlation	.769**	.852**	1
	Sig. (2-tailed)	.000	.000	
	n	168	168	168

**. Correlation is significant at the 0.01 level (2-tailed).

Homoscedasticity Test Results

The Levene's test for equality of variance was performed for the **homoscedasticity test. The presence of homoscedasticity** or the absence of heteroscedasticity is an assumption most commonly tested using the Levene's test for equality of variance (Bell *et al.*, 2022)**. The homoscedasticity** test results showed that Levene's statistics for each of the study variables were non-significant with p-values greater than 0.05, suggesting that equal variance was assumed. Table 3 presents the homoscedasticity test results of the study variables.

Table 3: Homoscedasticity Test Results

Variable	Levene Statistic	df1	df2	sig	Remarks
Stakeholder management (X)	4.85	1	168	.278	Equal Variance Assumed
Project leadership (Z)	3.66	1	168	.298	Equal Variance Assumed
Sustainability of solid waste management projects (Y)	4.51	1	168	.265	Equal Variance Assumed

Autocorrelation Test Results

The Durbin-Watson test was performed for autocorrelation test. The autocorrelation test results showed that the Durbin-Watson test had a value of 1.940, falling within the optimum range of 1.5 to 2.5, suggesting that there was no autocorrelation detected in the in the residual values in the datasets (Hair *et al.*, 2021). Table 4 presents the model summary results.

Table 4: Autocorrelation Test Results

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.769[a]	.592	.589	.274	
2	.898[b]	.806	.804	.190	
3	.940[c]	.884	.881	.147	1.940

a. Predictors: (Constant), Stakeholder Management (X)
b. Predictors: (Constant), Stakeholder Management (X), Project Leadership (Z)
c. Predictors: (Constant), Stakeholder Management (X), Project Leadership (Z), Stakeholder Management* Project Leadership (X*Z)
d. Dependent Variable: Sustainability of Solid Waste Management Projects (Y)

Multicollinearity Test Results

The variance inflation factor (VIF) values and tolerance values for each of the independent variables were used for the multicollinearity test. The multicollinearity test results indicated that for each of the independent variables, the VIF values were less than 10, while the tolerance values were greater than 0.1, suggesting that there was no significant multicollinearity that needed to be corrected. Generally, if the VIF value is higher than 10 or the tolerance value is lower than 0.1, there is significant multicollinearity that needs to be corrected (Davino *et al.*, 2022). Table 5 presents the multicollinearity test results.

Table 5: Multicollinearity Test Results

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	2.180	.108		20.159	.000		
	Stakeholder management (X)	.441	.028	.769	15.517	.000	1.000	1.000
2	(Constant)	.253	.161		1.567	.119		
	Stakeholder management (X)	.214	.026	.373	8.267	.000	.577	1.733
	Project leadership (Z)	.713	.053	.609	13.484	.000	.852	1.174
3	(Constant)	.609	.130		4.692	.000		
	Stakeholder management (X)	.099	.023	.173	4.329	.000	.848	1.179
	Project leadership (Z)	.266	.059	.227	4.496	.000	.580	1.724
	Stakeholder management* Project leadership (X*Z)	.475	.045	.602	10.466	.000	.661	1.513

a. Dependent Variable: Sustainability of Solid Waste Management Projects (Y)

Correlation Results

The Pearson's product moment correlation analysis was performed to confirm or deny the relationships between the study variables. The correlation results indicated that stakeholder management had a strong positive and significant relationship with sustainability of solid waste management projects ($r = 0.769$, $p \leq 0.05$). The results showed that stakeholder management had a moderately strong positive and significant relationship with project leadership ($r = 0.650$, $p \leq 0.05$). The results indicated that project leadership had a strong positive and significant relationship with sustainability of solid waste management projects ($r = 0.852$, $p \leq 0.05$). Table 6 presents the correlation results.

