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Grace Karenzi & Dr. Gitahi Njenga

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^{*1}Grace Karenzi & ²Dr. Gitahi Njenga

^{1,2}Mount Kigali University, Kigali, Rwanda

*Email of the Corresponding Author: k.nzigrace@yahoo.com

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Abstract

This study assessed the effect of stakeholder collaboration, an Agile project management practice, on the performance of the Gisagara peat power plant project in Rwanda. The plant has operated below its installed capacity because of implementation challenges, including weak coordination among stakeholders, yet little context-specific evidence links stakeholder collaboration to the performance of peat power projects. A cross-sectional descriptive and correlational design with a mixed-methods approach was used. From a population of 267 staff and stakeholders, a sample of 160 was determined using Yamane's formula and drawn through purposive and stratified random sampling. Questionnaires (132 of 148 returned; 89.2%) and interviews with 12 key informants were analyzed using SPSS version 23 (descriptive statistics, Pearson correlation and multiple regression) and thematic analysis. Stakeholder participation, meeting frequency and use of stakeholder feedback were rated highly, whereas communication between project managers and stakeholders was rated very low ($M = 1.45$). Stakeholder collaboration correlated strongly with project performance ($r = .631, p < .001$) and had a significant positive effect on it in the regression model ($\beta = .481, p < .001$); the model explained 55.1% of the variance in performance. *Conclusion:* Stakeholder collaboration is a significant driver of project performance, but its benefits are constrained by poor communication. Project managers should establish structured communication channels and strengthen feedback mechanisms.

Keywords: Stakeholder Collaboration, Project Performance, Peat Power Plant, Agile Project Management, Rwanda

1.0 Introduction

Project performance in the energy sector has become central to global discussions on sustainable development and energy security (KPMG, 2022). Governments are seeking reliable, affordable and environmentally responsible electricity supply while managing the complexity of delivering large infrastructure. Peat power plants, which burn decomposed organic material from wetlands, serve as a transitional option in several countries, but their performance is frequently undermined by cost overruns, schedule delays, inadequate stakeholder coordination and inefficient execution. Traditional project management models, built on linear planning and rigid control, struggle with the uncertainty typical of such projects. Agile Project Management (APM), which emphasizes flexibility, collaboration and iterative planning, has therefore gained prominence as a way of improving project outcomes (Serrador & Pinto, 2015). Experience from regions with long peat-energy traditions illustrates the potential of collaborative, Agile approaches. In Finland and Ireland, where peat has historically contributed to national energy security, operators have adopted Agile methods to modernize peat power projects, promoting multidisciplinary collaboration, rapid feedback and continuous improvement. These approaches have been associated with better coordination among engineering, environmental and regulatory teams and faster resolution of emerging problems (Kate & Burley, 2023; Ochieng & Price, 2022). In Eastern Africa, where industrialization and population growth are raising energy demand, countries such as Kenya, Uganda and Tanzania are exploring diverse sources including peat (Ruthuri, 2023), and Agile practices have shown promise in addressing limited technical expertise, funding shortages and poor coordination among implementing agencies (Mwangi & Okello, 2021).

In Sub-Saharan Africa, energy projects are often constrained by structural, financial and managerial limitations, including cost escalation, prolonged timelines and limited stakeholder engagement (Ivanov, 2024; World Bank, 2022). Rwanda has prioritized peat-based generation to diversify its energy mix, with the Gishoma and Gisagara peat power plants as flagship projects. The Gisagara plant has an installed capacity of 15 megawatts and supplies a significant share of power to the national grid (Rwanda Energy Group, 2024). Even so, it has consistently operated below installed capacity because of delays in peat extraction, inadequate coordination among stakeholders, operational disruptions and maintenance constraints (Rwanda Energy Group, 2024). The Ministry of Infrastructure (MININFRA, 2023) similarly reported that inefficiencies in domestic generation have raised production costs and prolonged reliance on expensive emergency power. Earlier studies indicate that Agile practices, including stakeholder collaboration, improve project performance by strengthening coordination and decision-making (Banda & Chirwa, 2021; Odhiambo, 2022). However, most were conducted in construction, information technology, manufacturing and general infrastructure projects outside Rwanda, and the few Rwandan studies addressed general energy or infrastructure projects rather than peat power plants. Whether their findings apply to Rwanda's peat power sector therefore remains uncertain. This study addresses that gap. Its objective was to assess the effect of stakeholder collaboration on the performance of the Gisagara peat power plant project. It tested the null hypothesis that stakeholder collaboration has no statistically significant effect on the performance of the project (H_0).

