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Sustainable Project Management and Performance of Water Project in Narok County, Kenya

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Abstract:

Purpose: *The study aimed to determine the effect of sustainable project management practices on the performance of water projects in Narok County, Kenya. The focus was on assessing how sustainable resource use and sustainable sourcing influence project performance.*

Material/methods: *The study was grounded in Stakeholder Theory and the Resource-Based View. A descriptive survey design was employed. Data were collected using structured questionnaires. Content validity was established through expert review, while reliability was assessed using Cronbach's Alpha coefficient. Descriptive statistics (means, standard deviations, frequencies, and percentages) were used to summarize the data. Inferential statistical techniques, including Pearson correlation and multiple regression analysis, were applied to examine relationships and test hypotheses. Findings were presented using tables and charts for clarity.*

Findings: *The results revealed that both sustainable resource use and sustainable sourcing had a positive and statistically significant effect on the performance of water projects. These dimensions of sustainable project management contributed meaningfully to improved outcomes.*

Conclusion*: The study concludes that adopting sustainable project management practices significantly enhances the performance of water projects in Narok County. Effective integration of sustainability principles into project planning and execution fosters improved efficiency and impact.*

Value: *This study contributes to the empirical understanding of sustainable project management within the water sector in developing regions. It provides practical recommendations for policymakers and project implementers, emphasizing the importance of stakeholder engagement, resource optimization, and sustainability-driven human resource practices to enhance project performance.*

Keywords*: Sustainable Project Management, Sustainable Resource, Sustainable Sourcing, Performance, Water Projects*

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1.1.Introduction

The performance of a project is crucial, as it reflects its ability to consistently meet its objectives while improving over time (Baba, Mohammad, & Young, 2021). For improved service delivery, public organizations are increasingly focusing on strategies and policies that enhance project performance, recognizing its importance for continuity and success (Silvius & Schipper, 2020). The performance of water projects is crucial for ensuring reliable access to clean and safe water, a fundamental resource for human well-being, economic development, and environmental sustainability (Tortajada, 2020). Continuous performance of these projects is essential to address growing water demands and mitigate issues like water scarcity, pollution, and infrastructure failures (Haider, et al., 2021). Despite significant global investment in project management, many projects still fall short of expectations. water projects often face numerous challenges, such as poor governance, inadequate funding, and environmental degradation, with sustainable project management emerging as a critical factor influencing their success (Shemer, et al., 2023). Addressing this gap, recent research emphasizes the need to explore how sustainable project managements affects the performance of water projects. This focus on water sustainability aligns with calls for more research in this area (Irannezhad et al., 2022).

Sustainable project management emphasizes integrating environmental, social, and economic considerations into all phases of a project to ensure long-term benefits for stakeholders and the environment (El Khatib et al., 2020). Key practices include incorporating environmental impact assessments, optimizing resource efficiency, and implementing renewable energy solutions to minimize ecological harm. Socially inclusive approaches, such as engaging stakeholders, fostering community participation, and addressing social equity, enhance ownership and sustainability. Additionally, economic practices like lifecycle cost analysis, risk management planning, and adopting monitoring and evaluation frameworks ensure projects remain financially viable and adaptable (Carboni, et al., 2024). These practices collectively strengthen the ability of water projects to meet their objectives by fostering operational efficiency, minimizing environmental impact, and delivering high-quality services (Kivilä, et al., 2017). Studies have shown that projects adopting such sustainable management practices are more likely to achieve their goals and remain resilient over time, even in complex and resource-constrained settings (Soares et al., 2024).

In Kenya, improving water project performance is vital for achieving water security. The African Development Bank (2022) highlights that the successful implementation of operational water projects in urban areas can sustainably supply quality water services to over 567,000 people. To enhance performance and sustainability, the Water Services Regulatory Board (2018) introduced governance principles, strategic plans, and corporate management frameworks in the water sector. Similarly, the Water Resource Authority (WRA) has developed management plans, including risk management, quality management, and monitoring and evaluation frameworks, aimed at improving water projects (WRA, 2018). Despite these efforts, water projects in Narok County continue to face significant challenges, attracting the attention of project management scholars. Therefore, this study seeks to examine the influence of sustainable project management on the performance of water projects in Narok County.

