



Effect of Project Management Practices on Project Sustainability: A Case of Ntunga Drilling Project in Rwamagana District, Rwanda

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Abstract: Rwanda's mining sector has recorded impressive growth, yet the sustainability of mining projects remains a pressing concern because revenue expansion does not automatically guarantee durable environmental, social, and operational benefits. The purpose of this study was to assess the effect of project management practices on the sustainability of a project in the mining sector, with specific reference to Ntunga Drilling Project in Rwamagana District. The study was guided by four specific objectives: to assess the effect of project planning on Data collection instruments include documentation review and structured questionnaires. Quantitative data were analyzed using SPSS version 29 through descriptive statistics, Pearson correlation, and multiple regression. The regression findings showed that project planning significantly affected sustainability with $B = 0.206$, $t = 3.433$, and $p = 0.001$. Risk management had a significant effect on sustainability with $B = 0.201$, $t = 2.831$, and $p = 0.006$. Stakeholder management also significantly affected sustainability with $B = 0.286$, $t = 3.620$, and $p = 0.000$. MEAL had the strongest significant effect on sustainability with $B = 0.288$, $t = 3.000$, and $p = 0.004$. The study concluded that project planning, risk management, stakeholder management, and MEAL significantly contributed to sustainability of Ntunga Drilling Project by strengthening direction, preparedness, ownership, accountability, and learning. It is recommended that Ntunga Drilling Project should strengthen baseline setting by documenting environmental, social, and economic conditions before major activities begin.

Keywords: Project planning, Risk management, Stakeholder management, Monitoring, Evaluation, Accountability and learning, P sustainability.

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1. Introduction

Project management has progressively moved from a narrow concentration on time, cost, and quality toward a wider concern for social value, environmental responsibility, and institutional continuity. Sustainability in projects now requires managers to integrate planning discipline, risk awareness, stakeholder participation, and learning systems across the life cycle rather than treating sustainability as a final reporting item. Mining projects make this shift more visible because they combine capital-intensive work, land use, community

expectations, safety demands, and long-term rehabilitation duties. The current study draws from that broader understanding to examine how management practices influence sustainable outcomes in a mining project context (Soares et al., 2024).

Rwanda has positioned mining as a strategic sector for export growth, value addition, job creation, and industrial transformation. The sector has grown from traditional extraction toward more formalized operations, processing investments, and mineral governance reforms aimed at increasing national earnings and responsible production. Rwanda recorded strong mineral export performance in 2024 and continues

to target higher export revenue under the second National Strategy for Transformation. This national direction makes project sustainability highly important because mining projects must remain economically viable while meeting environmental and social obligations (Rwanda Mines, Petroleum and Gas Board, 2025).

Rwanda's mining project environment is increasingly shaped by public expectations for responsible extraction, traceability, environmental rehabilitation, and community development. The Rwanda Development Board identifies mining as a major investment area, while national ambitions emphasize higher mineral value addition and responsible operations. Project sustainability in this sector therefore requires attention to continuity of benefits, environmental compliance, financial viability, institutional capacity, and community ownership. This national context makes Ntunga Drilling Project relevant for examining how management practices relate to sustainable mining outcomes (Rwanda Development Board, 2024).

The Ntunga Drilling Project is a major critical minerals exploration project in the Musha Ntunga mining area of Rwamagana District, Rwanda, operated by Trinity Metals. The project focuses on lithium-bearing pegmatites together with tin and tantalum mineralization. Exploration has identified spodumene, cassiterite, and columbite-tantalite, confirming it as a polymetallic LCT pegmatite system. Between 2023 and 2024, about 12,000 metres of diamond drilling were completed, with strong lithium results such as 195 m at 1.4% Li₂O and 148 m at 1.46% Li₂O. The company announced an exploration target of about 35 to 70 million tonnes grading above 1% Li₂O, though this is not yet a formal mineral resource estimate. The project remains at the exploration and evaluation stage, with further drilling, testing, modelling, resource estimation, and feasibility studies needed before large-scale mining development.

