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Risk Management Planning and The Sustainability of Donor-Funded Water, Sanitation and Hygiene Projects in Nairobi City County, Kenya

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Abstract

In recent years, the quest for sustaining water, sanitation, and hygiene (WASH) projects has become a critical global concern, particularly in developing countries where infrastructure failures continue to undermine access to essential services. Several donor-funded WASH projects in Nairobi City County have failed to achieve long-term operational success after donor withdrawal, largely due to inadequate integration of strategic risk management planning despite significant investments by development partners and governments. The study aimed to examine the influence of risk management practices on the sustainability of donor-funded WASH projects in Nairobi City County. The theoretical underpinnings of the study were the sustainability theory and the prospect theory. The study adopted a convergent (parallel) research design, which is a type of mixed research methods that required the researcher to engage in simultaneous collection and analysis of qualitative and quantitative data. The targeted a population 403 expert staff members of donor-funded WASH projects completed by NCWSC and AWWDA in Nairobi City County. The respondents included 200 expert staff of donor-funded WASH projects determined using Yamane's formula. Data was collected using a survey questionnaire comprising of "closed-ended and open-ended items. Data collected was analyzed using the Statistical Package for Social Sciences and content analysis. The statistical measures used included means, standard deviations, Pearson's correlation coefficients, ANOVA, and p-values. The analyzed data revealed that risk management planning (B = 0.285, p = 0.005) have a significant positive influence on the sustainability of donor-funded WASH projects" in Nairobi City County. The study findings articulate the recommendation to prioritize and adopt comprehensive risk management plans to enhance sustainability of donor funded WASH projects in Nairobi County, Kenya.

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1. INTRODUCTION

1.1 Background

In the recent years, the focus on achieving the sustainability of water, sanitation, and hygiene (WASH) projects has continued to elicit research interest, especially in developing countries (Daniel *et al.*, 2021; Marcus *et al.*, 2023). Based on the assertion by Bishoge (2021), sustainability in the WASH context depicts the ability of WASH projects remaining functional in the provision of services, even after the WASH donor or implementer organization ceases to support the project. Globally, several countries are struggling to achieve sustainability of the WASH projects. For example, Indonesia is one of the developing countries grappling to achieve 100% access to sustainable water and sanitation services uninterruptedly (Daniel *et al.*, 2021). Within the African continent, recent estimates show that the WASH system failure has resulted in a loss of about $1.2 billion investment (Daniel *et al.*, 2021). Kenya is one of the countries in Sub-Saharan Africa that have made great strides towards meeting the global targets on access to water as at the year 2015, 60% of the population "had access to potable water" (United Nations International Children's Emergency Fund [UNICEF], 2021). However, access to water and sanitation remains low as only about 29% of the population have access to improved sanitation nationally (United States Agency for International Development [USAID], 2020).

The increased need for sustainability of WASH projects has compelled governments and institutions to establish policies and regulations with a particular focusing on the strategic planning stage (Kim *et al.*, 2022). While there are several strategic planning practices that influence sustainability of WASH projects, particular scholarly research has remained particularly attentive to risk management planning. Risk management planning is meant to prepare WASH project implementers of potential threats, including political instability, funding shortfalls, or environmental hazards. For instance, a study by Challa et al. (2022), based on a South Sudanese context, revealed that lack of risk mitigation strategies left several water treatment plants non-operational after seasonal flooding damaged critical components.

1.2 Problem

While there has been heavy investment by development partners and governments in water, sanitation, and hygiene (WASH) projects, many WASH projects struggle to achieve long-term operational success after donor withdrawal. WASH systems designed to provide basic services often deteriorate. However, between 30% and 40% of such infrastructure ends up non-functional, representing an estimated US $1.2 to 1.5 billion in wasted investments over two decades (Neely & Valcourt, 2024). In developing country cities, such as Nairobi City County, Kenya, the sustainability of donor-funded WASH projects remains critically low, particularly due to limited attentiveness to strategic planning processes during the onset (World Bank, 2021). Among these include limited planning for risk, which collectively contribute to project underperformance and eventual collapse (Win *et al.*, 2024).

Despite numerous studies having explored sustainability and strategic planning in sectors such as healthcare (Odhiambo & Njuguna, 2021), Savings and Credit Cooperative Organizations (SACCOs) (Karuoya & Waithaka, 2023), and non-governmental organizations (Munene & Nyaga,

2021), limited empirical evidence exists on how risk management planning influence the sustainability of WASH projects in Nairobi City County, Kenya. This gap in contextual and sector-specific knowledge restricts the ability of practitioners and policymakers to implement effective planning frameworks in the WASH sector. Therefore, the motivation of this study was based on the need to investigate how risk management planning influences the sustainability of donor-funded WASH projects in Nairobi City County.

1.3 Aim

The aim of the study was to assess the influence of risk management planning on the sustainability of donor-funded water, sanitation, and hygiene projects in Nairobi City County, Kenya.

