



Influence of Stakeholder Management Practices on Environmental Project Implementation: Evidence from the NetZero Project in Rwamagana District, Rwanda

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Abstract: This study assessed the statistical association and predictive contribution of stakeholder management practices to environmental project implementation in the NetZero Project in Rwamagana District, Rwanda. Its four dimensions were stakeholder identification, stakeholder analysis, stakeholder engagement, and stakeholder monitoring and control. The research drew on Stakeholder Theory, Stakeholder Salience Theory, Participation Theory, and Control Theory. A cross-sectional descriptive and correlational design was employed within a quantitatively dominant mixed-method case study. Of 245 persons in the population, 152 were selected for the questionnaire through proportionate stratified and simple random sampling, and 140 submitted valid responses (92.1%); 20 key informants were selected purposively. Questionnaires, interviews and documentary review were used. Pearson correlations were positive and statistically significant for identification ($r = .862$), analysis ($r = .878$), engagement ($r = .778$), and monitoring and control ($r = .846$), all $p < .001$. Multiple regression explained 90.4% of the variance in the self-reported implementation score (adjusted $R^2 = .901$). Stakeholder analysis had the strongest unique contribution ($B = .357$, $\beta = .373$, $p < .001$), followed by identification ($B = .315$, $\beta = .330$, $p < .001$), monitoring and control ($B = .243$, $\beta = .254$, $p < .001$), and engagement ($B = .095$, $\beta = .099$, $p = .021$). All four null hypotheses were rejected. The findings recommend maintaining a current stakeholder register, salience-based prioritisation, meaningful participation and documented corrective-action closure.

Keywords: Stakeholder Identification; Stakeholder Analysis; Stakeholder Engagement; Stakeholder Monitoring and Control; Environmental Project Implementation; NetZero Project

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1. Introduction

Environmental projects translate policy commitments on climate resilience, ecological protection and sustainable resource use into activities that require cooperation among communities, public agencies, technical implementers and other interested parties. When the actors affected by those activities have different priorities, authority or expectations, effective project

delivery becomes partly a stakeholder-management problem. The Project Management Institute (2021) identifies the systematic recognition of stakeholders, appraisal of their needs, planned engagement and monitoring of stakeholder relationships as important project processes.

Stakeholder Theory argues for recognising all persons and groups able to influence or be affected by project decisions, whereas Stakeholder Salience Theory

explains why different actors require differentiated attention based on power, legitimacy and urgency (Freeman, 1984; Mitchell et al., 1997). Environmental evidence similarly suggests that stakeholder priorities, local knowledge and institutional coordination can strengthen restoration planning and collective implementation (Hernandez et al., 2024; Maccioni et al., 2024). These insights are particularly relevant when ecological benefits and implementation responsibilities span multiple groups.

Rwanda's environmental and climate-resilience programmes depend on coordination among implementing agencies, district authorities, local leaders and communities. Within Rwamagana District, the NetZero Project provided the case for examining the connections between stakeholder practices and five implementation indicators: timely delivery, cost performance, output completion, quality achievement and target attainment. The dissertation identifies 2022–2026 as its documentary review period, rather than a verified official project duration; primary data were collected in 2026.

The practical knowledge gap was the absence of consolidated project-specific evidence demonstrating how stakeholder identification, analysis, engagement, and monitoring and control were jointly associated with implementation outcomes. Existing Rwanda-based studies considered participation and engagement in other development settings, but did not estimate the four distinct contributions together within this NetZero Project case (Kwizera, 2025; Hategekimana & Tarus, 2025). This investigation therefore examined the relative contribution of each practice without assuming that the existence of stakeholder-management procedures proved project success or failure.

Rwanda's wider climate-adaptation monitoring and evaluation agenda highlights the need to link environmental interventions with accountable implementation and learning processes (Ministry of Environment & NAP Global Network, 2024). International landscape governance experience indicates that multistakeholder platforms can support negotiation among government actors, land users and local organisations, but only when representation and decision rules are clear (Siangulube et al., 2023). In this study, such institutional context strengthened the rationale for examining identifiable stakeholder-management functions rather than treating general participation as a single measure. The project-specific survey still remained the source for estimating the strength of the four relationships.

1.1 General Objective

The general objective of the study was to assess the statistical association and predictive contribution of stakeholder management practices to environmental

project implementation in the NetZero Project in Rwamagana District.