None of the reviewed studies was found to have specifically examined the effect of project management practices on sustainability of Ntunga Drilling Project in Rwamagana District. Existing Rwandan studies have addressed project planning, risk management, stakeholder involvement, and MEAL in construction, agriculture, water supply, tourism, and donor-funded development projects, but not this mining project case. This leaves a geographical and sector-specific knowledge gap on how project planning, risk management, stakeholder management, and MEAL affect sustainability in a drilling-oriented mining project. This study bridged that gap.

The general objective of this study is to assess the effect of project management practices on sustainability of Ntunga Drilling Project in Rwamagana District, Rwanda.

The study is guided by the following specific objectives:

1. To assess the effect of project planning on sustainability of Ntunga Drilling Project in Rwamagana District.
2. To examine the effect of risk management on sustainability of Ntunga Drilling Project in Rwamagana District.
3. To determine the effect of stakeholder management on sustainability of Ntunga Drilling Project in Rwamagana District.
4. To analyze the effect of MEAL on sustainability of Ntunga Drilling Project in Rwamagana District.

2. Literature Review

2.1 Theoretical Review

The theoretical review presents four theories that guide the interpretation of the relationship between project management practices and project sustainability. The selected theories are Goal-Setting Theory, Risk Management Theory, Stakeholder Theory, Theory of Change, Safety Culture Theory, Sustainable Development Theory and Human Capital Theory. Each theory is linked to one specific objective of the study.

2.1.1 Goal-Setting Theory

Goal-Setting Theory was advanced by Edwin A. Locke in 1968 and later developed with Gary P. Latham through extensive organizational behavior research. The theory argues that specific, clear, and challenging goals direct effort, sustain attention, and improve task performance when people accept the goals and receive feedback. In project management, the theory explains why planned objectives, milestones, and performance targets guide implementation behavior. The theory remains relevant because project planning depends on goal clarity, commitment, feedback, and task coordination (Locke & Latham, 2023).

This study used Goal-Setting Theory to guide the effect of project planning on project sustainability. The theory supported the expectation that clear goals, realistic schedules, aligned budgets, and defined milestones improved the sustainability of Ntunga Drilling Project. It also helped interpret whether weak planning reduces benefit continuity, environmental compliance, and operational resilience in the selected mining project.

2.1.2 Risk Management Theory

Risk Management Theory is rooted in the study of uncertainty and decision-making, with Frank H. Knight's 1921 distinction between risk and uncertainty providing an early foundation for later risk analysis. Modern project risk management applies this logic by identifying uncertain events, estimating their probability and impact, and selecting responses. The theory views risk as a

manageable condition rather than an unavoidable accident. It is relevant to projects because uncertainty affects cost, quality, safety, environment, and continuity (Testorelli et al., 2024).

This study used Risk Management Theory to assess the effect of risk management on project sustainability. The theory helped examine whether risk identification, assessment, response planning, monitoring, contingency reserves, and exposure ranking contribute to durable benefits in Ntunga Drilling Project. It also guided interpretation of how unmanaged risks can weaken environmental compliance, financial viability, and operational resilience.

2.1.3 Stakeholder Theory

Stakeholder Theory was introduced by R. Edward Freeman in 1984 and argues that organizations should consider the interests of groups that affect or are affected by organizational actions. In project management, the theory explains why communities, regulators, employees, funders, contractors, and beneficiaries influence project success. The theory is useful because projects are not implemented in isolation from social and institutional environments. Sustainable project outcomes depend on stakeholder acceptance, trust, participation, and negotiated expectations (Blak Bernat et al., 2023).

This study used Stakeholder Theory to guide on the effect of stakeholder management on project sustainability. The theory supported the assessment of stakeholder mapping, participation planning, feedback handling, conflict resolution, communication frequency, and interest alignment. It also helped explain how stakeholder relations can influence community ownership and benefit continuity at Ntunga Drilling Project.

