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# Project Constraints Management and Sustainability of an Environmental Protection Project: A Case of Sebeya Catchment Management Project in Rubavu District, Rwanda

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***Abstract:*** *Project constraints management is key to successful implementation of environmental protection projects because success depends on completing activities on time, within budget, and with attainment of intended ecological and social outcomes. The research was anchored on Theory of Constraints and Sustainable Development Theory, and adopted descriptive and correlational research designs with a mixed approach. The target population consisted of 161 stakeholders including project managers, technical staff, environmental officers, and community beneficiaries directly or indirectly involved in the project. A census survey was used, while structured questionnaires, interviews, and documentary review collected primary and secondary data. A pilot test was conducted on 17 respondents, the Content Validity Index was 1.0, and Cronbach's Alpha was 0.75, confirming validity and reliability of the instruments. Descriptive statistics, Pearson correlation, and regression analysis were applied using SPSS version 28 at a 0.05 level of significance. Findings showed that scope management had a positive and significant effect on sustainability (Beta = .509, t = 9.802, p = .000), time management had a positive and significant effect (Beta = .244, t = 5.127, p = .000), and cost management had a positive and significant effect (Beta = .285, t = 5.858, p = .000). The study concluded that sound management of scope, time, and cost constraints significantly enhances the sustainability of environmental protection projects. It recommended stronger planning, stakeholder involvement, timely execution, and financial control to secure long-term project success.*

***Keywords:*** *Project constraints management, Scope management, Time management, Cost management, Environmental protection projects, Sustainability, Sebeya Catchment Management Project.*

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## 1. Introduction

Environmental conservation initiatives have gained a bigger focus with the increasing need to address land degradation, biodiversity loss, water scarcity and effects of climate changes. These projects are, however, heavily constrained which threatens their sustainability. Typical project constraints, including cost constraints, scope changes, resource availability, time lags or stakeholder misalignment may impede successful execution and long-term outcomes (Zolin, 2019). As such, the capacity of managing project constraints systematically and proactively has emerged to be a major determinant in keeping sustainable environmental interventions (PMI, 2021).

Globally, initiatives such as the Great Green Wall in the Sahel, water management in South Asia and large-scale reforestation in Latin America have showcased progress and challenges for environmental restoration (UNCCD, 2022; FAO, 2020). These initiatives are motivated by international conventions such as UNFCCC, CBD and UNCCD, and adopted frameworks such as the Paris Agreement and Aichi Biodiversity Targets (UNFCCC, 2015; CBD, 2020). In Africa, regional restoration agendas and Rwanda's national policies, including the Environment and Climate Change Policy, show commitment to environmental protection, yet financing, enforcement, coordination and local involvement remain persistent limitations (African Union, 2019; REMA, 2019; GEF, 2021).

In Africa, multiple environmental rehabilitation programs have collapsed due to bad planning, lack of enforcement of environmental laws and mismanagement of resources. River basin restoration efforts such as the Tana River in Kenya and Awash River Basin in Ethiopia have experienced delays and budget overruns caused by logistical challenges, underestimation of environmental factors, and limited stakeholder participation (Olum, 2022). Projects that integrate participatory practices and robust monitoring, such as the Congo River Basin Conservation project, have demonstrated improved abilities to address constraints and improve environmental resilience (Tekleab, 2021; UNEP, 2022).

Rwanda has shown strong political will in mainstreaming environmental sustainability through the Green Growth and Climate Resilience Strategy, Vision 2050, and the National Environment and Climate Change Policy. The Sebeya Catchment Management Project works towards rehabilitating and sustainably managing the Sebeya River catchment through tree planting, land terracing, sustainable agriculture, and community-based watershed protection to address flooding, soil erosion and ecosystem degradation (Rwanda Water Resources Board, 2023). Notwithstanding these efforts, the project faces constraints related to funding, coordination, target communities and natural factors such as mountainous topography and high precipitation (Habiyaremye, 2023; MINIRENA, 2022).