2.0 Literature Review

This section reviews the theoretical and empirical literature relevant to stakeholder collaboration and project performance. The review provides the theoretical foundation of the study and examines previous empirical findings to establish existing knowledge, identify research gaps, and justify the

current investigation of stakeholder collaboration and performance in peat power plant projects in Gisagara District, Rwanda.

2.1 Theoretical Literature

2.1.1 Stakeholder Theory

Stakeholder Theory was introduced by Freeman (1984) in response to business models that focused solely on shareholders. It holds that organizations and projects must take into account the interests of all parties affected by their activities, and it has since been applied in strategic management, corporate governance and project management (Greenhans, 2024). The theory stresses the identification, analysis and engagement of individuals and groups who can affect or are affected by a project, including internal actors such as employees and management and external parties such as government agencies, contractors, financiers and local communities (Terry, 2022). It advocates inclusive decision-making, transparent communication and collaboration, and suggests that projects are more likely to succeed when stakeholder expectations are actively managed throughout the project life cycle (Oprah, 2024). For peat power projects such as Gisagara, the theory is relevant because decisions involving MININFRA, the Rwanda Energy Group (REG), local authorities and communities must reflect both technical and social considerations.

2.1.2 Stakeholder Collaboration in Agile Project Management

Agile Project Management is a flexible, iterative approach that emphasises collaboration, adaptability and continuous improvement (PMI, 2024). Stakeholder collaboration is one of its core principles. It means engaging all those with a vested interest in project outcomes so that decisions are inclusive, transparent and reflective of diverse perspectives, which reduces conflict and increases acceptance (Business Review, 2024). In practice it is achieved through continuous communication, joint planning and regular feedback, using devices such as sprint reviews, progress meetings and stakeholder workshops (Crawford & Turner, 2020). Collaboration also encourages shared ownership and accountability, which raises commitment among project partners (Penninah & Albery, 2023). In this study, stakeholder collaboration was operationalised through meeting frequency, stakeholder participation, communication effectiveness and the consideration of stakeholder feedback.

2.1.3 Project Performance

Project performance is the degree to which a project achieves its intended objectives, including efficient use of resources, timely completion, adherence to budget and delivery of quality outcomes (Atkinson, 2024). For energy infrastructure, performance is typically assessed across time, cost, scope, quality, stakeholder satisfaction and sustainability (Lee & Wang, 2024). This study measured performance through schedule adherence, cost efficiency, budget adherence and quality of outputs.

2.2 Empirical Literature

Empirical evidence consistently links stakeholder collaboration to better project outcomes. Prebanić and Vukomanović (2023) surveyed 280 infrastructure professionals in Europe and Asia and found that stakeholder collaboration, measured through regular engagement, joint decision-making and feedback loops, accounted for 68% of the variance in schedule adherence ($R^2 \approx .68$). They recommended institutionalizing stakeholder forums and formal feedback channels, and noted

that little is known about how such mechanisms work in lower-income regions where cultural and institutional conditions differ.

In Africa, Matu et al. (2020) conducted a descriptive-correlational survey of 309 respondents on Kenyan road projects and reported a strong positive correlation ($r = .859$, $R^2 \approx .737$) between early stakeholder participation and project completion. They concluded that involving stakeholders from project initiation improves outcomes and reduces disputes, while leaving open how institutional capacity and informal networks shape collaboration. In a descriptive study of 126 respondents on Kenyan water projects, Kiberenge and Osoro (2024) found that stakeholder engagement explained 58% of the variance in project performance, with feedback loops, risk mitigation and stakeholder resource contributions improving outcomes. The authors called for longitudinal studies of large energy and infrastructure projects.

In Rwanda, Kwizera (2025) used a mixed-methods approach with 150 respondents in the Green Gicumbi Project and found that stakeholder engagement explained 49.3% of the variance in project performance ($R^2 = .493$). Involving stakeholders in planning, decision-making and implementation was judged essential to success. The study pointed to the scarcity of empirical evidence on stakeholder collaboration in large-scale energy projects in Rwanda.

3.0 Methodology

The study used a cross-sectional descriptive and correlational design with a mixed-methods approach. Data were collected from the study population at a single point in time, giving a snapshot of stakeholder collaboration practices and the current level of project performance at the Gisagara peat power plant. The target population comprised 267 staff and stakeholders: 245 rural project support staff and 22 key personnel (project managers, agronomists, socio-economists, environmentalists, accountants, electrical engineers, procurement specialists and MININFRA officials). Using Yamane’s (1973) formula at a 5% margin of error, a sample of 160 respondents was determined ($n = 267 / [1 + 267(0.05)^2] \approx 160$). Purposive sampling was used to select 12 key informants with specialised roles, and stratified random sampling was used to select 148 rural project staff, so that each category of staff had a proportional chance of selection.