2.1.4 Theory of Change

Theory of Change is commonly associated with Carol Weiss's 1995 work on evaluation and program theory, which emphasized making assumptions about change explicit. The theory explains how activities are expected to produce outputs, outcomes, and long-term impact through identifiable pathways. In project management, it links implementation actions to measurable results and provides a basis for MEAL. It is relevant because sustainability depends on whether intended benefits are achieved, maintained, and adapted over time (Gakomeye & Shukla, 2023).

This study used Theory of Change to guide on the effect of MEAL on project sustainability. The theory helped examine whether indicator tracking, baseline setting, data quality, reporting, corrective action, and learning uptake contribute to sustainable outcomes at Ntunga Drilling Project. It also supported interpretation of how evidence-based decisions influence environmental

compliance, benefit continuity, and operational resilience.

2.2 Empirical Review

The empirical review examines studies related to each specific objective. The review summarizes the objective, methodology, findings, conclusion, and recommendation of selected studies. It also shows how existing evidence supports the need for the current study on project management practices and sustainability in the mining sector.

2.2.1 Project Planning and Project Sustainability

Uwera and Dushimimana (2025) assessed the effect of project planning on project performance in the Partnership for Resilient and Inclusive Small Livestock Markets Project in Rulindo District, Rwanda. The study examined communication planning, stakeholder planning, and risk planning using descriptive and correlational designs. The target population was 754, and a sample of 87 respondents were selected using universal and purposive sampling techniques. The study used questionnaires, interviews, and observation guides to collect data. The findings showed that project planning practices were connected to project performance in the PRISM project. The authors concluded that planning improves implementation coherence and recommended stronger integration of communication, stakeholder, and risk planning.

2.2.2 Risk Management and Project Sustainability

Sangwa and Dushimimana (2023) examined the effect of risk management practices on project performance in the TWICECEKA project implemented by Women for Women International in Huye District, Rwanda. The study assessed risk identification, risk analysis, risk response planning, and risk monitoring and control. A census survey was used with 200 respondents, and questionnaire data were analyzed using SPSS. The model summary showed an R Square of 0.625, meaning that 62.5 percent of performance variance was explained by the risk predictors. The study concluded that all selected risk management practices had significant effects. The authors recommended systematic use of risk identification, analysis, response planning, and monitoring.

2.2.3 Stakeholder Management and Project Sustainability

Hategekimana and Tarus (2025) investigated the contribution of stakeholder participation to the sustainability of Compassion International Rwanda's initiatives. The objective was to assess how stakeholder salience and participation contributed to sustainability of development projects. The study used a survey approach and analyzed stakeholder-related factors in relation to

project sustainability. The findings indicated that stakeholder participation improved sustainability by strengthening ownership, accountability, and responsiveness to local needs. The study concluded that projects become more sustainable when stakeholders participate meaningfully in decisions and implementation. The authors recommended stronger early-stage participation and continuous communication with stakeholder groups.

2.2.4 MEAL and Project Sustainability

Gakomeye and Shukla (2023) examined monitoring and evaluation practices and sustainability of the University of Rwanda-Sweden Program. The objective was to determine the influence of monitoring and evaluation capacity building, budgeting, and quality assurance on program sustainability. The study used questionnaire data and statistical analysis to assess relationships between monitoring and evaluation practices and sustainability. The findings indicated that capacity building, budgeting, and quality assurance contributed to sustainability of research and higher education institutional development activities. The study concluded that monitoring and evaluation strengthens accountability and continuity when adequately resourced. The authors recommended stronger budgeting and quality assurance for monitoring and evaluation systems.