The problem addressed in this study is that environmental conservation projects contribute significantly to sustainable development, ecosystem maintenance and climate resilience, especially in fragile regions like Rwanda's Western Province. Nevertheless, long-term success is threatened by project-specific constraints such as scope misfit, time lag and lack of budget resources, which can become obstacles to successful execution and sustainability of restoration programs (Zolin, 2019; Project Management Institute [PMI], 2021). Implementation challenges of the Sebeya Catchment Management Project include financial constraints, late delivery of infrastructure, weak inter-agency cooperation, and difficulties in mobilizing local communities (Habiyaremye, 2023). Although the project aligns with Rwanda's Green Growth and Climate Resilience Strategy and Vision 2050, its long-term success depends on effective management of these challenges (MINIRENA, 2022).

The general objective of the study was to assess the effect of project constraints management on sustainability of environmental projects in Rwanda. The specific objectives were to examine the effect of scope constraints management, determine the effect of time constraints management, and investigate the effect of cost constraints management on sustainability of the Sebeya Catchment Management Project in Rubavu District. The hypotheses tested were that scope, time and cost constraints management practices have no significant effect on sustainability of the Sebeya Catchment Management Project.

## 1.2 Problem Statement

Environment conservation projects contribute significantly to sustainable development, ecosystem maintenance and climate resilience, especially in fragile regions like Rwanda's Western Province. Nevertheless, the long-term success of these projects tends to be threatened by project-specific constraints. These limitations such as scope misfit, time lag and lack of provision of budget resources can indeed serve as obstacles to the successful execution and ongoing effects of sustainability programs (Zolin, 2019; Project Management Institute [PMI], 2021).

Implementation challenges of the Sebeya Catchment Management Project Established to restore degraded lands and reduce environmental risks (soil loss, floods, etc) Although eroded land has caused trouble for the project implementation. These challenges comprise financial constraints, late delivery of infrastructure, dismal inter agency cooperation, and challenges in mobilizing local communities (Habiyaremye, 2023). Although the project is compatible with national initiatives such as Rwanda's Green Growth and Climate Resilience Strategy (RW GGCRS) and Vision 2050, its long-term success depends on effective management of the challenges raised (MINIRENA, 2022).

In addition, despite continued spending on catchment protection, empirical research into the impacts of managing project constraints on sustainability outcomes remains scarce. This vacuum prevents project planners and policymakers from being able to draw on experiences in current work to adapt strategies for enhanced performance. Hence, in this research an assessment will be critically implemented: to determine the influence of project constraints (namely scope, time and Cost management) on sustain up ability of environmental conservation projects; with the study anchored on Sebeya Catchment Management Project. The results will provide pragmatic guidelines on how sound project management can be assimilated into nature restoration projects in Rwanda and alike.

# 2. Literature Review

This section presents the conceptual, theoretical and empirical literature related to project constraints management and sustainability of environmental protection projects. It provides the academic basis for understanding how scope, time and cost constraints influence sustainability outcomes in the Sebeya Catchment Management Project.

## 2.1 Conceptual Review

Project constraints management is an important part of project management practice that comprises identifying and handling restrictions which might affect delivery of a project. The Project Management Institute (2019) represents the triple constraint as time, cost and scope, showing that high-quality results require maintaining a balance between these dimensions because changes in one dimension normally affect others. Turner (2014) also describes project constraints as factors that prevent meeting objectives by binding a project with limitations, primarily time, cost and scope, but also including resource availability and external risks.

Scope management ensures that project goals, activities and deliverables are clearly defined and controlled. Gitahi (2024) states that effective scope management has an important effect on project performance through maintaining clarity and alignment to objectives and deliverables. Mulyungi (2018) added that delineating project activities enhances venture performance by clarifying expectations, while Yana (2018) highlights that project scope involves product content, work content and project content, all of which are necessary for supervision and control.

Time management is the process of planning and exercising conscious control of time spent on specific activities to increase effectiveness, efficiency and productivity. Urezweneza (2024) agreed that time management affects project performance, while Karamusingye (2018) stated that scheduling supports achievement of projects because the starting time for activities and phases is known and prepared. Cost management involves estimation, planning, monitoring and control of project costs to keep them within the approved budget limit. Gitahi (2024) and Mulyungi (2018) emphasize that cost control, proper planning and resource utilization prevent cost overruns and support project sustainability.