Table 1: Target Population and Sample

Category	Population	Sample
Project managers, agronomists, socio-economists, environmentalists, accountants and procurement specialists (two of each)	12	6
Electrical engineers	4	2
Government officials (MININFRA)	6	4
Rural project support staff	245	148
Total	267	160

Primary data were collected with a self-administered questionnaire and interview schedules. The questionnaire used a five-point Likert scale (1 = strongly disagree, 5 = strongly agree) alongside open-ended items. Structured and unstructured interviews were held with the key informants, in person or through virtual platforms. Secondary data came from project reports and documents of

MININFRA and REG. Content validity was established through expert review, and construct validity by aligning items with Stakeholder Theory. Reliability was assessed with Cronbach’s alpha, using a threshold of .70 (Tavakol & Dennick, 2011), on a pilot of 10 respondents who were not part of the main sample (Mugenda & Mugenda, 2003). Quantitative data were analyzed in SPSS version 23 using means, standard deviations, Pearson correlation and multiple linear regression of the form $PP = \beta_0 + \beta_1SC + \beta_2CM + \beta_3CI + \varepsilon$, where *PP* is project performance, *SC* is stakeholder collaboration, and *CM* (change management) and *CI* (continuous improvement) were entered as control variables. Significance was tested at the 95% confidence level ($\alpha = .05$). Interview data were analyzed thematically. Participation was voluntary, written informed consent was obtained, and respondents were assigned codes to preserve anonymity and confidentiality.

4.0 Results and Discussions

4.1 Response Rate and Respondent Profile

Of the 148 questionnaires distributed, 132 were completed and returned, a response rate of 89.2%, and all 12 key informants were interviewed (100%). A response rate above 70% is regarded as very good (Mugenda & Mugenda, 2003). Of the 132 questionnaire respondents, 65.2% were male, 53.0% were aged 31–45 years, and 77.3% held a bachelor’s degree, indicating a mature and well-educated respondent base able to judge project management practices (Table 2).

Table 2: Demographic Characteristics of Questionnaire Respondents (N = 132)

Characteristic	Category	f	%
Gender	Male	86	65.2
	Female	46	34.8
Age	Below 25 years	12	9.1
	25–30 years	38	28.8
	31–45 years	70	53.0
	Over 45 years	12	9.1
Education	Secondary	10	7.6
	Diploma	18	13.6
	Bachelor’s degree	102	77.3
	Master’s degree	2	1.5

4.2 Descriptive Results on Stakeholder Collaboration

Table 3 presents respondents’ assessments of stakeholder collaboration. Stakeholders’ active participation in meetings and decision-making recorded the highest mean ($M = 4.44$), followed by adequate meeting frequency ($M = 4.29$) and prompt consideration of stakeholder feedback ($M = 4.26$). Regularity of meetings was rated somewhat lower ($M = 3.82$) with the widest spread of opinion ($SD = .968$), suggesting that experience differs across departments and roles. In sharp contrast, the statement that communication between project managers and stakeholders is clear and effective recorded a very low mean ($M = 1.45$, $SD = .713$), indicating strong disagreement.

Table 3: Level of Agreement on Stakeholder Collaboration (N = 132)

Statement	N	M	SD
Project meetings with stakeholders are held regularly and consistently	132	3.82	.968
The frequency of stakeholder meetings is adequate to address project needs	132	4.29	.871
Stakeholders actively participate in project meetings and decision-making processes	132	4.44	.723
Communication between project managers and stakeholders is clear and effective	132	1.45	.713
Stakeholder feedback is promptly considered in project planning and execution	132	4.26	.898

The interviews corroborated this pattern. Key informants reported that stakeholders are regularly engaged and their input is considered in key decisions, and that bringing together technical experts, financial officers and government representatives improves the quality of decisions. Several also noted that information is not always clearly communicated to all parties and is sometimes inconsistent or delayed, creating coordination gaps in implementation.

4.3 Project Performance

Table 4 summarizes the performance of the project. Respondents rated schedule adherence ($M = 4.39$ and 4.34) and cost control ($M = 4.33$ and 4.30) highly, while the quality of outputs was rated lower ($M = 3.80$), though still within the agreement range. Interviewees likewise described time and cost management as strong but acknowledged inconsistencies in the quality of some outputs.