Despite these findings, many water projects still face significant performance challenges. For instance, the Kenya County Fact Sheets report (2013) by the Commission of Revenue Allocation (CRA) and the Kenya National Bureau of Statistics (KNBS) ranked Narok County last among all 47 counties in access to improved water services, with only 33% of its population accessing such services. This highlights a critical issue regarding water improvement and sustainability in the region. Additionally, an assessment by the Ewaso Ng'iro South Development Authority (ENSDA) (2021) on the status of community water projects in Narok County revealed that out of 120 projects implemented between 2014 and 2021, only 40% were functional, while 60% failed within two years after being handed over to the community. The report also noted persistent water shortages and poor sanitation in many areas where these projects were established.

Sustainable project management has been theoretically linked to improved project performance (Shaukat et al., 2022; Carvalho & Rabechini Jr, 2017). However, its application to water project performance remains underexplored. Locally, studies have examined factors influencing the sustainability of water projects in Narok County. For example, Achieno and Mwangangi (2018) found that community participation and project management practices significantly enhanced the sustainability of rural community-based water projects, while technology use and post-implementation support had minimal impact. Similarly, Munyao (2017) revealed that sustainability depended on community involvement, skills and knowledge of water management committee members, and the adoption of appropriate technologies, particularly in monitoring and evaluation. However, these studies have not specifically explored the influence of sustainable project management on water project performance in Narok County. Thus, this study seeks to address this gap by investigating the effect of sustainable project management on the performance of water projects in Narok County.

1.2. Theoretical literature review

Stakeholder Theory, first articulated by Freeman (1984), asserts that organizations must recognize and balance the interests of all parties who can affect or be affected by their objectives, not just shareholders. In the realm of public sector infrastructure—such as water projects—this means proactively identifying, engaging, and integrating a diverse array of actors including community members, government agencies, donors, and technical staff throughout the project lifecycle. Empirical studies have demonstrated the value of this approach: Yang et al. (2018) found that inclusive stakeholder engagement enhances transparency, reduces conflicts, and fosters accountability in large-scale infrastructure initiatives, while Aaltonen and Kujala (2016) showed that such engagement builds trust and improves communication between implementers and beneficiaries. In the water sector specifically, Beringer, Jonas, and Kock (2013) reported that community participation leads to higher project quality and sustainability, especially in underserved rural areas, and Bryson (2011) emphasized that systematic stakeholder analysis bolsters decision-making and social legitimacy. By framing stakeholder participation as a key independent variable, this study leverages Stakeholder Theory to hypothesize that the active involvement of Narok County's diverse stakeholders will be instrumental in aligning project goals with community needs and ensuring the long-term performance and sustainability of its water infrastructure projects.

The Resource-Based View (RBV), introduced by Wernerfelt (1984) and elaborated by Barney (1991), posits that an organization's competitive advantage and superior performance stem from its ability to acquire and effectively deploy valuable, rare, inimitable, and non-substitutable (VRIN) resources. In project management, RBV underscores the critical importance of optimizing physical, financial, and technological assets to maximize efficiency, minimize waste, and safeguard resources for future use. Research across utility sectors confirms this: Jugdev and Mathur (2013) highlighted that strategic resource allocation underpins successful project outcomes, while Kissi, Boateng, and Agyekum (2017) linked deficient resource optimization to frequent underperformance in water infrastructure projects. More recent work by Sweis et al. (2021) demonstrates that aligning project resources with sustainability objectives not only curbs operational costs but also mitigates environmental impacts, and Kamugisha et al. (2020) found that such practices enhance service delivery and long-term viability. Applying RBV to Narok County's water projects, this study contends that rigorous budgeting, meticulous planning, and judicious use of materials and manpower—hallmarks of sustainable resource management—will be positively correlated with project success, thereby providing a robust framework for assessing how internal capabilities drive performance in public infrastructure initiatives.