Table 6: Correlation Results

Variable		X	Z	Y
Stakeholder Management (X)	Pearson Correlation	1		
	Sig. (2-tailed)			
	N	168		
Project Leadership (Z)	Pearson Correlation	.650**	1	
	Sig. (2-tailed)	.000		
	N	168	168	
Sustainability of Solid Waste Management Projects (Y)	Pearson Correlation	.769**	.852**	1
	Sig. (2-tailed)	.000	.000	
	N	168	168	168

**. Correlation is significant at the 0.01 level (2-tailed).

Simple Linear Regression Results

A simple linear analysis was performed with sustainability of solid waste management projects as the dependent variable and stakeholder management as the predictor variable.

Model Summary

From the model summary in table, the value of coefficient of correlation (R) was 0.769, suggesting that there was a strong positive correlation between the stakeholder management and sustainability of solid waste management projects in Kenya. The value of coefficient of determination (R^2) was 0.592, suggesting that the overall model as a whole (the model involving constant, stakeholder management) was able to significantly predict and explain approximately 59.2% of the variance in the sustainability of solid waste management projects in Kenya. The value of the adjusted R^2 was 0.589, suggesting that the overall model as a whole (the model involving constant, stakeholder management) significantly predicted and explained 58.9% of the variance in the sustainability of solid waste management projects in Kenya. The value of the std. error of the estimate was 0.274, suggesting that there could be other factors not included in the model in the current study that could also predict and explain the remaining 41.1% of the variance in the sustainability of solid waste management projects in Kenya. Therefore, there is in need for future research to discover the other variables not included in the model in the current study that also predict the remaining variance in the sustainability of solid waste management projects in Kenya. Table 7 presents the model summary results.

Table 7: Model Summary[b] Results

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.769[a]	.592	.589	.274	2.249

a. Predictors: (Constant), Stakeholder Management (X)

b. Dependent Variable: Sustainability of Solid Waste Management Projects (Y)

Analysis of Variance

From the Analysis of Variance (ANOVA) table, the overall model as a whole (the model involving constant, stakeholder management), achieved a high degree of fit, as reflected by $R^2 = 0.592$, adj. $R^2 = 0.589$, $F(1, 166) = 240.783$, $p \leq 0.05$. The null hypothesis was that the overall model as a whole (the model involving constant,

stakeholder management) was not able to significantly predict the sustainability of solid waste management projects in Kenya. However, the alternative hypothesis was that the overall model as a whole (the model involving constant, stakeholder management) was able to significantly predict the sustainability of solid waste management projects in Kenya. From the results, the null hypothesis was rejected in favor of the alternative hypothesis. Therefore, the overall model as a whole (the model involving constant, stakeholder management) was able to significantly predict the sustainability of solid waste management projects in Kenya. Table 8 presents the ANOVA results.

Table 8: ANOVA[a] Results

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	18.077	1	18.077	240.783	.000[b]
	Residual	12.463	166	.075		
	Total	30.540	167			

a. Dependent Variable: Sustainability of Solid Waste Management Projects (Y)

b. Predictors: (Constant), Stakeholder Management (X)

Regression Coefficients

From the coefficients table, when the unstandardized regression coefficients (B) were substituted to the simple linear regression model specified for the study, the final predictive equation was:

$Y = 2.180 + 0.441X$

The final predictive equation suggested that holding all factors in to account constant (stakeholder management), constant at zero, the sustainability of solid waste management projects in Kenya would be 2.180. The final predictive equation suggested that with all other factors held constant, a unit increase in stakeholder management would lead to 0.441 unit increase in the sustainability of solid waste management projects in Kenya. The regression results indicated that stakeholder management had a positive and significant influence on the sustainability of solid waste management projects ($\beta = 0.769$; $t = 15.517$; $p \leq 0.05$) in Kenya. Table 9 presents the multiple regressions coefficients results.

Table 9: Regression Coefficients[a] Results

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	2.180	.108		20.159	.000
	Stakeholder Management (X)	.441	.028	.769	15.517	.000

a. Dependent Variable: Sustainability of Solid Waste Management Projects (Y)

Moderated Multiple Regression Results

A moderated multiple linear regression analysis was performed to test the moderating influence of project leadership in the relationship between stakeholder management and sustainability of solid waste management projects in Kenya.

