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Resource Management and Performance of Climate Change Adaptation Projects in Kenya

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ABSTRACT

Climate change adaptation has emerged as a crucial area of concern due to Kenya's susceptibility to climate change effects. Many climate change adaptation projects have been implemented across the country, both government and donor funded. This study examined the effects of resource management on the performance of climate change adaptation projects in Kenya. 11 climate change adaptation projects in Marsabit and Isiolo Counties, Kenya, with a total of 2,021 beneficiaries were targeted. A sample of 334 respondents was derived using Slovin's Formula. Data collection tools included questionnaires for beneficiaries, interviews with key informants, and field observations. Data was analyzed using SPSS and Microsoft Excel. Descriptive statistics (mean and standard deviation) described the data, while inferential statistics (correlation and regression analysis) assessed relationships between variables. A strong positive correlation was found between resource management and project performance (correlation = 0.409, p=0.000). The regression analysis indicated a statistically significant effect (F = 50,355, p = 0.000) with a coefficient *B*= 0.393, suggesting that resource management positively influenced project success. The Adjusted R Squared attained was 0.168, which implied that resource management had a poor effect in explaining project performance. The study concludes that resource management is a critical factor for successful implementation and enhancing performance of climate change adaptation projects. It recommends that project implementers should identify, allocate and ensure adequacy of the necessary resources for implementation of projects. The study further recommends resource optimization for efficient utilization of available resources.

Introduction

Resources are the essential inputs—both tangible and intangible—that enable organizations to pursue and achieve their strategic goals. According to Thompson et al. (2015), resources constitute the productive assets available within an organization's internal and external environment. Effective resource management not only facilitates goal alignment but also supports the timely execution of tasks and projects.

Resources can be categorized as tangible—including land, machinery, and equipment—and intangible, such as knowledge, competencies, technological capacity, time, and financial assets (Pearce & Robinson, 2007). While some resources, like fossil fuels or minerals, are non-renewable and finite in supply, others are renewable and capable of regeneration.

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Organizations may generate their own resources or leverage strategic partnerships to acquire or share them, enhancing operational resilience and adaptability. Assessing internal capabilities and determining optimal strategies for resource utilization are thus integral to organizational success (Thompson et al., 2015). Given the inherently limited nature of most resources, their efficient and profitable use is paramount (Liang et al., 2021).

Resource management allows for strategic allocation by ensuring that the right resources are directed toward the right activities. This minimizes waste, avoids duplication, and enhances overall efficiency (Gupta, 2024). Consequently, organizations are better positioned to reduce operational costs, boost productivity, and improve output quality. A clear understanding of the specific resources needed for successful strategy execution is a prerequisite for effective project delivery.

Central to this process is resource allocation, which involves assigning the appropriate resources—including personnel, skills, equipment, and finances—to meet specific organizational objectives. In this context, clearly defined goals help identify tasks, skill requirements, and suitable timelines and budgets (Chepng'eno & Kimutai, 2021). Establishing job schedules and evaluation frameworks supports ongoing monitoring and adjustment. Conversely, poor resource planning often results in misallocation, jeopardizing program and project outcomes (Gupta, 2024).

Another crucial dimension is resource adequacy, which refers to the extent to which an organization has access to sufficient human, financial, technical, and physical resources to operate effectively. Organizations that possess adequate and high-quality resources tend to outperform their counterparts (Ndege et al., 2020). Moreover, resource optimization ensures that resources—particularly scarce or non-renewable ones—are used to their full potential. This involves reallocating underutilized assets and upgrading overutilized ones to balance workloads and improve efficiency (Kusimo et al., 2019).

Globally, many organizations have adopted resource optimization as a strategy to address labor shortages, reduce inter-project resource conflicts, and enhance competitive advantage. Conceptual and empirical studies highlight that strategic resource management is fundamental to achieving sustainable performance and maintaining a competitive edge (Ismail et al., 2012).

In the African context, inadequate resource management—such as failure to meet technical specifications, budget overruns, and scheduling delays—has been cited as a major contributor to project failure (Rwelamila & Purushottam, 2012). Challenges such as underqualified project personnel, insufficient training, and poor communication systems have further undermined project success.