1.3. Conceptual Framework

The conceptual framework (fig 1) constitutes of the independent variables (sustainable resource and sustainable sourcing), dependent variable; performance of water projects in Narok County.

Independent Variable **Dependent Variable**

(Sustainable Project Management)

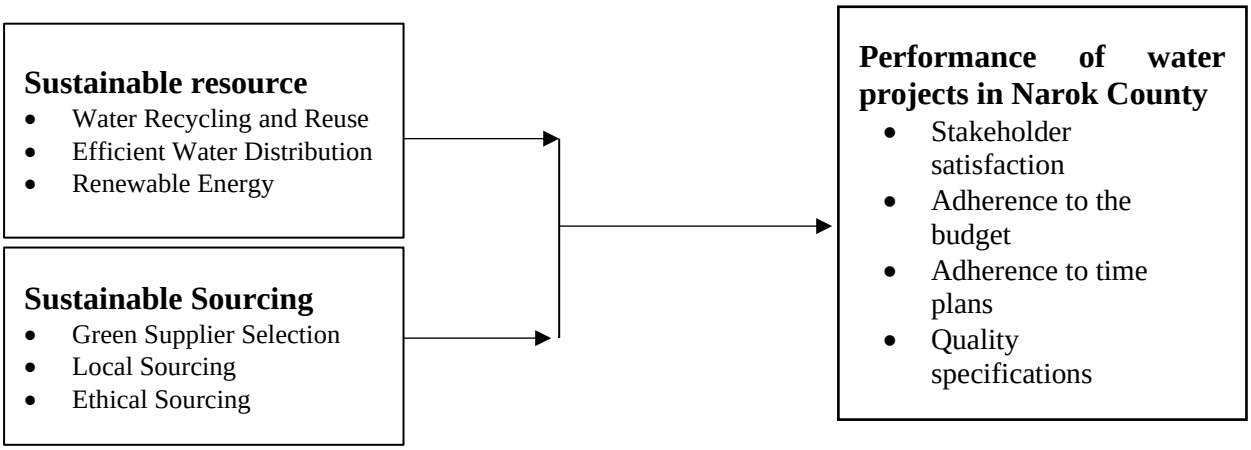

Figure 2.1: *Conceptual framework*

2.1. Empirical Review

2.1.1. Sustainable Resource Optimization on Project Performance

Santos and Silva (2021) conducted a study in Brazil to investigate the impact of sustainable resource optimization on the success of infrastructure projects. The study employed a mixed-methods approach, combining surveys with project managers and document analysis from completed government-funded infrastructure initiatives. The

findings revealed that optimized use of materials, energy efficiency practices, and recycling of construction waste contributed significantly to reducing costs and improving environmental outcomes. The study emphasized that sustainability in resource usage should be integrated early in the project design phase to achieve long-term performance benefits. In their study in China, Zhang and Li (2022) examined the relationship between resource efficiency practices and performance metrics in renewable energy projects. Using a quantitative research design, the authors distributed structured questionnaires to project engineers and sustainability officers across 42 wind and solar energy projects. The results showed a positive correlation between resource optimization strategies—such as reuse of resources and lean material usage—and project cost-efficiency, timeliness, and stakeholder satisfaction. The authors concluded that resource optimization enhances project delivery and supports broader sustainability goals, especially in energy-intensive sectors.