Model Summary

From the model summary table, it is clear that the value of the coefficient of correlation (R) was 0.769 for model 1, suggesting a strong positive correlation between the predictor variable (stakeholder management) and sustainability of solid waste management projects in Kenya. The value of the coefficient of determination (R^2) was 0.592 for model 1, suggesting that the overall model (the model involving constant and stakeholder management) could significantly predict and explain approximately 59.2% of the variance in the sustainability of solid waste management projects in Kenya. The value of the adjusted R^2 was 0.589 for model 1, suggesting that the overall model (the model involving constant and stakeholder management) significantly predicted approximately 58.9% of the variance in the sustainability of solid waste management projects in Kenya. The

value of the std. error of the estimate was 0.274 for model 1, suggesting that there could be other factors not included in the model that could predict the remaining 41.1% of the variance in the sustainability of solid waste management projects in Kenya.

From the model summary table, it is clear that the value of the coefficient of correlation (R) was 0.898 for model 2, suggesting a strong positive correlation between the predictor variables (stakeholder management and project leadership) and sustainability of solid waste management projects in Kenya. The value of the coefficient of determination (R^2) was 0.806 for model 2, suggesting that the overall model (the model involving constant, stakeholder management and project leadership) could significantly predict and explain approximately 80.6% of the variance in the sustainability of solid waste management projects in Kenya. The value of the adjusted R^2 was 0.804 for model 2, suggested that the overall model (the model involving constant, stakeholder management and project leadership) significantly predicted approximately 80.4% of the variance in the sustainability of solid waste management projects in Kenya. The value of the std. error of the estimate was 0.145 for model 2, suggesting that there could be other factors not included in the model that could predict the remaining 19.6% of the variance in the sustainability of solid waste management projects in Kenya.

From the model summary table, it is clear that the value of the coefficient of correlation (R) was 0.927 for model 3, suggesting a strong positive correlation between the predictor variables (stakeholder management, project leadership and stakeholder management *project leadership) and sustainability of solid waste management projects in Kenya. The value of the coefficient of determination (R^2) was 0.884 for model 3, suggesting that the overall model (the model involving constant, stakeholder management, project leadership and stakeholder management*project leadership) as a whole could significantly predict and explain approximately 88.4% of the variance in the sustainability of solid waste management projects in Kenya. The value of the adjusted R^2 was 0.881 for model 3, suggesting that the overall model (the model involving constant, stakeholder management, project leadership and stakeholder management*project leadership) significantly predicted approximately 88.1% of the variance in the sustainability of solid waste management projects in Kenya. The value of the std. error of the estimate was 0.147 for model 3, suggesting that there are other factors not included in the model that could predict the remaining 11.9% of the variance in the sustainability of solid waste management projects in Kenya.

From the model summary table, the Durbin-Watson test statistic had a value of 1.940, falling within the optimum range of 1.5 to 2.5, suggesting that there was no severe autocorrelation detected in the in the residual values in the datasets. Generally, Durbin-Watson statistics falling within the optimum range of 1.5 to 2.5 indicate that there is no severe autocorrelation detected in the in the residual values in the datasets (Hair *et al.*, 2021). Table 10 presents the moderated multiple linear regression's model summary results.

Table 10: Model Summary[d] Results

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.769[a]	.592	.589	.274	
2	.898[b]	.806	.804	.190	
3	.940[c]	.884	.881	.147	1.940

a. Predictors: (Constant), Stakeholder management (X)
b. Predictors: (Constant), Stakeholder management (X), Project leadership (Z)
c. Predictors: (Constant), Stakeholder management (X), Project leadership (Z), Stakeholder management* Project leadership (X*Z)
d. Dependent Variable: Sustainability of solid waste management projects (Y)

ANOVA[a]