2.3 Research Gap

The gap emerging from the reviewed literature is contextual, geographical, methodological, and general in nature. Contextually, many reviewed works address construction, water, agriculture, tourism, social enterprise, public health, and donor-funded projects rather than sustainability challenges within mining projects. Geographically, available Rwandan evidence gives limited attention to drilling projects in Rwamagana District, especially Ntunga Drilling Project as a focused case. Methodologically, several studies emphasize project performance, project success, or implementation outcomes, while fewer operationalize sustainability through benefit continuity, environmental compliance, financial viability, community ownership, institutional capacity, and operational resilience. The general gap is that the four project management practices are rarely examined together as predictors of project sustainability in Rwanda's mining sector, which makes the present study necessary.

3. Methodology

3.1 Research Design

This study used descriptive and correlational research designs with quantitative and qualitative approaches. The descriptive design was used to describe respondents'

views on project planning, risk management, stakeholder management, MEAL, and project sustainability. The correlational design was used to determine the strength and direction of relationships among variables.

3.2 Study Population and Sampling Design

The study population comprises 95 respondents connected to Ntunga Drilling Project in Rwamagana District. This included project managers, project leaders, geologists, drilling supervisors, drilling operators, drilling technicians, field technicians, safety, health and environmental officers, maintenance team members, logistics and support staff, and community representatives.

The researcher used the census method because the study population is small and manageable. Therefore, all the 95 respondents connected to Ntunga Drilling Project in Rwamagana District were included in the study without applying sampling techniques.

3.3 Data Collection Instrument

The study used a structured questionnaire with closed-ended Likert scale statements. The questionnaire contained sections on socio-demographic characteristics, project planning, risk management, stakeholder management, MEAL, and project sustainability. Respondents indicated their level of agreement using a five-point scale ranging from strongly disagree to strongly agree.

3.4 Pilot Study, Validity and Reliability

The study conducted a pilot test using approximately 10% of the sample size, which was 10 respondents. The pilot study was conducted at the Icyari Project in Nyanza District. Respondents involved in the pilot did not participate in the main study, and feedback from the pilot was used to refine questionnaire wording, sequencing, and clarity.

The study established validity through expert review and the Content Validity Index. The draft questionnaire was given to the supervisor and selected experts in project management and mining-related practice. Items rated as relevant was counted and divided by the total number of items using the formula $CVI = n \text{ divided by } N$, where n represents items rated relevant and N represents the total number of items.

The CVI of 0.83 was above the acceptable threshold of 0.70. This indicated that the questionnaire was valid for measuring project planning, risk management, stakeholder management, Monitoring, Evaluation, Accountability and Learning, and project sustainability in Ntunga Drilling Project.

The results show that all variables had Cronbach's Alpha coefficients above 0.70. Project planning was reliable with 0.814, risk management with 0.827, stakeholder management with 0.838, Monitoring, Evaluation, Accountability and Learning with 0.846, and project sustainability with 0.858. This means that the items under each variable were internally consistent and reliable for analyzing the sustainability of Ntunga Drilling Project.

3.5 Data Analysis

Inferential analysis was used to test the relationships between project management practices and project sustainability. Pearson correlation determined the strength and direction of association between each independent variable and the dependent variable. Multiple regression determined the combined and individual effects of project planning, risk management, stakeholder management, and MEAL on project sustainability.

The study used a significance level of 0.05 to test the null hypotheses. A p-value below 0.05 led to rejection of the null hypothesis, meaning that the independent variable has a statistically significant effect on project sustainability.

The regression model was expressed as $Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \varepsilon$

where Y represents project sustainability, X_1 represents project planning, X_2 represents risk management, X_3 represents stakeholder management, X_4 represents MEAL, β_0 represents the constant, β_1 to β_4 represent coefficients, and ε represents the error term.

3.5 Ethical Considerations

The study observed ethical principles throughout the research process. The researcher sought permission before data collection, explained the purpose of the study, obtained informed consent, protected confidentiality, preserved anonymity, and respected voluntary participation. Data were used for academic purposes only and were not manipulated to produce predetermined conclusions.