Gupta and Sharma (2023) focused on sustainable resource management within water and sanitation projects in India. Employing a case study methodology, they analyzed six community-based projects funded by local and international NGOs. The study found that projects incorporating strategies like water reuse, solar-powered systems, and localized material sourcing showed better long-term functionality and reduced maintenance costs. Gupta and Sharma emphasized that community training on resource conservation further improved the sustainability and performance of the projects, underscoring the need for both technical and social interventions. In a study based in Germany, Fischer and Weber (2020) explored the effect of digital technologies in optimizing resource usage across construction projects. Using longitudinal data from 25 smart infrastructure projects, the study adopted a regression analysis model to determine the influence of real-time data collection on resource planning. The findings indicated that projects employing digital resource tracking systems experienced significantly lower levels of material waste and fewer cost overruns. The authors advocated for integrating resource optimization technologies into the project lifecycle to boost overall performance and reduce environmental impacts.

Lastly, Nakamura and Tanaka (2024) investigated the role of sustainable resource use in public transportation development projects in Japan. The study utilized a qualitative approach, involving in-depth interviews with project managers and policy makers. Their analysis revealed that sustainable sourcing of construction materials and energy-efficient technologies led to better operational outcomes and improved public satisfaction with the projects. The study concluded that embedding sustainability into procurement and construction practices has a direct and measurable impact on both short-term and long-term project success.

2.1.2. Sustainable Sourcing on Project Performance

Nguyen and Tran (2022) conducted a study in Vietnam to examine how sustainable sourcing practices affect the performance of large-scale construction projects. The research used a quantitative design, collecting data through structured questionnaires from 120 project managers and procurement officers. Using regression analysis, the study found a strong positive relationship between the use of environmentally friendly materials and overall project success, especially in terms of cost control and stakeholder satisfaction. The authors concluded that sourcing sustainably not only enhances ecological outcomes but also improves the efficiency and quality of project execution. In a study from the United Kingdom, Harris and McFarlane (2021) explored the effects

of ethical and green sourcing on project delivery in the manufacturing sector. The researchers used a mixed-methods approach, combining semi-structured interviews with 15 supply chain managers and survey data from 85 organizations. The findings showed that firms employing ethical sourcing policies—such as fair labor practices and certified suppliers—experienced fewer delays and better supplier collaboration, leading to improved performance outcomes. Moreover, customers perceived such projects as more trustworthy and socially responsible.

Chen and Wong (2023) investigated the impact of sustainable procurement practices on infrastructure projects in Hong Kong. The study adopted a case study methodology, analyzing four public transportation projects that integrated sustainability criteria into supplier selection and evaluation processes. The results showed that early involvement of sustainably certified suppliers enhanced risk management, reduced procurement costs in the long term, and improved compliance with environmental regulations. The authors emphasized that sustainable sourcing is not merely a procurement strategy but a driver of long-term project resilience. In Canada, Miller and James (2020) focused on the role of sustainable supplier selection in the renewable energy sector. Their research utilized a Delphi method involving three rounds of expert consultations with sustainability and project management professionals. The study identified key sustainable sourcing criteria—such as carbon footprint, local supplier inclusion, and supplier sustainability ratings—and linked them to project success indicators. The experts agreed that projects using sustainable supplier frameworks were more likely to stay within budget, meet environmental targets, and gain public approval.

Lastly, a study by Rodríguez and González (2024) in Spain assessed the link between sustainable sourcing and performance in municipal infrastructure development. Employing a longitudinal analysis of 30 water supply projects over five years, the study used performance metrics such as cost efficiency, completion timelines, and community satisfaction. The findings revealed that sustainable sourcing—especially sourcing from local eco-friendly vendors—enhanced project outcomes by reducing logistical delays and increasing community support. The researchers recommended institutionalizing sustainability in procurement policies for better project governance and delivery.