In the Kenyan context, proper allocation of resources—especially financial and human—has been recognized as a critical factor in strategy implementation and organizational performance. Mobilizing resources effectively is seen as essential for the successful completion of projects (Muthiora & Moronge, 2018; Densford et al., 2018).

Statement of the Problem

Kenya remains highly vulnerable to the adverse effects of climate change, including increasingly erratic weather patterns, prolonged droughts, and other extreme climate events. These climatic disruptions pose significant risks to livelihoods, ecosystems, and economic stability, particularly in arid and semi-arid regions (Government of Kenya [GoK], 2010, 2013; Safaricom, 2023). In response, a range of climate change adaptation projects—supported by both domestic institutions and international development partners—have been initiated with the aim of building community resilience and mitigating the socio-economic impacts of climate change.

Despite the widespread implementation of these adaptation efforts, recent assessments suggest that the country continues to experience the devastating consequences of climate variability (OCHA, 2022; ReliefWeb, 2022). This persistent vulnerability raises concerns regarding the overall effectiveness, sustainability, and performance of climate adaptation initiatives. A critical examination of these projects reveals that resource-related challenges—such as poor allocation, insufficient provision, and inefficient utilization—may undermine project outcomes and hinder long-term success.

Emerging literature indicates that effective resource management, encompassing the strategic allocation, adequacy, and optimization of resources, plays a pivotal role in determining project performance (Gupta, 2024; Ndege, Awino, & Ogutu,

2020; Sathvara, 2023). However, empirical studies specifically examining this relationship within the Kenyan context remain limited. Addressing this gap, the present study investigates the extent to which resource management influences the performance of climate change adaptation projects in Kenya.

Research Objective

To examine the effect of resource management on the performance of climate change adaptation projects in Kenya.

Research Hypothesis

Ho: Resource management has no significant effect on the performance of climate change adaptation projects in Kenya.

Literature Review

Theoretical Framework

This study is anchored in the Resource-Based View (RBV) Theory, first articulated by Jay B. Barney in his influential article, Firm Resources and Sustained Competitive Advantage (Barney, 1991). RBV posits that firms can achieve and sustain a competitive advantage when they possess strategic resources that are valuable, rare, inimitable, and non-substitutable—often referred to as the VRIN criteria. These resources may be tangible (e.g., land, equipment, infrastructure) or intangible (e.g., organizational knowledge, culture, and skilled personnel).

A valuable resource enhances the firm's ability to deliver customer value or reduce costs. A rare resource is not widely possessed by competing firms. A resource is inimitable if it cannot be easily replicated due to factors like path dependency, causal ambiguity, or social complexity. Lastly, non-substitutable resources cannot be replaced by other strategically equivalent assets (Barney, 1991; TheoryHub, 2025).

Despite its wide applicability in strategic management, RBV has been critiqued for its internal orientation—focusing heavily on firm resources while underemphasizing external dynamics such as market changes and institutional pressures (Truijens, 2003). However, it remains highly relevant in examining how resource endowment and internal capacities affect project outcomes.

Kash, Aaron, Gamm, and Johnson (2014) applied RBV in the healthcare sector and found that resource allocation and coordination were crucial in implementing externally driven strategies, thus validating RBV's applicability beyond traditional for-profit contexts. In the current study, RBV provided a conceptual lens to assess whether project implementers possessed and utilized strategic resources—such as financial capital, skilled labor, and technology—to achieve competitive advantage in climate change adaptation projects.

Empirical Framework

Several empirical studies have explored the relationship between resource management and project performance. According to Muthiora and Moronge (2018), human resources are foundational to long-term strategy implementation, with managerial leadership and partner coordination playing a key role. Similarly, Densford et al. (2018) emphasized the role of material, human, and technical resources in enhancing the performance of infrastructure projects, notably in the road construction sector.

Ouma and Kamaara (2018) observed low project success rates among NGOs, often linked to financial mismanagement, weak resource allocation, and insufficient stakeholder involvement. The study recommended improving several key indicators—such as financial resource availability, staff expertise, and equitable resource distribution—to bolster project outcomes.