1.2 Specific Objectives

1. Assess the predictive contribution of stakeholder identification to environmental project implementation in the NetZero Project in Rwamagana District;
2. Assess the predictive contribution of stakeholder analysis to environmental project implementation in the NetZero Project in Rwamagana District;
3. Assess the predictive contribution of stakeholder engagement to environmental project implementation in the NetZero Project in Rwamagana District; and
4. Assess the predictive contribution of stakeholder monitoring and control to environmental project implementation in the NetZero Project in Rwamagana District.

1.3 Research Hypotheses

H01: Stakeholder identification has no statistically significant predictive contribution to environmental project implementation in the NetZero Project in Rwamagana District.

H02: Stakeholder analysis has no statistically significant predictive contribution to environmental project implementation in the NetZero Project in Rwamagana District.

H03: Stakeholder engagement has no statistically significant predictive contribution to environmental project implementation in the NetZero Project in Rwamagana District.

H04: Stakeholder monitoring and control has no statistically significant predictive contribution to environmental project implementation in the NetZero Project in Rwamagana District.

2. Literature Review

The literature review examines the theoretical mechanisms connecting stakeholder-management practices to environmental project implementation and the empirical evidence under the four objectives.

2.1 Theoretical Review

The study was guided by four theories: Stakeholder Theory, Stakeholder Salience Theory, Participation Theory, and Control Theory.

2.1.1 Stakeholder Theory

Freeman (1984) developed Stakeholder Theory to argue that management must account for groups that can affect or are affected by organisational decisions. In projects, identification establishes the population of interested and affected parties before consultation, analysis and action planning. A stakeholder register, beneficiary listing, agency mapping and clear role definitions reduce the risk that important actors remain unknown during implementation. This logic extends beyond formal institutional decision-makers to affected households, community representatives and technical partners.

For the NetZero Project, Stakeholder Theory explains why the completeness and currency of identification can matter for timely delivery, quality, output acceptance and coordination. It supports the first objective without equating a stakeholder list with meaningful engagement or proven causal effects on implementation.

2.1.2 Stakeholder Salience Theory

Mitchell et al. (1997) introduced Stakeholder Salience Theory by showing that managerial attention is shaped by power, legitimacy and urgency. The approach recognises that not all stakeholders have the same capacity to influence decisions or the same need for an immediate response. Analysing influence, interests, expectations and risks helps an implementation team prioritise scarce time and resources, while still recognising legitimate claims from vulnerable actors. Applied research on environmental governance shows the importance of mapping stakeholder relationships and risks before they affect implementation stability (Wang et al., 2023).

The second objective applies this theory to the NetZero Project by treating stakeholder analysis as a decision-support practice: priority and risk assessments should guide specific communication, protection, escalation and implementation responses, not remain purely administrative exercises.

2.1.3 Participation Theory

Participation Theory is associated with Arnstein's (1969) distinction between symbolic consultation and meaningful citizen influence over decisions. Meetings, information disclosure and feedback mechanisms can create opportunities for interaction, but participation becomes more substantive when views are considered and stakeholders can affect project choices. In ecological and development settings, locally grounded knowledge can improve the relevance, acceptance and legitimacy of technical activities. African environmental studies illustrate the value of practical stakeholder collaboration and knowledge sharing (Mganga et al., 2023).

In this study, the theory interprets stakeholder engagement through consultation meetings, feedback channels, information disclosure, complaint response and decision involvement. It also explains why high meeting participation alone cannot establish that engagement changed environmental implementation outcomes.

2.1.4 Control Theory

Control Theory draws on cybernetic feedback principles, classically associated with Wiener (1948): a system compares observed conditions with expected conditions and responds to deviations. Project management extends this logic to monitoring commitments, communication coverage, grievances, participation and the completion of corrective actions. Effective follow-up can identify unresolved issues before they interrupt work, whereas unclosed commitments weaken accountability despite initial consultation (Cheng, 2025).

For the fourth objective, Control Theory connects stakeholder monitoring and control with implementation discipline in the NetZero Project. Recording a complaint or issue is not equivalent to corrective action; managers need observable closure, assigned responsibility, feedback to affected actors and periodic reassessment.

2.2 Empirical Review

It examines findings from previous studies conducted in different geographical and institutional contexts, highlighting their methodological approaches, major findings, and limitations.