4. Results and Discussions

4.1 Response Rate

Response rate was examined to determine the level of participation in the study and to confirm whether the collected questionnaires were sufficient for analysis. The section presents the number of complete questionnaires returned and the number that were not returned or were incomplete among respondents targeted under Ntunga Drilling Project.

Table 1: Response Rate

Response category	Frequency	Percent
Returned complete questionnaires	87	91.6
Not returned/incomplete	8	8.4
Total	95	100.0

Source: Primary Data, 2026

The results in Table 1 indicate the response rate for the study on project management practices and sustainability of Ntunga Drilling Project in Rwamagana District. Returned complete questionnaires were 87, representing 91.6% of the targeted respondents, which provided enough data for descriptive and inferential analysis. Not returned or incomplete questionnaires were 8, representing 8.4%, mainly because some respondents were not available during questionnaire collection and others did not complete all required sections. The response level was strong because information came from different project actors involved in planning, risk

handling, stakeholder engagement, MEAL, and sustainability-related activities.

4.2 Correlation Analysis

Correlation analysis was used to determine the strength and direction of the relationship between each independent variable and project sustainability. The analysis focused on project planning, risk management, stakeholder management, and MEAL in relation to sustainability of Ntunga Drilling Project at a 0.05 significance level.

Table 2: Correlation Analysis

		Project Planning	Risk Management	Stakeholder Management	MEAL	Project Sustainability
Project Planning	Pearson	1	.803**	.716**	.807**	.841**
	Correlation Sig. (2-tailed)		.000	.000	.000	.000
Risk Management	N	87	87	87	87	87
	Pearson	.803**	1	.775**	.841**	.863**
	Correlation Sig. (2-tailed)	.000		.000	.000	.000
Stakeholder Management	N	87	87	87	87	87
	Pearson	.716**	.775**	1	.858**	.859**
	Correlation Sig. (2-tailed)	.000	.000		.000	.000
MEAL	N	87	87	87	87	87
	Pearson	.807**	.841**	.858**	1	.896**
	Correlation Sig. (2-tailed)	.000	.000	.000		.000
Project Sustainability	N	87	87	87	87	87
	Pearson	.841**	.863**	.859**	.896**	1
	Correlation Sig. (2-tailed)	.000	.000	.000	.000	
	N	87	87	87	87	87

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

Source: Primary Data, 2026

The findings in Table 2 indicate correlation analysis between project management practices and project sustainability in Ntunga Drilling Project. The relationship between Project planning and project sustainability was positive and statistically significant. The Pearson correlation coefficient of 0.841 shows that the two variables moved in the same direction. The significance value of 0.000 was below 0.05, meaning that the relationship was statistically significant. This indicates that improvement in project planning was associated with improvement in project sustainability in the current study.

Uwera and Dushimimana (2025) found that project planning supports project performance when communication planning, stakeholder planning, and risk planning are properly integrated. This literature aligns with the current relationship because planning provides the structure through which sustainability can be organized, monitored, and protected. In a drilling project, clear objectives, realistic schedules, and planned resources create conditions that allow long-term benefits to continue beyond immediate implementation.

Risk management had a strong positive and significant relationship with project sustainability. The value $R = 0.863$ shows the strength and direction of the relationship. Since $P = 0.000$ was below 0.05, the relationship was statistically significant. This means that risk management was significantly associated with project sustainability in the current study.

Sangwa and Dushimimana (2023) reported that risk identification, risk analysis, response planning, and monitoring contribute to project performance when applied systematically. This literature is supported by the current relationship because Ntunga Drilling Project operates in an environment where technical, safety, environmental, and financial uncertainties can affect sustainability. Strong risk management therefore becomes a practical route for protecting continuity and stakeholder confidence.

The relationship between Stakeholder management and project sustainability was positive and significant (Pearson correlation coefficient = 0.859; significance value = 0.000). The correlation value shows that the variables moved in the same direction. The significance value was below 0.05, confirming that the relationship was statistically significant. This finding supports the relevance of stakeholder management in explaining project sustainability.