Sathvara (2023) reinforced the idea that an organization's performance is heavily dependent on its internal capabilities and not merely on financial capital. Resources and competencies, when effectively harnessed, enable firms to distinguish themselves and maintain a sustainable advantage. In line with this, Wachira (2024) advocated for resource reallocation, especially toward marketing and training functions, to enhance organizational performance.

Chepng'eno and Kimutai (2021) reported that transparent and accountable management of construction resources—supported by robust budget projections and scheduling—contributed to cost minimization and timely project completion. Likewise, Allu et al. (2024), in the context of Engineering, Procurement, and Construction (EPC) projects, noted that mere resource allocation was insufficient; without integrated planning, scheduling, and decision-support systems, resource underutilization persisted, compromising operational efficiency.

Further supporting these findings, Lavu and Maina (2019) emphasized the value of human capital, stating that employees represent the true assets of a business. When effectively managed, financial resources empowered project managers to form productive teams and optimize work schedules. Similarly, Koyi, Miroga, and Otinga (2021) emphasized resource scheduling and planning as essential for achieving person-job fit, increasing efficiency, and ensuring timely project delivery.

Recent literature also cautions against the over-allocation or misalignment of resources. Lean-PM® (2020) warns that excess planning, redundant processes, and complex procedures can result in overprocessing—a critical form of project waste. This challenges traditional assumptions that more resources automatically translate to better outcomes, instead favoring value-driven planning and lean execution models.

Liang, Xu, and Chen (2021) advocated for optimal labor allocation, stressing that matching employee skills with task requirements and managing human resource availability in real time is vital for success. The study called for dynamic adjustment mechanisms to resolve resource conflicts and increase organizational agility.

Despite the depth of existing research, most studies have been conducted in sectors such as infrastructure, healthcare, and education, or within institutional and organizational settings. Notably absent are insights into the resource management dynamics of climate change adaptation projects in arid and semi-arid lands (ASALs) of Kenya. This gap underscores the need for targeted investigation into how resource allocation, adequacy, and optimization affect the performance of adaptation initiatives in these vulnerable regions.

Conceptual Framework

This study was guided by the conceptual framework illustrated below, which outlines the relationship between resource management (the independent variable) and project performance (the dependent variable). The framework is grounded in the Resource-Based View (RBV) theory and integrates constructs derived from the literature review.

Resource Management

Resource management refers to the systematic process of organizing, allocating, monitoring, and optimizing the use of an organization's resources—both tangible and intangible—to efficiently and effectively achieve project objectives. The literature identifies three critical sub-components of resource management:

Resource Allocation

This involves identifying and assigning the necessary resources (e.g., human, financial, technical) required for the successful implementation of a project. Poor or incomplete resource allocation often leads to delays, cost overruns, or outright project failure.

Resource Adequacy

Resource adequacy refers to the sufficiency of the allocated resources to meet project demands. Even with initial allocation, if the resources are insufficient in quantity or quality, the project is likely to face implementation challenges.

Resource Optimization

Optimization involves the strategic utilization of the available resources to ensure minimal waste, maximum efficiency, and value delivery. Tools such as performance dashboards, reallocation mechanisms, and planning software can support this process. Effective optimization improves project outcomes by adjusting resource use based on real-time needs.

Project Performance

Project performance represents the dependent variable and refers to the extent to which a climate change adaptation project meets its intended objectives, timelines, budget, and quality standards. Performance is often measured by beneficiary satisfaction, project completion rates, efficiency, and impact sustainability.

Summary Linkage

The conceptual framework posits that effective resource management—through proper allocation, ensuring adequacy, and optimizing use—has a significant effect on the performance of climate change adaptation projects. Failure in any of the sub-components is likely to negatively affect project outcomes.