2.2.1 Stakeholder Identification and Environmental Project Implementation

Environmental restoration research shows that knowing which groups value particular ecological and social outcomes strengthens planning. Hernandez et al. (2024) connected stakeholder priorities with desired wetland-restoration attributes, supporting purposeful recognition of relevant beneficiaries and institutions. Wango et al. (2024) found stakeholder identification related to the performance of World Bank-funded projects in Kenya. These studies support early mapping, although their settings differ from the NetZero Project and cannot demonstrate its results independently.

Early stakeholder identification can also reduce late discovery of approval responsibilities, affected populations or implementation dependencies. This evidence makes the completeness of the register, clarity of roles, beneficiary listing and identification of supporting agencies relevant measures of the first objective. The remaining gap concerned their unique predictive contribution after accounting for the other stakeholder practices in Rwamagana District.

A complementary study by Maina and Mutuku (2025) connected stakeholder identification to the performance of humanitarian NGO projects in Nairobi, while Linaker et al. (2022) demonstrated a method for analysing the influence of stakeholders within a complex organisational ecosystem. Together with the wetland restoration evidence, these findings suggest that identification should be iterative rather than a once-only list: stakeholders may be added as outputs, risks and affected groups become clearer. For NetZero management, a regularly reviewed register linked to approval responsibilities and inclusion criteria is therefore a more useful operating instrument than an unverified directory of stakeholder names.

2.2.2 Stakeholder Analysis and Environmental Project Implementation

Wang et al. (2023) examined stakeholder-related social-stability risks in public-private water environmental governance projects in China and illustrated the complexity of interacting stakeholders. Mitchell et al. (1997) provide the analytical distinction among power, legitimacy and urgency, while Hategekimana and Tarus (2025) offer Rwanda-based evidence on stakeholder participation and project sustainability. The studies suggest that prioritisation can inform targeted management attention, although their outcome measures and contexts vary.

The NetZero Project consequently required empirical assessment of power and interest ratings, risk profiles, priority ranking and expectation mapping as one distinct construct. Its contribution to implementation could not be inferred from general participation literature; it required multiple-regression estimation alongside identification, engagement and monitoring.

Additional research reinforces the importance of differentiation in stakeholder governance. Chamdany et al. (2025) linked stakeholder management with renewable-energy project performance in Kenya, while Corazza et al. (2023) examined the complex and ethical demands of responding to stakeholders in contested megaprojects. The studies suggest that a power-based classification must be tempered by legitimacy and fairness; otherwise, highly affected but less influential community groups may be overlooked. For the NetZero case, this highlights the importance of ranking not just influence but also exposure to environmental consequences, urgency of claims and feasible corrective actions. The present regression measured perceived analysis quality, not objective proof that every vulnerable group was protected.

2.2.3 Stakeholder Engagement and Environmental Project Implementation

Maccioni et al. (2024) examined listening, meeting and collaborating with stakeholders in a fragile ecosystem

context, while Mganga et al. (2023) showed how multistakeholder participation can support applied environmental research in African settings. In Rwanda, Kwizera (2025) associated stakeholder engagement with Green Gicumbi Project performance. Ipara and Kipchumba (2024) similarly reported a positive relationship between stakeholder collaboration and environmental conservation in Kenya.

These findings support transparent consultation and beneficiary involvement, but they also indicate that mere contact with stakeholders is an incomplete measure of effective participation. The study therefore assessed multiple engagement indicators and distinguished their bivariate correlation with implementation from their unique effect after controlling for the other three practices.

Bernat et al. (2023) connect sustainability-oriented project management with stakeholder engagement and knowledge exchange, indicating that the value of engagement partly depends on how information circulates within implementation teams. Hasan (2024) discusses technology-enabled forecasting in stakeholder management and points to opportunities for more responsive communication. Yet digital contact mechanisms do not automatically establish informed participation or decision authority. In NetZero activities involving residents and local institutions with unequal digital access, project teams should therefore combine accessible physical consultation with traceable feedback records. This provides a practical basis for distinguishing the presence of engagement channels from evidence that those channels influence implementation decisions.

2.2.4 Stakeholder Monitoring and Control and Environmental Project Implementation

Cheng (2025) discusses analytical monitoring of stakeholder conflict in construction projects, demonstrating why emerging concerns need continuous attention rather than occasional consultation. Amuni et al. (2025) associated stakeholder involvement in monitoring and evaluation with donor-funded project performance in Kenya. These perspectives highlight the potential role of systematic tracking, feedback review, and documented resolution in stabilising project delivery.