3.1. Methodology

This study employed a descriptive survey design to examine how sustainable resource optimization affects the performance of 98 water projects in Narok County, with project managers serving as the unit of analysis. By using a census approach—surveying all projects initiated, completed, or underway between 2019 and 2024—the research aimed to eliminate sampling error and ensure comprehensive data collection. A structured, five-point Likert-type questionnaire was developed based on the study objectives to gather uniform, easily coded primary data; its reliability was assessed via Cronbach's alpha (targeting ≥ 0.70) and its validity ensured through expert review, pilot testing (on 10% of the population in a neighboring county), and component factor analysis to refine survey items. Data collection procedures included obtaining institutional approvals, providing respondents with cover letters guaranteeing confidentiality, and employing a drop-and-pick method to maximize response rates. Finally, responses were edited, coded, and analyzed in SPSS using descriptive statistics to characterize patterns, correlational matrices to detect multicollinearity, and multiple regression to test

hypotheses regarding the impact of sustainable resource management on water project outcomes. The regression model is represented below:

$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \varepsilon$

Where,

$Y =$ water project development in Narok County

$\beta_0 =$Constant

$X_1 =$ Sustainable resource

$X_2 =$ Sustainable sourcing

4.1. Findings And Discussion

This section presents the findings and results of the use of variables using procedures mentioned in chapter three of the methodology. In line with specific objectives, data was analyzed, interpreted, and inferences drawn on them. The main aim of the study was the determination of the influence of sustainable project management on performance of water projects in Narok County. out of the 98 questionnaires distributed, 77 were returned, giving a response rate of 78.6%. After data cleaning, 3 questionnaires were deemed unusable, representing 4.8% of the total returned questionnaires. Consequently, 74 questionnaires were usable, resulting in a usable response rate of 75.6%.

4.1.1. Descriptive Statistics

The results in Table 1 show that the overall performance of water projects recorded a moderate rating (Mean = 3.22, SD = 0.80), indicating that respondents generally perceived project outcomes as average, with some variation in experiences. Among the specific aspects measured, the highest mean was observed for the statement that the water projects meet or exceed quality specifications (Mean = 3.45, SD = 1.18). This suggests that quality standards were largely upheld during project implementation. Conversely, the management of financial resources and adherence to budgets recorded the lowest mean (Mean = 3.09, SD = 1.17), highlighting possible challenges in financial management across projects. Stakeholder satisfaction with the outcomes of the water projects was moderate (Mean = 3.18, SD = 0.98), suggesting that while many stakeholders were reasonably satisfied, there remains room for further improvement in meeting community and donor expectations. Finally, adherence to time schedules showed a moderate rating (Mean = 3.12, SD = 1.14), indicating that while some projects were completed on time, there were delays in others. Overall, the results imply that while the quality of water projects was strong, improvements in financial management and timely delivery could significantly enhance project performance in Narok County.

Table 1: *Descriptive Statistics for Performance of water projects in Narok County*

	Mean	**Std. Dev**
The stakeholders (including community members, donors, and employees) are satisfied with the overall performance and outcomes of the water project in Narok County	3.18	0.98
The water project in Narok County consistently adheres to its allocated budget and manages financial resources efficiently	3.09	1.17
The water project in Narok County is completed on time, adhering to the established time plans and deadlines	3.12	1.14

"The water project meets or exceeds the quality specifications outlined during the planning and implementation stages	3.45	1.18
Performance of water projects in Narok County	**3.22**	**0.80**

Table 2's findings reveal that sustainable resource practices in Narok County's water projects are acknowledged but underutilized, with an overall mean of 2.64 (SD = 0.65) indicating ample room for improvement. Among the dimensions assessed, locally sourcing materials scored highest (M = 2.92, SD = 1.21), reflecting moderate efforts to support local economies and reduce transport emissions. Environmentally friendly supplier selection followed closely (M = 2.90, SD = 1.08), suggesting some prioritization of green criteria in procurement, though still at a modest level. In contrast, ethical sourcing practices (M = 2.59, SD = 0.95) and the broader integration of sustainable sourcing into project operations (M = 2.46, SD = 0.93) lag behind, highlighting weaknesses in supplier standards and the consistency of sustainability measures. These lower scores underscore the need for stronger ethical guidelines, more rigorous environmental criteria in supplier selection, and more comprehensive incorporation of sustainable practices throughout project planning and execution to elevate the overall sustainability of water infrastructure in the county.