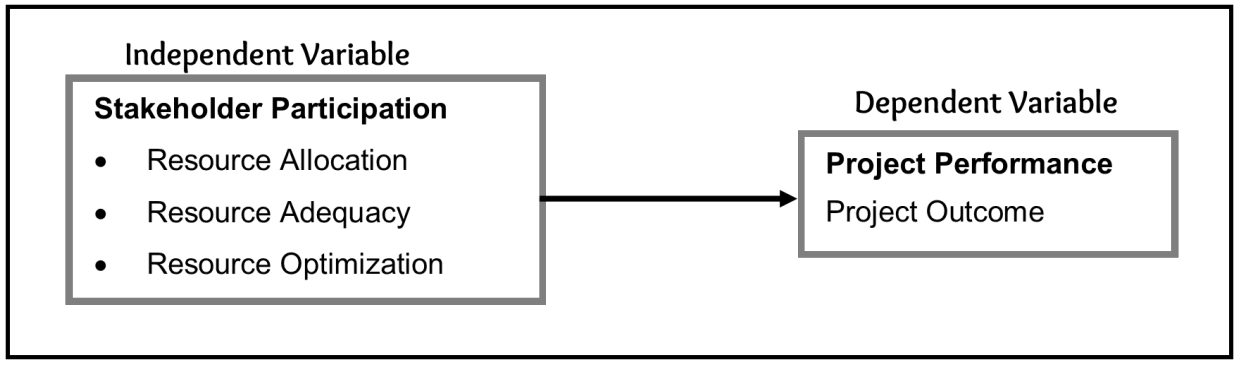

Figure 1: *Conceptual Framework*

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Reseach Methodology

Research Design

This study employed a mixed-methods research design, combining both quantitative and qualitative approaches to generate comprehensive insights. The quantitative component focused on collecting and analyzing numerical data to measure the relationship between resource management and project performance. In contrast, the qualitative component explored the lived experiences, perceptions, and contextual understanding of respondents to provide depth to the findings. The integration of both approaches allowed for triangulation, enhancing the validity and reliability of the results (Leavy, 2017; Tenny et al., 2022).

Target Population

The target population comprised stakeholders involved in climate change adaptation projects within Kenya's arid and semi-arid lands (ASALs), specifically Marsabit and Isiolo counties. These areas were selected due to their heightened vulnerability to climate change impacts as reported by the Integrated Food Security Phase Classification (IPC) and the

Famine Early Warning Systems Network (FEWS NET) (IPC, 2022; FEWS NET, 2022).

The population included:

Project implementers (project officers, government officials, and development partners),

Community beneficiaries (individuals directly impacted by the projects), identified through local administrators and project leaders.

Sample Size and Sampling Techniques

A multi-stage sampling strategy was adopted. Purposive sampling was used to identify key informants (KIs) such as project officers and government representatives due to their specific knowledge and roles. For beneficiaries, simple random sampling was applied to ensure objectivity and eliminate bias.

The sample size was determined using Slovin's Formula (Ellen, 2020):

$$n = \frac{N}{1 + Ne^2}$$

Where:

n= sample size

N = total population (2,021)

e = margin of error (0.05)

Using this formula, a sample size of 334 respondents was obtained. Beneficiaries were randomly selected from official lists provided by project chairpersons, ensuring proportional representation across the study counties.

Data Collection Tools

To ensure comprehensive data capture, the following tools were employed:*Structured questionnaires for quantitative data collection from beneficiaries. Key informant interviews (KIIs) with project implementers to obtain qualitative insights.Field observations at selected project sites to validate reported data and assess resource use, implementation status, and community engagement.*

All instruments were pre-tested to ensure clarity, reliability, and validity.

Data Processing and Analysis

Quantitative data was analyzed using Statistical Package for the Social Sciences (SPSS) and Microsoft Excel. Descriptive statistics (means, standard deviations) summarized the data, while inferential statistics, including regression analysis, tested relationships between variables.

The regression model applied was:

$$Y = Bo + BiX1 + E$$

Where Y represents project performance, *X*1 is stakeholder participation, and *Bi* is the regression coefficient.

Ethical Considerations

Ethical approval was obtained from the Meru University Institutional Research and Ethics Review Committee (MIRERC) (approval number: MIRERC 051/2024) and the National Commission for Science, Technology, and Innovation (NACOSTI) (license number: NACOSTI/P/24/414768). Participants were informed of the study's objectives, and confidentiality was ensured throughout the research process. There was no conflict of interest declared and plagiarism check was carried out.