From the ANOVA table results, the overall model 1 (the model involving constant, stakeholder management), as a whole achieved a high degree of fit, as reflected by $R^2 = 0.592$, adj. $R^2 = 0.589$, $F(1, 166) = 240.783$, $p \leq 0.05$. The null hypothesis was that the linear combination of predictor variables was not able to significantly

predict the sustainability of solid waste management projects in Kenya. However, the alternative hypothesis was that the linear combination of predictor variables was able to significantly predict the sustainability of solid waste management projects in Kenya. The regression results showed that the linear combination of predictor variables (stakeholder management) was able to significantly predict the variance in the sustainability of solid waste management projects in Kenya in Kenya. The null hypothesis was rejected in favor of the alternative hypothesis. Therefore, the decision was that stakeholder management significantly predict the sustainability of solid waste management projects in Kenya.

From the ANOVA table results, the overall model 2 (the model involving constant, stakeholder management and project leadership), as a whole achieved a high degree of fit, as reflected by $R^2 = 0.806$, adj. $R^2 = 0.804$, $F(2, 165) = 342.446$, $p \leq 0.05$. The null hypothesis was that the linear combination of predictor variables (stakeholder management and project leadership) was not able to significantly predict the sustainability of solid waste management projects in Kenya. However, the alternative hypothesis was that the linear combination of predictor variables (stakeholder management and project leadership) was able to significantly predict the sustainability of solid waste management projects in Kenya. The regression results showed that the linear combination of predictor variables (stakeholder management and project leadership) significantly predicted the variance in the sustainability of solid waste management projects in Kenya. The null hypothesis was rejected in favor of the alternative hypothesis. Therefore, the decision was that the linear combination of predictor variables (stakeholder management and project leadership) significantly predict sustainability of solid waste management projects in Kenya.

From the ANOVA table results, the overall model 3 (the model involving constant, stakeholder management, project leadership and stakeholder management*project leadership), as a whole achieved a high degree of fit, as reflected by $R^2 = 0.884$, adj. $R^2 = 0.881$, $F(3, 164) = 415.000$, $p \leq 0.05$. The null hypothesis was that the linear combination of predictor variables (stakeholder management, project leadership and stakeholder management*project leadership) was not able to significantly predict the sustainability of solid waste management projects in Kenya. However, the alternative hypothesis was that the linear combination of predictor variables (stakeholder management, project leadership and stakeholder management*project leadership) was able to significantly predict the sustainability of solid waste management projects in Kenya. Table 11 presents the standard multiple linear regression's ANOVA results.

Table 11: ANOVA[a] Results

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	18.077	1	18.077	240.783	.000[b]
	Residual	12.463	166	.075		
	Total	30.540	167			
2	Regression	24.611	2	12.306	342.446	.000[c]
	Residual	5.929	165	.036		
	Total	30.540	167			
3	Regression	26.986	3	8.995	415.000	.000[d]
	Residual	3.555	164	.022		
	Total	30.540	167			

a. Dependent Variable: Sustainability of Solid Waste Management Projects (Y)
b. Predictors: (Constant), Stakeholder Management (X)
c. Predictors: (Constant), Stakeholder Management (X), Project Leadership (Z)
d. Predictors: (Constant), Stakeholder Management (X), Project Leadership (Z), Stakeholder Management* Project Leadership (X*Z)

Regression Coefficients[a] Results

From the coefficients table, when the unstandardized regression coefficients (B) were substituted to the moderated multiple regression models specified for the study, the final predictive equations were:

$Y = 2.180 + 0.441X$ ..... Equation 1

$Y = 0.253 + 0.214X + 0.713Z$ ..... Equation 2

$Y = 0.609 + 0.099X + 0.266Z + 0.475X*Z$ ..... Equation 3

The first final predictive equation suggested that holding all factors in to account constant (stakeholder management), constant at zero, the sustainability of solid waste management projects would be 2.180 in Kenya. The first final predictive equation suggested that with all other factors held constant, a unit increase in stakeholder management would lead to 0.441 unit increase in the sustainability of solid waste management projects in Kenya.