In environmental projects, monitoring needs to link engagement records with schedules, resource use, output quality and target completion. Evidence from other sectors offers a rationale for this expectation but does not establish the contribution in the NetZero case. This study therefore tested whether monitoring and control predicted environmental project implementation beyond stakeholder identification, analysis and engagement.

Operational stakeholder-management guidance also places emphasis on continuity after the initial meeting.

The reporting and review cycles described by CLP Group (2023) and ESB Networks (2023) connect engagement activity with ongoing listening, reporting and revision of plans. This complements the fourth research objective by identifying concrete practices that can be measured: regular updates, commitment tracking, grievance response, assignment of responsible actors and verification of closure. The evidence supports a management rationale, while the NetZero questionnaire and regression results are necessary to establish the observed relationship in the study setting.

3. Methodology

3.1 Research Design

The study adopted a cross-sectional descriptive and correlational design within a quantitatively dominant convergent mixed-method case study. The questionnaire measured the four stakeholder-management variables and environmental project implementation during one survey period, while interview notes and available documents provided explanatory context. Pearson correlation examined the direction and strength of bivariate associations, and multiple linear regression estimated the contribution of each predictor while holding the others constant. The observational design could not establish temporal precedence or strict causality (Creswell & Creswell, 2023).

3.2 Study Population and Sampling

The study population comprised 245 persons in the project-related sampling frame, including project personnel, district and local-government actors, environmental officers, institutional stakeholders, community representatives and beneficiaries. Slovin's formula, $n = N/[1 + N(e)^2]$, with $N = 245$ and $e = .05$, generated a questionnaire sample of approximately 152. Proportionate stratification preserved representation across five population categories, and respondents were selected through simple random sampling within each stratum. Separately, 20 information-rich key informants were chosen purposively for interviews. The final quantitative analysis used 140 complete questionnaires.

3.3 Data Collection Instruments and Processing

Three instruments supported data collection: a structured questionnaire, an interview guide and a documentary-review checklist. The questionnaire contained 25 five-point Likert statements—five for each stakeholder-

management dimension and five for implementation—plus respondent-profile questions. The instruments maintained distinct construct boundaries between identification, analysis, engagement, monitoring and implementation. After collection, questionnaires were edited for completeness, responses were coded on a 1–5 agreement scale, and valid records were tabulated in IBM SPSS Statistics version 29. Incomplete questionnaires were excluded from regression rather than imputed.

Responses were coded using a five-category agreement scale, and construct means were formed from related items rather than interpreting any single item as the entire dimension. Methodological discussions of Likert-type scales distinguish between individual ordinal responses and composite multi-item scores; those distinctions matter when selecting means, standard deviations and multivariable methods (Koo & Yang, 2025; Lindner & Lindner, 2024). The questionnaire was constructed to keep the five dimensions separate by content even where respondents perceived them as related. Consequently, subsequent statistical associations were reported with the acknowledgement that shared response sources and conceptual overlap could inflate observed relationships.

3.4 Pilot Study, Validity and Reliability

A pilot involving respondents outside the main sample, approximately 10% of the planned questionnaire sample, was used to assess wording, relevance, response flow and preliminary internal consistency. The dissertation does not retain a definitive pilot participant count, so no exact number is inferred. Expert review assessed the relevance of 29 elements, comprising 25 construct items and four instructions/profile or administrative elements. The validation archive did not retain the identities or number of reviewers or a clearly reproducible numeric CVI, limiting independent verification. Internal consistency was assessed through Cronbach's alpha against a .70 benchmark; the five original alpha statistics are shown below (Roebianto et al., 2023; Zakariya, 2022).

Pilot testing was treated as an instrument-refinement exercise rather than evidence of substantive project outcomes. Bujang et al. (2024) discuss the implications of pilot sample size for questionnaire reliability assessment; their work supports careful reporting of the pilot's role and uncertainty. Because the exact pilot count and detailed expert-rating calculations were not independently documented in the available source material, the present article retains the dissertation's approximate pilot proportion and reported alpha coefficients without inventing a more precise validation history.