Results and Discussions

Descriptive Analysis

The study sought to determine respondents' perceptions regarding resource management in climate change adaptation projects. Resource management was measured through indicators such as resource allocation, adequacy, and optimization.

The mean scores for items under this construct ranged from 2.75 to 4.18. The highest mean (4.18) indicated disagreement with the statement that there was adequate communication infrastructure to facilitate project implementation. The lowest mean (2.75) reflected agreement that project planning was conducted before implementation, suggesting relative satisfaction with the planning phase.

The standard deviation for the items was low (ranging from 1.16 to 1.70), implying limited variation in responses and indicating strong consensus among respondents.

All (100%) of the Key Informants (KIs) affirmed the need for and use of various resources—including financial, technological, material, machinery, human skills, and natural resources—for successful project execution. Notable challenges faced included vandalism and human resource sabotage. Vandalism was curbed through follow-ups and penalties, while

sabotage was addressed via dialogue, wage payments, and mediators.

To ensure resource adequacy, KIs reported the use of tools such as procurement plans, budgets, and bills of quantities. However, budgetary constraints arose during implementation, making it difficult to complete or maintain projects. For instance, inadequate agricultural extension officers hindered outreach. Some PIs pursued supplementary funding, and the need for more trained extension officers was highlighted.

Regarding resource optimization, tools such as project planning, scheduling, and budgeting were used. Notably, 20% of KIs applied dynamic adjustment strategies to reallocate resources. An example included revising budgets to install water kiosks due to unforeseen severe water shortages.

From the beneficiaries' perspective, qualitative responses revealed:

34% felt resources were inadequately managed, leading to incomplete projects.

25% reported lack of sustainability planning, citing abandoned or non-functional equipment post-handover.

10% noted poor planning, e.g., failed irrigation systems and ineffective infrastructure placement.

Only 10% believed resource management was effective.

Site observations reinforced these findings. Of the sampled projects:

3 projects were thriving (including a demonstration farm),

4 were struggling, with limited activity,

3 were entirely bare.

Water sources were present in most areas (e.g., boreholes and rivers), but underutilized. Some equipment was vandalized or left unused, as in the Walda project.

Inferential Analysis

Correlation Analysis

A Pearson correlation coefficient was calculated to assess the relationship between resource management and project performance. As shown in Table 1, the coefficient was 0.409, with a p-value of 0.000, indicating a statistically significant moderate positive correlation

	Resource Management	Project Performance
Pearson Correlation	1	0.409
Sig. (2-tailed)		.000
N	252	252

Table 1: *Correlations for Resource Management*

Source: *Research Data (2025)*

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

Model	R	R^2	Adjusted R^2	Std. Error
1	0.409	0.168	0.164	13.67553

Table 2: *Model Summary*

Source: *Research Data (2025)*

Source	Sum of Squares	Df	Mean Square	F	Sig.
Regression	9417.405	1	9417.405	50.355	.000
Residual	46755.024	250	187.020		
Total	56172.429	251			

Table 3: *ANOVA for Resource Management*

Source: *Research Data (2025)*

Model	B	Std. Error	Beta	t	Sig.
Constant	22.532	2.416		9.327	.000
Resource Mgmt.	0.393	0.055	0.409	7.096	.000

Table 4: *Regression Coefficients*

Source: *Research Data (2025)*

Model Summary

The adjusted R^2 value from Table 2 was 0.164, indicating that 16.4% of the variation in project performance could be explained by resource management alone. This implies that although statistically significant, resource management has a relatively low explanatory power on project performance.

ANOVA

The ANOVA results **(Table 3)** showed an F-statistic of 50.355 and a p-value of .000, confirming that the regression model is statistically significant at the 0.05 level. Therefore, resource management significantly influences project performance.

Regression Coefficients

The regression coefficients indicate the model:

$Y=22.532+0.393X$

Where:

Y = Project performance

X = Resource management

This implies that a one-unit increase in resource management results in a 0.393 unit increase in project performance.