Sustainability of environmental protection projects refers to the extent to which a project's effects are considered long-term in terms of protecting, restoring or enhancing environmental quality. Majoro et al. (2023) underline the need for site-based Soil Erosion Control Measures in the Sebeya watershed, while Koesrindartoto, Pratama, and Setiawan (2020) argue that sustainability depends on long-term empowerment of local communities, community participation, capacity building and ongoing education.

## 2.2 Theoretical Review

The theoretical review explains the theories used to connect project constraints management and sustainability of environmental protection projects. The study used Theory of Constraints and Sustainable Development Theory as the main theoretical pillars.

### 2.2.1 Theory of Constraints

Theory of Constraints originated with Eliyahu M. Goldratt's landmark book The Goal (1984). It is an essential concept in project management that centers on how identifying and managing the greatest limitation can dramatically improve overall project performance. The central thesis of the theory is that every project or system has at least one constraint that prevents it from attaining higher performance, and understanding this constraint is key to successful project execution (Goldratt, 1984).

The theory calls for concentrated and disciplined effort in which project managers constantly focus, exploit, subordinate, elevate and reassess constraints to facilitate continuous improvement. In the context of the Sebeya Catchment Management Project, successful management of constraints is indispensable when planning for long-term landscape restoration. If inadequate technical capacity, weak community involvement, unclear scope, time delays or budget limitations become binding constraints, targeted efforts must prioritize them to improve project sustainability.

### 2.2.2 Sustainable Development Theory

Sustainable Development Theory was introduced by the Brundtland Commission in 1987 in the report Our Common Future and focuses on meeting the needs of the present without compromising the ability of future generations to meet their own needs (WCED, 1987). The theory promotes integrated development by emphasizing economic growth, social equity and environmental stewardship simultaneously. It supports planning and policy-making that acknowledge the need for environmental sustainability, economic viability and social equity in the long term.

The theory is relevant to environmental protection initiatives such as the Sebeya Catchment Management Project because it provides principles for saving the environment now and for future generations. A project that exceeds its scope, goes over budget or runs behind schedule may fail to deliver intended outcomes sustainably. Poor management of project constraints may result in incomplete activities, lack of community trust and deterioration of rehabilitated ecosystems. Therefore, Sustainable Development Theory shows how strong constraint management leads to sustainable environmental, social and economic benefits aligned with Rwanda's Green Growth and Resilience objectives.

## 2.3 Empirical Review

The empirical review summarizes previous studies on the effect of project constraints management on sustainability of environmental protection projects. It is

organized according to the three specific objectives of the study.

### 2.3.1 Scope Management and Sustainability of Environmental Protection Projects

Mutuyimana (2022) analyzed the Rubyiro Catchment Management Project in Rwanda and found that misplaced project boundaries and ad hoc stakeholder engagement created ambiguity, delayed actions and reduced community ownership. The study emphasized the importance of clear deliverable definition and strong stakeholder engagement for maintaining project momentum and long-term environmental sustainability.

Ong'ayo *et al.* (2020) assessed the reforestation projects of the Green Belt Movement in Kenya and reported that unclear targets and overlap in roles among implementing teams led to poor monitoring, inconsistent reporting and compromised survival rates for trees planted. The study showed that measurable targets and well-defined roles are important for reaching environmental restoration goals productively.

Carvalho, Lima and Barbosa (2018) analyzed restoration projects of the Amazon basin in Brazil and found that an expansive and scattered scope became unworkable under limited logistical and financial resources. The prioritization of high biodiversity conservation zones adjusted deliverables to available resources and improved ecological and social outcomes.

### 2.3.2 Time Management and Sustainability of Environmental Protection Projects

Gashakamba (2023) studied the Yanze Watershed Management Project in Rwanda and found that procurement delays and seasonal mismatches disrupted planting schedules, leaving sensitive regions exposed to soil erosion. The study showed that seasonal risk planning and responsive scheduling are critical for achieving long-term sustainability.

Van Heerden, Jacobs and Moses (2021) investigated time management in the Cape Town Water Resilience Project in South Africa and identified that poor coordination between contractors and municipalities delayed key interventions. The study showed that agile project management tools, shorter planning cycles and real-time communication increased responsiveness and adherence to deadlines.