Table 1. Reliability Results

Variable	N of Items	Cronbach's Alpha
Stakeholder Identification	5	.837
Stakeholder Analysis	5	.788
Stakeholder Engagement	5	.840
Stakeholder Monitoring and Control	5	.832
Environmental Project Implementation	5	.799

All five reliability coefficients exceeded .70: stakeholder identification (.837), stakeholder analysis (.788), stakeholder engagement (.840), stakeholder monitoring and control (.832), and environmental project implementation (.799). The results support preliminary internal consistency, but do not prove discriminant validity. The archived dataset did not retain final-sample item-level output needed to independently recompute the scales.

3.5 Data Analysis and Diagnostic Procedures

Descriptive analyses used frequencies, percentages, item and construct means and standard deviations. Pearson correlation evaluated pairwise associations with the environmental project implementation score. A four-predictor regression model was estimated as $EPI = \beta_0 + \beta_1(SI) + \beta_2(SA) + \beta_3(SE) + \beta_4(SMC) + \epsilon$, where the predictors were stakeholder identification, stakeholder analysis, stakeholder engagement, and stakeholder monitoring and control. Regression diagnostics examined tolerance, variance inflation factors, residual normality, heteroscedasticity, linearity, influential observations and error independence. All hypotheses were assessed at $\alpha = .05$. Interview notes were coded thematically to help explain the quantitative patterns rather than presented as standalone qualitative findings.

3.6 Ethical Considerations and Limitations

The researcher sought institutional access, obtained informed consent, and emphasised voluntary

participation, confidentiality, anonymity and the academic use of information. Findings were reported without personal identifiers. The main limitations were the cross-sectional design, reliance on self-reported measures for both predictors and outcome, potential common-method bias, missing detailed interview transcripts, and incomplete archived diagnostic or measurement output. Because one environmental project was studied, the statistical results were interpreted as case-specific associations and prediction rather than demonstrated causal effects or sector-wide estimates.

4. Results and Discussion

This section presents, analyses, and discusses the research findings. The findings are organised according to the four research objectives: stakeholder identification, stakeholder analysis, stakeholder engagement, and stakeholder monitoring and control. The section also presents hypothesis-testing decisions and discusses the findings in relation to relevant empirical studies and theoretical perspectives.

4.1 Response Rate

This subsection presents the response rate of respondents who participated in the study on stakeholder management practices and environmental project implementation in the NetZero Project in Rwamagana District, Rwanda

Table 2. Questionnaire Response Rate

Questionnaires	Frequency	Percent
Returned complete	140	92.1
Not returned/incomplete	12	7.9
Total distributed	152	100.0

Of the 152 questionnaires distributed, 140 were returned fully complete (92.1%) and 12 were missing or incomplete (7.9%). Thus, 140 cases formed the quantitative dataset used for correlation, diagnostic checks and multiple regression. The response rate was sufficient to describe the surveyed participants, but high return alone does not rule out non-response or common-method bias.

4.2 Correlation Analysis

Pearson correlation coefficients were used to determine the extent of the relationships, while statistical significance was assessed at the 0.05 level. The findings provide a basis for understanding the associations between the study variables before conducting multiple regression analysis.

Table 3. Pearson Correlation Matrix

		Stakeholder Identification	Stakeholder Analysis	Stakeholder Engagement	Stakeholder Monitoring and Control	Environmental Project Implementation
Stakeholder Identification	Pearson Correlation	1	.736**	.687**	.745**	.862**
	Sig. (2-tailed)		< .001	< .001	< .001	< .001
	N	140	140	140	140	140
Stakeholder Analysis	Pearson Correlation	.736**	1	.736**	.744**	.878**
	Sig. (2-tailed)	< .001		< .001	< .001	< .001
	N	140	140	140	140	140
Stakeholder Engagement	Pearson Correlation	.687**	.736**	1	.698**	.778**
	Sig. (2-tailed)	< .001	< .001		< .001	< .001
	N	140	140	140	140	140
Stakeholder Monitoring and Control	Pearson Correlation	.745**	.744**	.698**	1	.846**
	Sig. (2-tailed)	< .001	< .001	< .001		< .001
	N	140	140	140	140	140
Environmental Project Implementation	Pearson Correlation	.862**	.878**	.778**	.846**	1
	Sig. (2-tailed)	< .001	< .001	< .001	< .001	
	N	140	140	140	140	140

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

Each stakeholder-management dimension was positively and significantly associated with environmental project implementation. Stakeholder analysis recorded the highest correlation ($r = .878$, $p < .001$), followed by stakeholder identification ($r = .862$, $p < .001$), stakeholder monitoring and control ($r = .846$, $p < .001$), and stakeholder engagement ($r = .778$, $p < .001$). These are strong sample-level bivariate associations, not estimates of unique regression effects. Correlations among the predictors were also substantial, supporting the need to control their shared variance in the multiple-regression model.