Table 2: *Descriptive Statistics for Sustainable resource*

	Mean	**Std. Dev**
Our water project prioritizes the selection of suppliers who follow environmentally friendly practices and offer sustainable products	2.90	1.08
The project focuses on sourcing materials and resources locally to support the local economy and reduce transportation-related emissions	2.92	1.21
We ensure that all suppliers meet ethical standards, including fair labor practices and responsible sourcing of materials	2.59	0.95
"Sustainable sourcing practices, including green supplier selection, local sourcing, and ethical sourcing, are integral to the success of the water project	2.46	0.93
Sustainable resource	**2.64**	**0.65**

Table 3 reveals that sustainable sourcing is perceived as moderately embedded in Narok County's water projects, with an overall mean of 3.24 (SD = 0.68). The strongest endorsement came from the item asserting that "sustainable sourcing practices—including green supplier selection, local sourcing, and ethical sourcing—are integral to the success of the water project" (M = 3.14, SD = 1.08), underscoring stakeholder recognition of its importance despite uneven application. In contrast, the lowest score was for "our water project prioritizes the selection of suppliers who follow environmentally friendly practices and offer sustainable products" (M = 2.23, SD = 0.94), pointing to deficiencies in supplier evaluation criteria. Similarly modest means for local sourcing (M = 2.46, SD = 0.95) and ensuring all suppliers meet ethical standards (M = 2.44, SD = 0.80) highlight that while these practices are on the agenda, they are not yet driving procurement decisions. Collectively, these findings suggest a

clear awareness of sustainable sourcing's value but also indicate critical gaps—in particular, in establishing robust processes for green, local, and ethical supplier selection—that need to be addressed to fully integrate sustainability across project operations.

Table 3: *Descriptive Statistics for Sustainable sourcing*

	Mean	**Std. Dev**
Our water project prioritizes the selection of suppliers who follow environmentally friendly practices and offer sustainable products	2.23	0.94
The project focuses on sourcing materials and resources locally to support the local economy and reduce transportation-related emissions	2.46	0.95
We ensure that all suppliers meet ethical standards, including fair labor practices and responsible sourcing of materials	2.44	0.80
"Sustainable sourcing practices, including green supplier selection, local sourcing, and ethical sourcing, are integral to the success of the water project	3.14	1.08
Sustainable sourcing	**3.24**	**0.68**

4.1.2. Correlation Analysis

The correlation analysis results are presented in Table 4.12, The results showed that there is a strong positive correlation between Performance of water projects in Narok County and sustainable resource, with a Pearson correlation coefficient of $r = 0.713$, $p < 0.01$. This finding suggests that higher levels of sustainable resource are associated with better project performance, indicating that effective support and guidance significantly enhance employees' skills and overall contribution to project success. In addition, Performance of water projects in Narok County demonstrated a moderate positive correlation with sustainable sourcing ($r = 0.530$, $p < 0.01$). This implies that sustainable sourcing practices—such as prioritizing environmentally friendly suppliers and local sourcing—positively influence employee effectiveness and project outcomes..

Table 4: *Correlation Analysis*

		Performance of water projects in Narok County	Sustainable resource	Sustainable sourcing
Performance of water projects in Narok County	Pearson Correlation	1		
	Sig. (2-tailed)			
	N	102		
Sustainable resource	Pearson Correlation	.713**	1	
	Sig. (2-tailed)	0.000		
	N	102	102	
Sustainable sourcing	Pearson Correlation	.530**	.317**	1
	Sig. (2-tailed)	0.000	0.001	

N	102	102	102

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

4.1.3. Regression Analysis

The regression analysis included several components: ANOVA for assessing the goodness of fit, and Coefficient of Estimates, as illustrated in Tables 5,6 and 7. The model summary, detailed in Table 5 evaluates the relationships among the aforementioned variables and their combined influence on Performance of water projects in Narok County.