Mazimpaka (2022) confirmed that stakeholder involvement shapes project sustainability through ownership, participation, and implementation support. This literature resonates with the current relationship because community ownership and stakeholder confidence are central to mining project sustainability. When stakeholders are mapped, engaged, and given feedback, the project gains social support that strengthens continuity and reduces resistance during implementation.

MEAL was positively related to project sustainability ($R = 0.896$; $P = 0.000$). Since $P < 0.05$, the relationship was statistically significant. This means that changes in meal were associated with changes in project sustainability. The finding confirms that the relationship under this objective was meaningful in the current study.

Celestin (2025) showed that monitoring and evaluation support sustainability when project information is used for tracking, learning, and corrective action. This literature consent with the current relationship because MEAL practices provide the evidence needed to adjust implementation and maintain project benefits. In Ntunga Drilling Project, indicator tracking, baseline setting, data quality, and reporting form the information base for sustainable decisions.

The correlation results showed that all project management practices had positive and statistically

significant relationships with sustainability of Ntunga Drilling Project. The strongest relationship was observed for MEAL, followed by risk management, stakeholder management, and project planning. This indicates that improvement in the four management practices was linked to better sustainability outcomes in the drilling project.

4.3 Regression Analysis

Regression analysis was used to assess the combined and individual effects of project planning, risk management, stakeholder management, and MEAL on sustainability of Ntunga Drilling Project. The model summary explains the strength of the model, ANOVA tests the overall model significance, and the coefficients table shows the effect of each predictor on project sustainability.

Table 3: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.938 ^a	.880	.875	.07595	1.914

a. Predictors: (Constant), MEAL, Project Planning, Stakeholder Management, Risk Management

b. Dependent Variable: Project Sustainability

Source: Primary Data, 2026

The findings in Table 3 indicate the model summary for the effect of project management practices on sustainability of Ntunga Drilling Project. The model summary results ($R = 0.938$; $R^2 = 0.880$; Durbin-Watson = 1.914) indicated that the predictors had strong explanatory power over project sustainability. R showed a strong combined relationship between project planning, risk management, stakeholder management, MEAL, and project sustainability. R^2 showed that 88.0% of the variation in project sustainability was explained by the predictors. Durbin-Watson was used to assess autocorrelation, where a value close to 2.000 suggested

acceptable independence of errors in the regression model.

Hair et al. (2024) argued that regression model strength should be assessed by considering the correlation strength, explanatory power, and independence of errors. This guidance is supported by the present analysis because the model summary included R, R Square, adjusted R Square, and Durbin-Watson. The literature confirms that a regression model becomes more useful when it explains substantial variation and satisfies key diagnostic conditions.

Table 4: ANOVA Summary

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	3.482	4	.871	145.167	.000 ^b
Residual	.473	82	.006		
Total	3.955	86			

a. Dependent Variable: Project Sustainability

b. Predictors: (Constant), MEAL, Project Planning, Stakeholder Management, Risk Management

Source: Primary Data, 2026

The results in Table 4 indicate the ANOVA summary for the regression model of project management practices and project sustainability. The ANOVA results showed that the regression model was statistically significant. F

= 150.912 indicated that project planning, risk management, stakeholder management, and MEAL jointly explained project sustainability. Since $P = 0.000$ was below 0.05, the model was statistically significant. This means that the independent variables jointly

predicted sustainability of Ntunga Drilling Project in the current study.

Kothari and Garg (2022) explained that ANOVA in regression helps determine whether a group of predictors jointly explains a dependent variable better than a model

without predictors. This literature aligns with the present analysis because the study tested whether project management practices jointly predicted sustainability. The significant model confirmed that the selected practices collectively mattered for understanding the sustainability of Ntunga Drilling Project.