4.3 Regression Analysis

The analysis involved 140 valid responses and examined the regression diagnostics, model summary, analysis of variance (ANOVA), and regression coefficients. The results established the explanatory power and statistical significance of the model and supported decisions on the research hypotheses.

4.3.1 Regression Diagnostics

The tests examined multicollinearity, independence of errors, residual normality, homoscedasticity, linearity, and influential observations. Tolerance and variance inflation factor (VIF), Durbin–Watson, Shapiro–Wilk, Breusch–Pagan, Ramsey RESET, studentised residuals, and Cook’s distance were used to assess these assumptions.

Table 4. Regression Diagnostic Tests

Assumption	Diagnostic	Obtained result	Decision criterion	Interpretation
Multicollinearity	Tolerance and VIF	Tolerance = .323-.391; VIF = 2.558-3.092	Tolerance > .10; VIF < 10	Acceptable; predictors were related but not redundant
Independence of errors	Durbin-Watson	1.842	Value close to 2	DW was close to 2; supplementary only in this cross-sectional survey.
Normality of residuals	Shapiro-Wilk	W = .983; p = .074	p > .05	Residual normality was not rejected; residual plots should also be reviewed.
Homoscedasticity	Breusch-Pagan	$\chi^2 = 2.104$; p = .717	p > .05	Residual variance was approximately constant
Linearity	Ramsey RESET	F = .520; p = .472	p > .05	No evidence of important non-linearity
Outliers and influence	Studentised residuals and Cook's distance	Maximum residual = 2.583; maximum Cook's D = .066	studentised residual < 3; Cook's D < 1; leverage < .071.	Residual and Cook's D thresholds were met; maximum leverage was not retained in the attached output.
Leverage	2(k + 1)/n threshold	Maximum value not retained	Threshold = .071 for k = 4 and n = 140	Leverage could not be independently verified from the retained output.
Common-method variance	Design limitation	Not directly tested	Procedural and statistical checks recommended	Acceptable diagnostics did not eliminate common-source bias.

The reported variance inflation factors ranged from 2.558 to 3.092 and tolerance values from .323 to .391, indicating no severe multicollinearity under the adopted thresholds. The Durbin–Watson statistic was 1.842; residual normality was not rejected (Shapiro–Wilk p = .074), and reported homoscedasticity and linearity checks were nonsignificant (Breusch–Pagan p = .717; RESET p = .472). Maximum absolute studentised residual and Cook's distance were 2.583 and .066. The source explicitly notes that maximum leverage and common-method variance were not independently verified; consequently, the diagnostic table should not be interpreted as eliminating every model risk.

4.3.2 Model Summary

The analysis considered the multiple correlation coefficient (R), coefficient of determination (R^2), adjusted R^2 , standard error of the estimate, and Durbin–Watson statistic. These measures established the extent to which stakeholder identification, stakeholder analysis, stakeholder engagement, and stakeholder monitoring and control collectively explained variations in environmental project implementation.

Table 5. Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.951 ^a	.904	.901	.11477	1.842

a. Predictors: (Constant), Stakeholder Monitoring and Control, Stakeholder Engagement, Stakeholder Identification, Stakeholder Analysis

b. Dependent Variable: Environmental Project Implementation

The four-predictor model produced $R = .951$, $R^2 = .904$ and adjusted $R^2 = .901$. Accordingly, the measured predictors accounted statistically for 90.4% of the observed variation in respondents' environmental project implementation scores in this sample, after which the adjusted estimate remained 90.1%. The standard error of the estimate was .11477. The fit indicates strong prediction within the analysed dataset, without establishing that the practices caused equivalent

improvements in objectively documented implementation outcomes.

4.3.3 Analysis of Variance

The ANOVA results provide evidence of the overall suitability of the regression model for explaining variations in environmental project implementation, as presented in Table 6.

Table 6. ANOVA Summary

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	16.698	4	4.174	321.077	< .001
	Residual	1.778	135	.013		
	Total	18.476	139			

a. Dependent Variable: Environmental Project Implementation

b. Predictors: (Constant), Stakeholder Monitoring and Control, Stakeholder Engagement, Stakeholder Identification, Stakeholder Analysis

The overall regression model was statistically significant, $F(4, 135) = 321.077$, $p < .001$. This means that the joint predictor set improved prediction of the composite implementation score compared with an intercept-only model. The ANOVA does not identify the strongest individual practice; those comparisons require the standardised coefficients and associated tests in the coefficients table.