Mwakilasa, Mndeme and Lugomela (2020) studied the Uluguru Mountains Conservation Initiative in Tanzania and found that poor alignment of nursery operations with planting seasons led to high sapling mortality. The study recommended time-mapping to ensure reforestation activities are timed to periods that support sapling survival and ecosystem healing.

### 2.3.3 Cost Management and Sustainability of Environmental Protection Projects

Habimana (2022) analyzed the Sebeya Catchment Management Project and found that under-budgeting community mobilization and awareness reduced stakeholder engagement and local ownership. The study showed that allocating funds to stakeholder training and communication restored trust and improved sustainability of restoration.

Kassahun, Tefera and Taddesse (2019) studied the Sustainable Land Management Project in Ethiopia and showed that delayed disbursement and non-transparent budget lines hampered soil erosion interventions. Improved financial transparency and cost tracking enabled more efficient re-allocation of resources toward stronger soil conservation outcomes.

Adhikari and Paudel (2020) studied community forestry management activities in Nepal and found that sudden cost increases in fencing materials, nurseries and transportation led to delays in project completion. The study recommended buffer budgets and regular financial audits to protect continuity of conservation activities from market volatility.

# 3. Methodology

This section presents the methodological procedures used to examine the effect of scope, time and cost constraints management on sustainability of the Sebeya Catchment Management Project. It covers research design, population, sample size, data collection instruments, pilot study, validity and reliability, data analysis and ethical considerations.

## 3.1 Research Design

The nature of this study was descriptive and correlational. The descriptive design helped to present the existing situation regarding project scope, time and cost management within the Sebeya Catchment Management Project. The correlational design was applied through Pearson correlation and regression analysis to establish the strength, direction and significance of relationships between scope, time and cost constraints management and sustainability of the Sebeya Catchment Management Project. A mixed approach guided the combination of quantitative questionnaire data with qualitative interview and documentary review data to provide a complete understanding of current project management practices and their effects.

## 3.2 Study Population and Census Approach

The study population consisted of project managers, technical staff, environmental officers and community beneficiaries who directly participated in or benefited from the Sebeya Catchment Management Project. The total population included 161 members in pivotal roles of project planning, supervision and sustainability. The research used a census survey of the entire target population because the population was small and all 161 people were considered important sources of information.

## 3.3 Data Collection Instruments

The study used questionnaires, interview guide and documentary review. The questionnaire collected standardized data from project managers, technical staff, environmental officers and community beneficiaries. The interview guide collected detailed information from key informants on managerial practices, difficulties and perceptions about project constraints and sustainability. Documentary review involved examination of project reports, monitoring and evaluation records, policy documents and previous academic studies related to the Sebeya Catchment Management Project.

## 3.4 Pilot Study, Validity and Reliability

A pilot study was conducted with 17 respondents, representing about 10% of the total population, to test clarity, reliability and validity of the research instruments. Feedback from the pilot test was used to improve wording, order and sequencing of the questionnaire and interview guide. Content validity of the instruments was confirmed by experts in project constraints management and environmental protection. The Content Validity Index was 1.0, which exceeded the minimum acceptable level of 0.70. Cronbach's Alpha was 0.75, confirming that the instrument was reliable and internally consistent.

## 3.5 Data Analysis

The study used both descriptive and inferential statistics. Descriptive statistics included frequencies, percentages, means and standard deviations. Inferential statistics included Pearson correlation and regression analysis, conducted at a 0.05 level of significance using SPSS version 28. Simple linear regression was conducted for each independent variable, while multiple linear regression measured the simultaneous effect of scope management, time management and cost management on sustainability of environmental protection projects.

The multiple regression model used in the study was:

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

where Y represents sustainability of environmental protection projects, $X_1$ represents scope management, $X_2$ represents time management, $X_3$ represents cost management, $\beta_0$ represents the constant, $\beta_1$ to $\beta_3$ represent regression coefficients, and $\varepsilon$ represents the error term.

## 3.6 Ethical Considerations

Participants received detailed information on the aim, objectives and procedures of the study. Participation was voluntary and prior consent was obtained from respondents. Respondents were informed that they could withdraw at any time without prejudice. To maintain privacy, information was depersonalized and assigned codes to avoid identification. The information was stored securely and used only for academic and research purposes. The research was conducted transparently and with respect for the local culture and values of communities within the Sebeya Catchment.