The second final predictive equation suggested that holding all factors in to account constant (stakeholder management and project leadership), constant at zero, the sustainability of solid waste management projects would be 0.253 in Kenya. The second final predictive equation suggested that with all other factors held constant, a unit increase in stakeholder management would lead to 0.214 unit increase in the sustainability of solid waste management projects in Kenya. The second final predictive equation suggested that with all other factors held constant, a unit increase in project leadership would lead to 0.713 unit increase in the sustainability of solid waste management projects in Kenya.

The third final predictive equation suggested that holding all factors in to account constant (stakeholder management, project leadership and stakeholder management*project leadership), constant at zero, the sustainability of solid waste management projects would be 0.609 in Kenya. The third final predictive equation suggested that with all other factors held constant, a unit increase in stakeholder management would lead to 0.099 unit increase in the sustainability of solid waste management projects in Kenya. The third final predictive equation suggested that with all other factors held constant, a unit increase in project leadership would lead to 0.266 unit increase in the sustainability of solid waste management projects in Kenya. Furthermore, the third final predictive equation suggested that with all other factors held constant, a unit increase in stakeholder management*project leadership would lead to 0.475 unit increase in the sustainability of solid waste management projects in Kenya.

In the first step for the moderation testing, the independent variable (stakeholder management) was regressed on the dependent variable (performance) in Kenya. Therefore, model 1 was fitted with stakeholder management predicting sustainability of solid waste management projects in Kenya. From the regression coefficients table in model 1, the regression results indicated that stakeholder management had positive and significant influence on the sustainability of solid waste management projects ($\beta_2 = 0.769$; $t = 15.517$; $p \leq 0.05$) in Kenya.

In the second step for the moderation testing, the independent variable (stakeholder management) and the moderating variable (project leadership) were regressed on the dependent variable (performance) in Kenya. From the regression coefficients table in model 2, the regression results indicated that stakeholder management had positive and significant influence on the sustainability of solid waste management projects ($\beta_3 = 0.373$; $t = 8.267$; $p \leq 0.05$) in Kenya. The regression results indicated that project leadership had a positive and significant influence on the sustainability of solid waste management projects ($\beta_4 = 0.609$; $t = 13.484$; $p \leq 0.05$) in Kenya.

In the third step for the moderation testing, the independent variable (stakeholder management) and the moderating variable (project leadership) and the interaction term (stakeholder management* project leadership) were regressed on sustainability of solid waste management projects. From the regression coefficients table in model 3, the regression results indicated that stakeholder management had a positive and significant influence on the sustainability of solid waste management projects ($\beta_5 = 0.173$; $t = 4.329$; $p \leq 0.05$) in Kenya. The regression results indicated that project leadership had a positive and significant influence on the sustainability of solid waste management projects ($\beta_6 = 0.227$; $t = 4.496$; $p \leq 0.05$) in Kenya. The regression results indicated that stakeholder management * project leadership (the interactive term) had a positive and significant influence

on the sustainability of solid waste management projects ($\beta_7 = 0.602$; $t = 10.466$; $p \leq 0.05$) in Kenya. Table 12 presents the moderated multiple linear regression coefficients results.

Table 12: Moderated Multiple Regression Coefficients[a] Results

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	2.180	.108		20.159	.000		
	Stakeholder management (X)	.441	.028	.769	15.517	.000	1.000	1.000
2	(Constant)	.253	.161		1.567	.119		
	Stakeholder management (X)	.214	.026	.373	8.267	.000	.577	1.733
	Project leadership (Z)	.713	.053	.609	13.484	.000	.852	1.174
3	(Constant)	.609	.130		4.692	.000		
	Stakeholder management (X)	.099	.023	.173	4.329	.000	.848	1.179
	Project leadership (Z)	.266	.059	.227	4.496	.000	.580	1.724
	Stakeholder management* Project leadership (X*Z)	.475	.045	.602	10.466	.000	.661	1.513

a. Dependent Variable: Sustainability of Solid Waste Management Projects (Y)

Hypotheses Test Results

In this research, 2 null hypotheses were tested. The hypotheses were tested at 5% level of significance, $\alpha = 0.05$, $t = 1.960$, and 95% confidence level to statistically help draw acceptable and realistic inferences. Therefore, the decision rule was to reject the null hypothesis H_0i if the $P \leq 0.05$, and otherwise fail to reject the null hypothesis H_0i if the $P > 0.05$.