Table 5: *Model Summary Statistics*

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.802a	0.643	0.628	0.48837

a Predictors: (Constant), Sustainable sourcing , sustainable resource

The results from Table 5 show that the predictors collectively accounted for approximately 64.3% of the total variation in the Performance of water projects in Narok County ($R^2 = 0.643$, Adjusted $R^2 = 0.628$). This indicates a strong relationship between the identified factors and project performance outcomes. The high R-square value suggests that Sustainable sourcing, and Sustainable resource collectively have a substantial influence on the effectiveness and success of water projects in Narok County.

Multiple regression F-test analysis was conducted using ANOVA to determine the goodness of fit of the regression model assessing the influence of sustainable project management factors on the Performance of water projects in Narok County. The results are summarized in Table 6.

Table 6: *ANOVA for goodness of fit*

ANOVA
a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	41.695	4	10.424	43.705	.000b
	Residual	23.135	97	0.239		
	Total	64.83	101			

a Dependent Variable: Performance of water projects in Narok County

b Predictors: (Constant) sustainable sourcing and sustainable resource

The ANOVA results shown in Table 6 indicate that the joint prediction of the sustainable project management factors—Sustainable sourcing, and Sustainable resource—on the Performance of water projects in Narok County was statistically significant ($F = 43.705$, $p = .000$). This finding confirms that the regression model provides a good fit to the data and that the predictors collectively contribute significantly to explaining the variance in project performance. The significance level ($p < 0.05$) underscores the model's strength, validating the relevance of sustainable HRM practices, stakeholder engagement, sustainable sourcing, and resource optimization in enhancing the success of water projects in the county.

The results from Table 7 present the individual contribution of each predictor (Stakeholder's Participation, Sustainable Resource, Sustainable Sourcing, and Sustainable HRM) to the Performance of water projects in Narok County, analyzed through the multiple regression model.

Table 7: *coefficient of Estimates*

	Unstandardized Coefficients		**Standardized Coefficients**		
	B	**Std. Error**	**Beta**	**t**	**Sig.**
(Constant)	-0.007	0.297		-0.024	0.981
Sustainable resource	0.538	0.083	0.490	6.504	0.000
Sustainable sourcing	0.259	0.082	0.232	3.152	0.002

a Dependent Variable: Performance of water projects in Narok County

The first objective of the study aimed at determining the effect of sustainable resource on the performance of water projects in Narok County. The regression analysis showed a strong and statistically significant positive effect of sustainable resource ($\beta = 0.538$, $p < 0.001$). This coefficient was the highest among all predictors, indicating that resource optimization had the most profound influence on project performance. This suggests that the efficient and sustainable use of resources—whether materials, energy, or financial inputs—greatly enhanced the outcomes of water projects. Sustainable resource management likely helped in reducing wastage, lowering costs, improving environmental outcomes, and promoting project sustainability, ultimately translating into better quality and more resilient infrastructure. The study's findings are strongly supported by previous research. Santos and Silva (2021) demonstrated that practices such as material optimization, energy efficiency, and recycling significantly reduced costs and improved environmental performance. Similarly, Zhang and Li (2022) highlighted that resource reuse and lean material usage strategies were positively correlated with project timeliness, cost-efficiency, and stakeholder satisfaction. Gupta and Sharma (2023) reinforced these results by showing that projects incorporating

water reuse, solar-powered systems, and local material sourcing exhibited better functionality and lower maintenance costs in the long term. Fischer and Weber (2020) further noted that using digital resource tracking systems helped minimize material waste and reduced cost overruns. These findings emphasize that sustainable resource optimization is not just an environmental concern but a strategic management tool that enhances the efficiency, resilience, and performance of infrastructure projects. Thus, for water projects in Narok County, prioritizing resource sustainability appears to be critical for achieving high-impact results.