# 4. Results and Discussion

This section presents analysis, interpretation and discussion of data on project constraints management and sustainability of the Sebeya Catchment Management Project. The findings are organized according to response return rate, descriptive statistics, correlation analysis and regression analysis.

The response-rate findings showed that 161 questionnaires were issued to target respondents of the Sebeya Catchment Management Project and 158 completed questionnaires were returned, giving a response rate of 98%. This high completion rate indicates strong cooperation and provides a sufficient basis for descriptive and inferential analysis.

**Table 1: Response Return Rate**

| Description | Frequency | Percentage (%) |
|---|---|---|
| Questionnaires Distributed | 161 | 100 |
| Questionnaires Returned | 158 | 98 |
| **Total** | **161** | **98** |

Source: Researcher, December 2025

Table 1 indicates that 158 completed questionnaires were returned from 161 distributed questionnaires, representing 98%. The high response rate strengthens confidence in the adequacy of the data used to analyze project constraints management and sustainability of the Sebeya Catchment Management Project.

## 4.1 Sustainability of the Sebeya Catchment Management Project

This subsection presents respondents' assessment of the sustainability of the Sebeya Catchment Management Project. Sustainability was measured through community benefits, environmental impact, stakeholder involvement, maintained project outcomes and long-term environmental improvements.

**Table 2: Sustainability of Sebeya Catchment Management Project**

| Statement | 5 (SA) | 4 (A) | 3 (N) | 2 (D) | 1 (SD) | Mean | Std. Dev. |
|---|---|---|---|---|---|---|---|
| Project results continue to benefit the community after completion. | 55% (87) | 33% (52) | 7% (11) | 3% (5) | 2% (3) | 4.36 | 0.85 |
| Environmental impacts have been positively sustained. | 49% (77) | 37% (59) | 8% (13) | 4% (6) | 3% (5) | 4.25 | 0.89 |
| Stakeholders remain actively involved in maintaining project outcomes. | 46% (73) | 39% (62) | 9% (14) | 4% (6) | 2% (3) | 4.23 | 0.88 |
| There is evidence of improved environmental conservation practices. | 50% (79) | 36% (57) | 8% (13) | 4% (6) | 2% (3) | 4.28 | 0.87 |
| The project has led to long-term socio-environmental improvements like fresh air and a clean environment. | 57% (90) | 32% (50) | 7% (11) | 2% (3) | 2% (3) | 4.40 | 0.83 |
| **Composite Mean for Sustainability** | | | | | | **4.30** | **0.86** |

Source: Researcher, December 2025

Table 2 shows a high composite mean for sustainability of the Sebeya Catchment Management Project. The findings imply that respondents perceived the project as having maintained benefits for the community, sustained positive environmental impacts and supported long-term environmental improvements. This agrees with Koesrindartoto et al. (2020), who emphasized the role of community capacity and continued involvement in sustainability of environmental protection projects.

## 4.2 Scope Management and Sustainability

This subsection presents findings on scope management constraints and their relationship with sustainability of the Sebeya Catchment Management Project. The analysis addresses the first specific objective of the study.

**Table 3: Scope Management Constraints**

| Statement | 5 (SA) | 4 (A) | 3 (N) | 2 (D) | 1(SD) | Mean | Std. Dev. |
|---|---|---|---|---|---|---|---|
| The project had clearly defined objectives and deliverables. | 52% (82) | 35% (55) | 8% (13) | 3% (5) | 2% (3) | 4.32 | 0.87 |
| Scope changes were managed effectively during project implementation. | 46% (73) | 39% (62) | 8% (13) | 4% (6) | 3% (4) | 4.21 | 0.91 |
| Stakeholders were involved in defining the list of activities. | 50% (79) | 36% (57) | 9% (14) | 3% (5) | 2% (3) | 4.29 | 0.88 |
| There were procedures to handle scope creep during the project. | 44% (70) | 41% (65) | 8% (13) | 4% (6) | 3% (4) | 4.19 | 0.93 |
| Clear scope management enhanced project sustainability. | 55% (87) | 33% (52) | 7% (11) | 3% (5) | 2% (3) | 4.36 | 0.85 |
| Composite Mean for Scope Management | | | | | | 4.27 | 0.89 |

Source: Researcher, December 2025

Table 3 indicates that scope management practices were highly applied in the project, with a composite mean of 4.27. The results show that clear objectives, effective management of scope changes, stakeholder involvement and procedures for handling scope creep supported sustainability of environmental protection activities.