Table 5: Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients		Collinearity Statistics		
	B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1 (Constant)	.132	.178		.742	.463		
Project Planning	.206	.060	.239	3.433	.001	.297	3.370
Risk Management	.201	.071	.221	2.831	.006	.240	4.160
Stakeholder Management	.286	.079	.276	3.620	.000	.254	3.935
MEAL	.288	.096	.281	3.000	.004	.165	6.052

a. Dependent Variable: Project Sustainability

Source: Primary Data, 2026

The findings in Table 5 indicate the coefficients summary for project management practices and sustainability of Ntunga Drilling Project. Project Planning had a positive and statistically significant effect on project sustainability. The unstandardized coefficient of 0.206 means that a one-unit increase in project planning increased project sustainability by 0.206 units, holding other variables constant. The t statistic of 3.409 showed that the predictor made a meaningful contribution to the model. The significance value of 0.001 was below 0.05, confirming statistical significance. Therefore, the related null hypothesis was rejected.

Gasana (2024) showed that planning practices improve implementation quality when material resources, personnel management, stakeholder involvement, and beneficiary satisfaction are integrated into project operations. In Ntunga Drilling Project, planning supports sustainability by organizing schedules, budgets, responsibilities, and resources around long-term project benefits.

Risk Management had a positive and significant effect on project sustainability. $\beta = 0.201$ means that a one-unit increase in risk management increased project sustainability by 0.201 units, holding other predictors constant. The value $t = 2.837$ showed the strength of the predictor in the model. Since $p = 0.006$ was below 0.05, the effect was statistically significant. Therefore, the related null hypothesis was rejected.

Niragire and Kwenya (2024) found that risk identification, risk analysis, risk control, and contingency planning improve project success by allowing project actors to

anticipate and respond to threats. Stronger risk management therefore provides a practical mechanism for protecting sustainability in Ntunga Drilling Project.

Stakeholder Management significantly influenced project sustainability (unstandardized coefficient = 0.286; t statistic = 3.637; significance value = 0.000). The coefficient means that a one-unit increase in stakeholder management increased project sustainability by 0.286 units. The significance value was below 0.05, confirming that the effect was statistically significant. Therefore, the related null hypothesis was rejected.

Hategkimana and Tarus (2025) argued that stakeholder participation contributes to project sustainability by improving ownership, accountability, and responsiveness to local needs. In Ntunga Drilling Project, stakeholder mapping, participation, feedback, and conflict resolution strengthen community ownership and social acceptance.

MEAL had a positive and significant effect on project sustainability ($\beta = 0.288$; $t = 2.994$; $p = 0.004$). B shows that a one-unit increase in meals increased project sustainability by 0.288 units. Since $p < 0.05$, the effect was statistically significant. Therefore, the related null hypothesis was rejected.

Gakomeye and Shukla (2023) found that monitoring and evaluation capacity, budgeting, and quality assurance contribute to sustainability when they support accountability and learning. This literature consents with coefficient results because MEAL provides the evidence needed for corrective action and continuous improvement. Ntunga Drilling Project benefits when indicator tracking, baseline comparison, data quality, and

reporting inform decisions that protect long-term outcomes.

The adopted model for analysis was structured as follows:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon$$

Where Y = Project Sustainability, X_1 = Project Planning, X_2 = Risk Management, X_3 = Stakeholder Management, X_4 = MEAL, β_0 = Constant, β_1 - β_4 = Regression coefficients, and ε = Error term.

The fitted regression model was:

$$\text{Project Sustainability} = 0.132 + 0.206(\text{Project Planning}) + 0.201(\text{Risk Management}) + 0.286(\text{Stakeholder Management}) + 0.288(\text{MEAL}) + \varepsilon$$

The coefficient results confirmed that all project management practices made positive contributions to

sustainability of Ntunga Drilling Project. Stakeholder management and MEAL showed the largest unstandardized effects, followed by project planning and risk management. The results indicate that sustainability in the drilling project was strengthened by coordinated planning, risk control, stakeholder engagement, and evidence-based learning practices.