The second objective of the study investigated the impact of sustainable sourcing on the performance of water projects in Narok County. The regression results revealed a significant positive relationship between sustainable sourcing practices and project performance ($\beta = 0.259$, $p = 0.002$). This indicates that the adoption of sustainable procurement practices—such as purchasing environmentally friendly materials, engaging ethical suppliers, and prioritizing local vendors—significantly enhanced the performance of water projects. Sustainable sourcing likely contributed to reducing project delays, improving quality, supporting local economies, and fostering greater community acceptance of projects. Furthermore, ethical sourcing practices might have strengthened supplier relationships, ensured regulatory compliance, and minimized reputational risks, thus enhancing overall project delivery. Empirical literature strongly supports these findings. Nakamura and Tanaka (2024) reported that sourcing sustainable construction materials and energy-efficient technologies led to better operational outcomes and higher public satisfaction. Nguyen and Tran (2022) similarly found that the use of environmentally friendly materials was positively associated with cost control, stakeholder satisfaction, and improved project efficiency. Harris and McFarlane (2021) observed that projects involving ethical sourcing policies experienced fewer supplier conflicts, smoother operations, and greater customer trust. Additionally, Chen and Wong (2023) emphasized that early engagement with sustainably certified suppliers enhanced procurement risk management and reduced long-term costs. Miller and James (2020) also linked sustainable supplier frameworks to better budget adherence and environmental compliance, while Rodríguez and González (2024) highlighted that sourcing from local eco-friendly vendors helped reduce logistical delays and enhanced community support. Together, these studies show that sustainable sourcing is not merely an ethical obligation but a practical strategy for improving project delivery, stakeholder satisfaction, and long-term resilience, as confirmed by the results from Narok County.

5.1. Conclusion

Based on the findings, sustainable resource initiatives are shown to have a strong positive correlation with the performance of water projects in Narok County. The results reveal that optimizing resource use and incorporating sustainable practices have a significant impact on project success. This finding emphasizes the importance of implementing efficient and environmentally friendly resource management strategies to improve the effectiveness and sustainability of water projects in the region. Regarding sustainable sourcing, the findings indicate a moderate positive correlation between sustainable sourcing practices and the performance of water projects. The statistical significance of sustainable sourcing practices in the regression analysis further supports their importance in enhancing project outcomes. The positive impact of sustainable sourcing, particularly through eco-friendly procurement and responsible

material use, highlights its role in improving both environmental and operational aspects of water projects.

6.1. Recommendations

The strong positive correlation between sustainable resource practices and project performance suggests that water projects in Narok County should prioritize the implementation of more robust resource optimization strategies. It is recommended that project managers focus on adopting energy-efficient technologies, water conservation techniques, and resource recycling initiatives. In addition, providing training on sustainable resource practices for both staff and the community could further enhance the long-term success of these projects.

In light of the positive effects of sustainable sourcing on project performance, it is recommended that water projects in Narok County increase their commitment to environmentally responsible sourcing. This includes sourcing eco-friendly materials, working with local suppliers who adhere to sustainability standards, and considering the environmental impacts of procurement decisions. Additionally, establishing sustainability guidelines for procurement processes could help ensure that sourcing decisions align with the project's long-term goals of environmental and operational efficiency.

7.1. Further Research

The present study has made significant contributions to understanding the impact of sustainable project management practices on the performance of water projects in Narok County, focusing on key practices such as stakeholder participation, sustainable resource optimization, sustainable sourcing, and sustainable HRM. However, to gain a more holistic understanding of the relationship between sustainable project management and project performance, future research should explore additional sustainable practices, such as green building techniques, climate change adaptation strategies, and social sustainability measures, which could further influence project outcomes. Moreover, the scope of this study was confined to water projects in Narok County, which may limit the generalizability of its findings. To enhance the external validity of these results, future studies should replicate this research in water projects across different counties or regions. This would provide a broader perspective on whether the effects of sustainable project management practices are consistent across various settings, cultures, and environmental conditions. Additionally, expanding the geographic scope could offer insights into the specific challenges and opportunities in diverse regions, thus contributing to a more comprehensive body of knowledge on sustainable project management.

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