**Table 4: Relationship between Scope Management Constraints and Sustainability of Sebeya Catchment Management Project**

| | | Scope management | Sustainability of environmental protection projects |
|---|---|---|---|
| Scope management constraints | Pearson Correlation | 1 | .808** |
| | Sig. (2-tailed) | | .000 |
| | N | 158 | 158 |
| Sustainability of environmental protection projects | Pearson Correlation | .808** | 1 |
| | Sig. (2-tailed) | .000 | |
| | N | 158 | 158 |

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

Source: Researcher, December 2025

Table 4 shows a strong positive and statistically significant relationship between scope management and sustainability of environmental protection projects (r = .808, p = .000). The relationship indicates that better scope planning, clarity and control are associated with stronger sustainability outcomes in the Sebeya Catchment Management Project.

**Table 5: Effect of Scope Management on Sustainability of Sebeya Catchment Management Project**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| Summary | .808[a] | .653 | .651 | .48116 |

| Model | | Sum of Squares | Df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| ANOVA | Regression | 67.991 | 1 | 67.991 | 293.680 | .000[b] |
| | Residual | 36.116 | 156 | .232 | | |
| | Total | 104.108 | 157 | | | |

| Model | | Unstandardized Coefficients | | Standardized Coefficients | T | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| Coefficients | (Constant) | 1.218 | .179 | | 6.820 | .000 |
| | Scope management | .725 | .042 | .808 | 17.137 | .000 |

a. Dependent Variable: Sustainability of environmental protection projects

b. Predictors: (Constant), Scope management

Source: Researcher, December 2025

Table 5 shows that scope management explains 65.3% of the variation in sustainability of environmental protection projects (R Square = .653). The coefficient for scope management was positive and significant (B = .725, Beta = .808, t = 17.137, p = .000), indicating that improved scope management significantly increases sustainability of the Sebeya Catchment Management Project.

## 4.3 Time Management and Sustainability

This subsection presents findings on time management constraints and their effect on sustainability of the Sebeya Catchment Management Project. The analysis addresses the second specific objective of the study.

**Table 6: Time Management Constraints**

| Statement | 5 (SA) | 4 (A) | 3 (N) | 2 (D) | 1 (SD) | Mean | Std. Dev. |
|---|---|---|---|---|---|---|---|
| Project activities were completed on time. | 47% (74) | 38% (60) | 8% (13) | 4% (6) | 3% (5) | 4.22 | 0.90 |
| A clear project schedule was developed and followed. | 53% (84) | 34% (54) | 7% (11) | 3% (5) | 3% (4) | 4.31 | 0.87 |
| Project delays were addressed in a timely manner. | 44% (70) | 40% (63) | 9% (14) | 4% (6) | 3% (5) | 4.18 | 0.92 |
| Time management practices improved project efficiency. | 56% (89) | 33% (52) | 7% (11) | 2% (3) | 2% (3) | 4.39 | 0.83 |
| Good time management contributed to the sustainability of the project. | 58% (92) | 31% (49) | 6% (9) | 3% (5) | 2% (3) | 4.41 | 0.81 |
| **Composite Mean for Time Management** | | | | | | **4.30** | **0.87** |

Table 6 shows that respondents rated time management practices highly, with a composite mean of 4.30. Completion of activities on time, a clear project schedule, timely response to delays and efficient implementation contributed to project sustainability. These findings support Gashakamba (2023), who emphasized seasonal risk planning and responsive scheduling in watershed projects.

**Table 7: Relationship between Time Management Constraints and Sustainability of Sebeya Catchment Management Project**

| | | Time management | Sustainability of environmental protection projects |
|---|---|---|---|
| Time management constraints | Pearson Correlation | 1 | .654** |
| | Sig. (2-tailed) | | .000 |
| | N | 158 | 158 |
| Sustainability of environmental protection projects | Pearson Correlation | .654** | 1 |
| | Sig. (2-tailed) | .000 | |
| | N | 158 | 158 |

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

Source: Researcher, December 2025

Table 7 shows a positive and statistically significant relationship between time management and sustainability of environmental protection projects (r = .654, p = .000). The finding means that adherence to schedules, timely implementation and quick resolution of delays are associated with stronger sustainability performance.