4.3.4 Regression Coefficients

The analysis considered unstandardized coefficients (B), standardized coefficients (Beta), standard errors, t-statistics, and significance values to establish the direction, magnitude, and statistical significance of each independent variable while controlling for the other predictors.

Table 7. Regression Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	.033	.119		.277	.781		
Stakeholder Identification	.315	.043	.330	7.326	.000	.356	2.807
Stakeholder Analysis	.357	.045	.373	7.933	.000	.323	3.092
1 Stakeholder Engagement	.095	.041	.099	2.317	.021	.391	2.558
Stakeholder Monitoring and Control	.243	.044	.254	5.523	.000	.343	2.917

a. Dependent Variable: Environmental Project Implementation

Stakeholder analysis had the largest standardised coefficient ($B = .357$, $\beta = .373$, $t = 7.933$, $p < .001$), followed by stakeholder identification ($B = .315$, $\beta = .330$, $t = 7.326$, $p < .001$), stakeholder monitoring and

control ($B = .243$, $\beta = .254$, $t = 5.523$, $p < .001$), and stakeholder engagement ($B = .095$, $\beta = .099$, $t = 2.317$, $p = .021$). Each coefficient was positive and statistically significant after adjusting for the other practices. On the five-point composite scales, one additional point in

stakeholder analysis corresponded to a .357-point higher predicted implementation score, holding the other variables constant. The intercept ($B = .033$, $p = .781$) was not statistically significant and has limited substantive interpretation because a zero score falls outside the measurement range.

4.3.5 Decision on Null Hypotheses

Table 8. Decision on Null Hypotheses

Hypothesis	B	Beta	t	p-value	Decision
H01	.315	.330	7.326	< .001	Reject the null hypothesis
H02	.357	.373	7.933	< .001	Reject the null hypothesis
H03	.095	.099	2.317	.021	Reject the null hypothesis
H04	.243	.254	5.523	< .001	Reject the null hypothesis

At the .05 significance level, H01, H02, H03 and H04 were all rejected. The decisions reflect the positive conditional coefficients in the original regression table; they do not imply that observational data establish a causal influence. Stakeholder analysis remained the highest-priority practice by relative standardised effect, while engagement had the smallest statistically distinct contribution.

4.4 Discussion of Research Findings

The findings are interpreted in relation to the regression results, relevant empirical studies, and the theoretical perspectives underpinning the research.

4.4.1 Stakeholder Identification and Environmental Project Implementation

Stakeholder identification has positive correlation with implementation ($r = .862$) remained significant after the other three practices were controlled ($B = .315$, $\beta = .330$, $p < .001$). In the NetZero Project, this result indicates that recording relevant groups, listing beneficiaries and supporting agencies, clarifying responsibilities and documenting interests were associated with more effective reported delivery of environmental activities. The relatively weaker score for supporting-agency listing points to a practical need for more complete institutional mapping.

The result is consistent with Stakeholder Theory, under which project teams should recognise actors likely to affect or experience implementation decisions (Freeman, 1984). Hernandez et al. (2024) similarly demonstrate the relevance of identifying stakeholder priorities in wetland restoration, and Wango et al. (2024) associate stakeholder identification with project performance in Kenya. These comparisons support the interpretation that timely identification can reduce omission and coordination risk, but the NetZero result cannot be

The decisions were based on the significance values obtained from the multiple regression coefficients, using a 0.05 level of significance. A null hypothesis was rejected when its p-value was less than or equal to 0.05, indicating a statistically significant predictive contribution.

extrapolated mechanically to other projects or treated as causal proof.

4.4.2 Stakeholder Analysis and Environmental Project Implementation

Stakeholder analysis obtained the largest correlation with implementation ($r = .878$, $p < .001$). More importantly, its standardised regression coefficient ($\beta = .373$; $B = .357$, $p < .001$) was the greatest among the four dimensions. The NetZero finding indicates that ranking stakeholder power and interests, preparing risk profiles, assigning priorities and mapping expectations were particularly important for differentiating managerial attention, resolving competing demands and protecting implementation schedules and quality. Management should therefore refresh the salience and risk matrix at major milestones and translate ratings into specific responsibilities.