Hypothesis Testing

The null hypothesis (H_0) posited that resource management has no significant effect on project performance. Given the p-value of 0.000, the study rejects the null hypothesis and concludes that resource management has a statistically significant effect on the performance of climate change adaptation projects in Kenya.

Discussion of Findings

The findings are consistent with the Resource-Based View (RBV) theory (Barney, 2000), which posits that access to strategic, valuable, rare, inimitable, and non-substitutable resources provides a competitive advantage. In this context, resource management—when properly executed—contributes to enhanced project performance.

These findings align with prior studies:

Lavu & Maina (2019) and Muthiora & Moronge (2018) identified resource allocation and adequacy as crucial to strategy success.Densford et al. (2018) emphasized the importance of resource mobilization.Ouma & Kamaara (2018) highlighted both allocation and optimization for implementation success. Chepng'eno & Kimutai (2021) noted that sufficien-

cy and proper utilization were as important as mere allocation.Koyi et al. (2021) and Liang et al. (2021) found that optimization strategies, including job-resource matching, influence project success.

The study reinforces the notion that effective planning, sufficient resource provision, and dynamic optimization are key determinants of success in climate change adaptation projects.

Conclusion and Recommendation

Conclusions

The study assessed the effect of resource management—specifically through the dimensions of resource allocation, resource adequacy, and resource optimization—on the performance of climate change adaptation projects in Kenya.

The Pearson correlation analysis established a statistically significant positive correlation between resource management and project performance, indicating that improvements in resource management are associated with better project outcomes. The regression model was statistically significant, further validating the relationship. Based on these findings, the null hypothesis—that resource management has no significant effect on project performance—was rejected.

The study concluded that:

i.Resource management significantly influences the success of climate change adaptation projects.

ii.While many projects were initially well-resourced, inefficient management practices—such as poor planning, uncoordinated implementation, and lack of maintenance strategies—hampered long-term success.

iii.Some projects invested heavily in costly and unsustainable systems, which proved challenging to operate or maintain, leading to eventual project failure.

iv.Projects that effectively managed the available resources, embraced planning and scheduling, and made dynamic adjustments to respond to evolving community needs showed superior performance.

v.Conversely, inadequate or inequitable allocation of resources led to suboptimal outcomes or project abandonment.

These findings underscore the necessity for strategic, sustained, and adaptive resource management in ensuring the effectiveness and continuity of climate change adaptation initiatives.

Recommendations

Based on the empirical evidence and insights drawn from both statistical analysis and field observations, the following recommendations are made:

i.Strengthen Resource Planning and Allocation

Project Implementers (PIs) should conduct comprehensive needs assessments to determine the exact resource requirements before project initiation.

Resources should be equitably allocated across project components to ensure balanced development and reduce regional or sectoral disparities.

ii.Promote Resource Adequacy

PIs should ensure that the quantity and quality of resources provided match project requirements throughout the lifecycle, not just at inception.

Tools such as procurement plans, budgets, and bills of quantities should be employed to forecast and track resource sufficiency.

iii.Enhance Resource Optimization Practices

In response to shifting community needs or resource constraints, PIs should adopt dynamic adjustment strategies to reallocate resources where necessary.

Tools such as project planning, scheduling, and budget monitoring systems should be utilized to ensure that the available resources are used efficiently and effectively.

iv.Adopt Sustainability-Oriented Resource Management

A sustainability plan should be incorporated into the project framework to cater for maintenance and continuity post-implementation.

Capacity building for community ownership and skills transfer is essential to reduce dependency on external implementers.

v.Monitor and Evaluate Resource Use

Continuous monitoring and evaluation (M&E) mechanisms should be embedded to assess the effectiveness of resource utilization and detect areas of inefficiency or waste early.

vi.Leverage Community Participation

Community input should be sought not only during project design but also during resource planning and implementation to align interventions with local priorities and enhance ownership.

Effective resource management—grounded in strategic planning, equitable allocation, continuous optimization, and sustainability—is not optional but essential for the success of climate change adaptation projects, particularly in vulnerable regions like Kenya's ASALs. Policymakers, donors, and implementers must integrate these principles into their frameworks to maximize the impact and longevity of their interventions.

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