**Table 8: Effect of Time Management on Sustainability of Sebeya Catchment Management Project**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| Summary | .654[a] | .428 | .424 | .61784 |

| Model | | Sum of Squares | Df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| ANOVA | Regression | 44.558 | 1 | 44.558 | 116.72 | .000[b] |
| | Residual | 59.550 | 156 | .382 | | |
| | Total | 104.108 | 157 | | | |

| Model | | Unstandardized Coefficients | | Standardized Coefficients | T | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| Coefficients | (Constant) | 1.791 | .229 | | 7.818 | .000 |
| | Time management | .598 | .055 | .654 | 10.804 | .000 |

**a.** Dependent Variable: Sustainability of environmental protection projects

b. Predictors: (Constant), Time management

Source: Researcher, December 2025

Table 8 indicates that time management explains 42.8% of the variation in sustainability (R Square = .428). The coefficient for time management was positive and significant (B = .598, Beta = .654, t = 10.804, p = .000), showing that effective time management significantly contributes to sustainability of the Sebeya Catchment Management Project.

## 4.4 Cost Management and Sustainability

This subsection presents findings on cost management constraints and their relationship with sustainability of the Sebeya Catchment Management Project. The analysis addresses the third specific objective of the study.

**Table 9: Cost Management Constraints**

| Statement | 5 (SA) | 4 (A) | 3 (N) | 2 (D) | 1(SD) | Mean | Std. Dev. |
|---|---|---|---|---|---|---|---|
| The project had a well-prepared budget. | 49% (77) | 37% (59) | 8% (13) | 3% (5) | 3% (4) | 4.26 | 0.89 |
| Budgetary controls were in place and followed. | 45% (71) | 39% (62) | 9% (14) | 4% (6) | 3% (5) | 4.20 | 0.91 |
| Financial resources were used efficiently. | 51% (80) | 36% (57) | 8% (13) | 3% (5) | 2% (3) | 4.31 | 0.87 |
| Cost overruns were effectively managed. | 43% (68) | 40% (63) | 10% (16) | 4% (6) | 3% (5) | 4.16 | 0.93 |
| Effective cost management contributed to project sustainability. | 54% (85) | 34% (54) | 7% (11) | 3% (5) | 2% (3) | 4.35 | 0.85 |
| **Composite Mean for Cost Management** | | | | | | **4.26** | **0.89** |

Source: Researcher, December 2025

Table 9 shows that cost management practices were highly rated, with a composite mean of 4.26. The findings indicate that budget preparation, budgetary controls, efficient financial resource use and effective handling of cost overruns were important contributors to project sustainability.

**Table 10: Relationship between Cost Management Constraints and Sustainability of Sebeya Catchment Management Project**

| | | Cost management | Sustainability of environmental protection projects |
|---|---|---|---|
| Cost management | Pearson Correlation | 1 | .690** |
| | Sig. (2-tailed) | | .000 |
| | N | 158 | 158 |
| Sustainability of environmental protection projects | Pearson Correlation | .690** | 1 |
| | Sig. (2-tailed) | .000 | |
| | N | 158 | 158 |

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

Source: Researcher, December 2025

Table 10 shows a positive and statistically significant relationship between cost management and sustainability of environmental protection projects (r = .690, p = .000). This means that effective budgeting, cost control and financial discipline are associated with improved sustainability of the Sebeya Catchment Management Project.

**Table 11: Effect of Cost Management Constraints on Sustainability of Sebeya Catchment Management Project**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| Summary | .690[a] | .476 | .473 | .59136 |

| Model | | Sum of Squares | Df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| ANOVA | Regression | 49.553 | 1 | 49.553 | 141.69 | .000[b] |
| | Residual | 54.554 | 156 | .350 | | |
| | Total | 104.108 | 157 | | | |

| Model | | Unstandardized Coefficients | | Standardized Coefficients | T | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| Coefficients | (Constant) | 1.340 | .246 | | 5.457 | .000 |
| | Cost management | .665 | .056 | .690 | 11.904 | .000 |

a. Dependent Variable: Sustainability of environmental protection projects

b. Predictors: (Constant), Cost management

Source: Researcher, December 2025

Table 11 indicates that cost management explains 47.6% of the variation in sustainability of environmental protection projects (R Square = .476). The coefficient for cost management was positive and significant (B = .665, Beta = .690, t = 11.904, p = .000), confirming that good cost management significantly enhances sustainability of the project.