Stakeholder Salience Theory provides a coherent explanation, as power, legitimacy and urgency indicate who requires differentiated and sometimes immediate response (Mitchell et al., 1997). Wang et al. (2023) support the importance of analysing stakeholder relationships and social-stability risks in water environmental governance. Although Hategekimana and Tarus (2025) address project sustainability rather than the NetZero implementation score, their Rwanda-based findings reinforce the importance of managing stakeholder priorities rather than relying on uniform consultation. This distinction helps explain why analysis made the strongest unique contribution.

4.4.3 Stakeholder Engagement and Environmental Project Implementation

Stakeholder engagement correlated strongly with implementation ($r = .778$, $p < .001$). However, when identification, analysis and monitoring were held constant, its contribution was considerably smaller ($B = .095$, $\beta = .099$, $p = .021$). This does not indicate that

participation was unimportant. Rather, much of the relationship between engagement and implementation overlapped with the connected stakeholder-management system. Consultation, accessible feedback channels, information disclosure and decision involvement are most valuable when they are designed for the right actors and followed by a recorded response.

Participation Theory distinguishes meaningful involvement from procedural attendance at meetings (Arnstein, 1969). Evidence from environmental collaboration in Kenya (Ipara & Kipchumba, 2024), stakeholder engagement in fragile ecosystems (Maccioni et al., 2024), and the Green Gicumbi Project in Rwanda (Kwizera, 2025) supports the importance of interaction and community ownership. The smaller conditional coefficient in the NetZero analysis adds a useful qualification: engagement quantity alone should not be treated as a substitute for prioritisation, responsiveness or verification that public contributions affected decisions.

4.4.4 Stakeholder Monitoring and Control and Environmental Project Implementation

Monitoring and control was positively associated with implementation both bivariate ($r = .846, p < .001$) and conditionally ($B = .243, \beta = .254, p < .001$). The findings indicate that communication follow-up, participation review, grievance monitoring and progress updates were associated with stronger environmental implementation. Nevertheless, corrective-action closure was comparatively weaker than other monitoring indicators, signalling that logging issues does not ensure they are resolved.

Control Theory predicts the value of feedback, deviation detection and appropriate corrective response (Wiener, 1948). Cheng (2025) also discusses systematic analysis of stakeholder conflict, and Amuni et al. (2025) link stakeholder involvement in monitoring to project performance in a Kenyan donor-funded setting. For the NetZero Project, the implication is to maintain an auditable record of each concern, assign a responsible officer and due date, record closure evidence, and review unresolved issues alongside time, cost, output and environmental targets. Such practices may strengthen coordination, although longer-term validation requires objective longitudinal records.

5. Conclusion and Recommendations

This section presents the conclusions and recommendations derived from the research findings on the influence of stakeholder management practices on environmental project implementation in the NetZero Project in Rwamagana District, Rwanda.

5.1 Conclusions

The study concluded that all four stakeholder-management practices were positively and significantly associated with environmental project implementation in the NetZero Project in Rwamagana District. Their joint regression model explained 90.4% of the observed variation in the self-reported implementation measure. Stakeholder analysis was the strongest unique predictor, followed by stakeholder identification, stakeholder monitoring and control, and stakeholder engagement. These findings support treating the four dimensions as complementary elements of one project-management cycle rather than as independent administrative checklists.

Identification contributed through complete mapping, beneficiary recognition and role clarity; analysis through prioritisation of power, interests, legitimacy, urgency and risks; engagement through meaningful consultation, disclosure and response; and monitoring through commitment follow-up, grievance handling and corrective-action closure. The conclusions apply to observed associations in this cross-sectional case, not proof of causality or an independently audited claim of environmental impact.

5.2 Recommendations

The recommendations focus on strengthening stakeholder identification, improving stakeholder analysis, promoting meaningful stakeholder engagement, and enhancing stakeholder monitoring and control.

1. The NetZero Project management team should maintain a current stakeholder register identifying beneficiaries, local leaders, technical institutions and implementing partners, with clear responsibilities and a change log.
2. District environmental officers should verify that supporting agencies and potentially excluded groups are captured at initiation and during major delivery milestones.
3. Stakeholder analysis should receive first managerial priority because it produced the strongest independent coefficient.
4. Future studies should combine longitudinal surveys and objective project records to evaluate causal ordering, sustained environmental outcomes and the replicability of these relationships across projects.

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