Table 4: Level of Agreement on Project Performance (N = 132)

Statement	N	M	SD
Project activities are completed according to the planned schedule	132	4.39	.696
The project demonstrates effective adherence to timeframes and deadlines	132	4.34	.939
Project resources are utilized efficiently to minimize unnecessary costs	132	4.33	.870
The project remains within the approved budget throughout implementation	132	4.30	.873
The outputs of the project meet the expected quality standards	132	3.80	.722

4.4 Correlation and Regression Results

Stakeholder collaboration was strongly and positively correlated with project performance ($r = .631$, $p < .001$), indicating that higher levels of stakeholder engagement, communication and

participation are associated with better project outcomes (Table 5). Stakeholder collaboration was also positively related to the two control variables, so the regression below isolates its effect net of those practices. In the multiple regression model, the predictors jointly explained 55.1% of the variance in project performance ($R = .742$, $R^2 = .551$, adjusted $R^2 = .540$), and the model was statistically significant, $F(3, 128) = 52.308$, $p < .001$. Table 6 shows that, holding the other predictors constant, stakeholder collaboration had a positive and statistically significant effect on project performance: a one-unit increase in stakeholder collaboration was associated with a .467-unit increase in performance ($\beta = .481$, $t = 6.094$, $p < .001$).

Table 5: Pearson Correlations

Variable	r	p
Project performance	.631	< .001
Change management (control)	.660	< .001
Continuous improvement (control)	.210	.016

Table 6: Regression of Project Performance on Stakeholder Collaboration

Predictor	B	SE B	β	t	p
Stakeholder collaboration	.467	.077	.481	6.094	< .001

Note. Dependent variable: project performance. $R^2 = .551$; $F(3, 128) = 52.308$, $p < .001$. Change management ($\beta = .109$, $p = .178$) and continuous improvement ($\beta = .374$, $p < .001$) were included as control variables. Source: Field data (2026).

Because the significance value for stakeholder collaboration ($p < .001$) is below the .05 threshold, the null hypothesis that stakeholder collaboration has no significant effect on project performance is rejected.

4.5 Discussion

The finding that stakeholder collaboration significantly influences performance agrees with the wider literature. Prebanić and Vukomanović (2023) found that stakeholder engagement improves efficiency and schedule adherence, Matu et al. (2020) found that early stakeholder involvement improves completion and reduces delays, and Kwizera (2025) reported that stakeholder participation improves performance in a Rwandan energy-related project. The present result extends this evidence to a peat power plant in Rwanda, a setting in which it had not previously been tested. It also supports Stakeholder Theory (Freeman, 1984): where those who affect or are affected by the project take part in meetings, decisions and feedback, coordination and ownership improve, and the project is better placed to meet its time and cost targets.

The results also show where collaboration falls short. Participation, meeting frequency and use of feedback were rated strongly, yet communication between project managers and stakeholders was rated very poorly. Stakeholder Theory and Agile practice both treat transparent, continuous communication as the channel through which engagement becomes shared understanding (Crawford & Turner, 2020; Oprah, 2024). A plausible reading is that the project is strong on the

structures of collaboration (meetings, participation, feedback loops) but weaker on the clarity and timeliness of the information that flows through them, which interviewees confirmed. This may cap the gains that collaboration can deliver, and it is consistent with the comparatively lower rating for quality of outputs, where misunderstandings are likely to surface. The latter link is an interpretation that this study did not test directly.

The results carry implications for theory and practice. For theory, they lend empirical support to Stakeholder Theory in a project setting that has received little attention, showing that engagement of project actors is not merely normatively desirable but is associated with measurable performance gains. For practice, they show that high participation alone is not enough: project managers must also make sure that the information exchanged with stakeholders is clear, timely and reaches all parties. Agile ceremonies such as progress reviews and stakeholder workshops (Crawford & Turner, 2020) offer ready-made vehicles for this, and could be used to confirm that decisions and changes have been understood by those who must implement them. Two limitations should be noted. The study examined one project, and the cross-sectional, self-reported design supports conclusions about association and predictive effect rather than proof of causation. The very low communication score also stands apart from the other items, so it deserves verification in follow-up work.

5.0 Conclusion

The study concludes that stakeholder collaboration has a statistically significant, positive effect on the performance of the Gisagara peat power plant project. Active participation of stakeholders in meetings and decisions, adequate meeting frequency and the use of stakeholder feedback contribute to coordination, ownership and alignment with project goals. However, weak communication between project managers and stakeholders limits the full benefit of collaboration.

6.0 Recommendations

First, the project manager and coordination team should establish structured communication mechanisms with all stakeholders, including regular coordination meetings with engineers, contractors, MININFRA officials and community representatives, clear progress reports and defined feedback channels. Second, the project should sustain its current participation and feedback practices while improving the consistency of stakeholder meetings across phases and stakeholder groups. Third, capacity-building in stakeholder communication should be provided to project staff and managers.

MININFRA and REG should require a stakeholder communication plan as part of governance arrangements for peat and other energy infrastructure projects.

Future studies should compare several energy projects across Rwanda to improve generalizability, adopt longitudinal designs that follow collaboration from planning through operation, and examine in more depth how communication quality mediates the effect of collaboration on performance.

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