## 4.5 Combined Effect of Project Constraints Management

This subsection presents the comprehensive effect of scope management, time management and cost management on sustainability of the Sebeya Catchment Management Project.

**Table 12: The Combined Effect of Project Constraints Management on Sustainability of Sebeya Catchment Management Project**

| Model | R | R Square | | Adjusted R Square | Std. Error of the Estimate | |
|---|---|---|---|---|---|---|
| Summary | .876[a] | .767 | | .763 | .39662 | |
| **Model** | | **Sum of Squares** | **Df** | **Mean Square** | **F** | **Sig.** |
| ANOVA | Regression | 79.882 | 3 | 26.627 | 169.266 | .000[b] |
| | Residual | 24.226 | 154 | .157 | | |
| | Total | 104.108 | 157 | | | |
| Model | | Unstandardized Coefficients | | Standardized Coefficients | T | Sig. |
| | | B | Std. Error | Beta | | |
| Coefficients | (Constant) | .240 | .186 | | 1.295 | .197 |
| | Scope management | .456 | .047 | .509 | 9.802 | .000 |
| | Time management | .223 | .043 | .244 | 5.127 | .000 |
| | Cost management | .274 | .047 | .285 | 5.858 | .000 |

a. Dependent Variable: Sustainability of environmental protection projects

b. Predictors: (Constant), Cost management, Time management, Scope management

Source: Researcher, December 2025

Table 12 shows that project constraints management practices jointly explain 76.7% of the variation in sustainability of environmental protection projects (R Square = .767). The model was statistically significant (F = 169.266, p = .000). The coefficient results show that scope management (Beta = .509, t = 9.802, p = .000), time management (Beta = .244, t = 5.127, p = .000), and cost management (Beta = .285, t = 5.858, p = .000) all had positive and significant effects on sustainability. Therefore, all null hypotheses were rejected at the 0.05 level of significance.

# 5. Conclusion and Recommendations

This section presents the conclusion, recommendations and suggestions for further studies based on the findings on project constraints management and sustainability of the Sebeya Catchment Management Project.

## 5.1 Conclusion

The study concluded that project constraints management significantly affects sustainability of the Sebeya Catchment Management Project in Rubavu District. The sustainability of the project was reflected in continued community benefits, positive environmental outcomes and long-term improvements in conservation activities.

Regarding scope management, the study concluded that setting clear objectives, defining deliverables, managing scope changes, involving stakeholders and controlling scope creep significantly contribute to sustainability of environmental protection projects. The regression findings confirmed that scope management was the strongest predictor among the three constraints.

Regarding time management, the study concluded that adherence to schedules, timely activity completion and prompt management of delays improve project efficiency and support long-term sustainability. Regarding cost management, the study concluded that proper budgeting, efficient resource use, budgetary controls and cost-overrun management are essential for sustaining environmental protection project outcomes.

## 5.2 Recommendations

1. Project managers and implementing agencies should strengthen scope management by defining clear objectives, approved deliverables and formal scope-change procedures before and during implementation of environmental protection projects.
2. Sebeya Catchment Management Project stakeholders should improve time management by preparing realistic schedules, aligning activities with ecological and seasonal calendars, monitoring deadlines and addressing implementation delays immediately.
3. Project financiers and implementing institutions should reinforce cost management through realistic budgeting, timely disbursement, expenditure tracking, cost-control mechanisms and provision of contingency budgets for unexpected project needs.
4. Local authorities and community representatives should be continuously

involved in planning, implementation, monitoring and post-project maintenance to strengthen ownership and sustain environmental, social and economic benefits.

## 5.3 Suggestions for Further Studies

Future studies may examine the influence of other project management factors such as risk management, communication management, procurement management and human resource practices on sustainability of environmental protection projects. Comparative studies may also assess sustainability performance of environmental projects across different districts in Rwanda.

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