Hypothesis One Test Results

The $H_0 1$ predicted that stakeholder management has no significant influence on sustainability of solid waste management projects in Kenya. The decision rule was to reject the $H_0 1$ if the $\beta_1 \neq 0$, $t \geq 1.960$, $P \leq 0.05$, and otherwise fail to reject the $H_0 1$ if the $\beta_1 = 0$, $t < 1.960$, $P > 0.05$. The regression results indicated that stakeholder management had a positive and significant influence on sustainability of solid waste management projects ($\beta_1 = 0.769$; $t = 15.517$; $p \leq 0.05$) in Kenya. The $H_0 1$ was rejected in the favor of the $H_A 1$. Therefore, decision was made that stakeholder management has a significant influence on sustainability of solid waste management projects in Kenya.

Hypothesis Two Test Results

The $H_0 2$ predicted that project leadership has no significant moderating influence on the relationship between stakeholder management and sustainability of solid waste management projects in Kenya. The moderated hierarchical multiple regression results showed that project leadership significant moderating influence on the relationship between stakeholder management and sustainability of solid waste management projects in Kenya. In model 2, the regression results indicated that stakeholder management had positive and significant influence on the sustainability of solid waste management projects ($\beta_3 = 0.373$; $t = 8.267$; $p \leq 0.05$) in Kenya. Additionally, for model 2, the regression results indicated that project leadership had a positive and significant influence on the sustainability of solid waste management projects ($\beta_4 = 0.609$; $t = 13.484$; $p \leq 0.05$) in Kenya. In model 3, the regression results indicated that project leadership had a positive and significant influence on the sustainability of solid waste management projects ($\beta_6 = 0.227$; $t = 4.496$; $p \leq 0.05$) in Kenya. Besides, for model 3, the regression results indicated that stakeholder management*project leadership (the interactive term) had a positive and significant influence on the sustainability of solid waste management projects ($\beta_7 = 0.602$; t

= 10.466; $p \leq 0.05$) in Kenya. Therefore, decision was made that project leadership had a positive and significant moderating influence on the relationship between stakeholder management and sustainability of solid waste management projects in Kenya. Table 13 presents the hypotheses test results.

Table 13: Hypotheses Test Results

Hypothesis			β	t	Sig.	Decision
$H_0$1:	Stakeholder management has no significant influence on sustainability of solid waste management projects in Kenya.		.769	15.517	.000	Reject the $H_0$1
$H_0$2:	Project leadership has no significant moderating influence on the relationship between stakeholder management and sustainability of solid waste management projects in Kenya.					Reject the $H_0$2
	Stakeholder Management	→ Sustainability of solid waste management projects	.173	4.329	.000	
	Project Leadership	→ Sustainability of solid waste management projects	.227	4.496	.000	
	Stakeholder Management * Project Leadership	→ Sustainability of solid waste management projects	.602	10.466	.000	

Discussions

The purpose of this quantitative correlational study was to examine the influence of stakeholder management on sustainability of solid waste management projects and the moderating influence on the relationship between stakeholder management and sustainability of solid waste management projects in Kenya. Specifically, the research sought to examine the influence of stakeholder management on sustainability of solid waste management projects in Kenya. The correlation results indicated that stakeholder management had a positive and significant relationship with sustainability of solid waste management projects in Kenya. The regression results showed that stakeholder management on sustainability of solid waste management projects in Kenya. The findings are consistent with the results of prior studies (Kariuki, 2024; Kaumbulu, 2021; Miano, 2023).

The research examined the moderating influence on the relationship between stakeholder management and sustainability of solid waste management projects in Kenya. The regression results indicated that project leadership had a significant moderating influence on the relationship between stakeholder management and sustainability of solid waste management projects in Kenya. The findings are consistent with the results of previous studies (Liaqat *et al.*, 2024).

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