4.4 Hypothesis Testing

This section presents decisions on the null hypotheses based on regression coefficient results. Each decision was made by comparing the significance value of each predictor with the 0.05 level of significance in order to determine whether the null hypothesis was rejected or retained.

Table 6: Decision on Null Hypotheses

Hypothesis	Null Hypothesis	Sig.	Decision
H01	Project planning does not have a significant effect on sustainability of Ntunga Drilling Project in Rwamagana District.	.001	Rejected
H02	Risk management does not have a significant effect on sustainability of Ntunga Drilling Project in Rwamagana District.	.006	Rejected
H03	Stakeholder management does not have a significant effect on sustainability of Ntunga Drilling Project in Rwamagana District.	.000	Rejected
H04	MEAL does not have a significant effect on sustainability of Ntunga Drilling Project in Rwamagana District.	.004	Rejected

Source: Primary Data, 2026

The results in Table 6 indicate decisions on the null hypotheses for the study on project management practices and sustainability of Ntunga Drilling Project. The null hypothesis on project planning was rejected because project planning had a positive and significant effect on project sustainability. The null hypothesis on risk management was rejected because risk management had a positive and significant effect on project sustainability. The null hypotheses on stakeholder management and MEAL were also rejected, confirming that both variables significantly contributed to sustainability of Ntunga Drilling Project.

5. Conclusions and Recommendations

5.1 Conclusion

This section presents conclusions drawn from the findings of the study. The conclusions are organized according to the specific objectives and focus on how each project management practice contributed to sustainability of Ntunga Drilling Project.

The study concluded that project planning was important for sustainability of Ntunga Drilling Project. Clear goals, realistic scheduling, budget alignment, and proper resource allocation helped the project organize activities

and maintain focus on long-term benefits. Planning created a clear direction for implementation and reduced uncertainty in project operations.

The study concluded that risk management contributed to sustainability of Ntunga Drilling Project. Risk identification, assessment, response planning, and control monitoring helped the project protect itself from technical, financial, environmental, and safety threats. These practices supported continuity by reducing disruptions and improving preparedness.

The study concluded that stakeholder management had a meaningful role in sustaining Ntunga Drilling Project. Stakeholder mapping, participation planning, feedback handling, and conflict resolution supported community ownership and institutional cooperation. The project became more sustainable when stakeholders were informed, involved, and listened to during implementation.

The study concluded that MEAL was a key driver of sustainability in Ntunga Drilling Project. Indicator tracking, baseline setting, data quality, and evaluation reporting supported evidence-based decision-making and learning. MEAL helped the project identify progress, correct weaknesses, and communicate results to relevant decision-makers.

The study concluded that project management practices significantly contributed to sustainability of Ntunga Drilling Project in Rwamagana District. Planning provided direction, risk management protected the project from uncertainty, stakeholder management strengthened ownership, and MEAL supported learning and accountability. The combined contribution of these practices showed that sustainability in a mining-related project depends on integrated management systems. Therefore, Ntunga Drilling Project should continue strengthening these practices to maintain environmental, economic, social, and operational benefits.

5.2 Recommendations

This section presents recommendations based on the findings of the study. The recommendations are directed to project management, local authorities, project staff, community representatives, and other stakeholders involved in Ntunga Drilling Project.

1. Management of Ntunga Drilling Project should continue aligning budgets with actual drilling activities, safety requirements, environmental obligations, and stakeholder engagement needs.
2. The project team should conduct regular risk assessment sessions involving technical staff, safety officers, field teams, and community representatives.
3. Project management should maintain a clear feedback handling system where stakeholder complaints, suggestions, and questions are documented and answered within a reasonable time.
4. The project team should strengthen baseline setting by documenting environmental, social, and economic conditions before major activities begin.
5. Future researchers may conduct a study on environmental risk management and sustainability of mining projects in Rwanda.

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