1.4 Hypothesis

H_{01}: *There is no significant "influence of risk management planning on the sustainability of donor-funded water, sanitation, and hygiene projects" in Nairobi City County, Kenya.*

1.4 Significance

This study is significant to WASH project managers, policymakers, researchers, and local communities. It enhances understanding of how strategic planning affects donor-funded WASH project sustainability in Nairobi, informing policy, governance, and partnership models. Researchers gain insights for theory expansion and future studies. Local communities benefit through improved planning for lasting water and sanitation access, aligning with SDG 6. The findings have both local and global relevance for sustainable WASH interventions.

2. LITERATURE REVIEW

2.1 Theoretical Review

The theories that underpinned this study included the sustainability theory and the prospect theory.

2.1.1 The Sustainability Theory

The sustainability theory was first popularized in 1987 by the Brundtland Commission in its report, "*Our Common Future"* (Hajian & Kashani, 2021). The key proposition of sustainability is meeting "the needs of the present unprecedently without compromising the ability of future generations to meet their own needs" (Emina, 2021; Elsawy & Youssef, 2023). The theory emphasizes the integration of environmental, social, and economic factors in decision-making processes for any intervention or project intended to enhance the living conditions of humanity (Crossley et al., 2021). While scholars have maintained that sustainability theory is difficult to operationalize in practice due to complexities associated with three dimensions that define it (Rasmussen & Thøgersen, 2020), the theory is remains relevant because it provides a basis for framing the role that risk management planning as a strategic planning practice play in promoting achievement of not only short-term goals of donor-funded WASH projects, but also ensuring long lasting impact.

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2.1.2 The Prospect Theory

The prospect theory emerged from the scholarly works of "Daniel Kahneman and Amos Tversky in 1979," which were cited in Kahneman's 2002 Nobel Memorial Prize Economics. The prospect theory explains how individuals make decisions in context of risks and hard times (Wang *et al.,* 2020). It is common place for key stakeholders such as local governments, funders, and implementing agencies to exhume risk aversion when faced with a possibility of project failure in the context of donor-funded WASH projects. The prospect theory helps in understanding how stakeholder's perception of project failure may compel them to develop risk aversion behaviors. Despite the prospect theory being criticized on the basis of having limited applicability to the real-world decision-making as the theory focuses on hypothetical scenarios (Tian *et al*., 2022), it is relevant to the study because it provided a basis for framing the outcomes of WASH projects, particularly long-term benefits as a motivator for stakeholders' willingness to minimize risk-averseness stances in the pursuit for enhanced project sustainability.

2.2 Empirical Review

Risk management is an undeniable aspect in WASH projects that seek to achieve sustainability. Studies have shown that effective management of risks is crucial in sustainability of WASH projects. For example, Hakkarainen *et al.* (2020) launched an inquiry on the integration of risk management strategies within the WASH projects in Bangladesh. The study employs a mixed – method approach whereby they identify key risks that affect the outcome of projects such as political instability and natural disaster. The research proposes that effective risk management promotes sustainable WASH solutions. The necessity of developing adaptive management framework such as risk mitigating strategies promotes longevity of WASH interventions in vulnerable communities. However, the study is not based on longitudinal data which is necessary in determining the long-term impacts of risk management practices. Moreover, the case study approach, while it offers depth, may not be appropriate in capturing the broader implications of risk management in diverse WASH contexts. The second limitation relates to the geographical context of the study, which is dissimilar to the Kenyan context, hence, it limits the generalizability of the results towards informing the Kenyan context. While the aforementioned weaknesses are evident, studies such as Osei-Kyei *et al*. (2023) and Wong *et al.* (2022) have revealed that effective planning for risk management is a recipe for sustainability outcomes.

Moreover, Osei-Kyei *et al*. (2022) studied risk management practices of WASH projects in private and public partnerships in Ghana; to highlight the importance of assessing risks throughout the execution of the project. unlike most studies in risk management that adopt secondary or quantitative data (Kapwata *et al.,* 2022; Ward *et al.,* 2022), Osei-Kyei *et al.* (2022) conducted qualitative analysis on data from interviews with key stakeholders. The study established that proactive risk planning promotes project sustainability. Based on this study, integrating local knowledge into the risk assessment enhances the resilience of WASH initiative and promotes the adaptation of social dynamics and environmental changes. Nonetheless, one limitation of the study is that it relied on a limited sample, which is not representative of the "diverse range of stakeholders that are involved in WASH projects. Moreover, the study is based in Ghana and therefore is not representative of Kenyan context and other regions facing diverse challenges in WASH initiative implementation. Adopting a mixed method would generate more robust findings by combining

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both quantitative and qualitative featuring larger sample sizes, hence, generating highly generalizable findings.

Ochieng *et al.* (2021) investigates the role of risk management in promoting the sustainability if WASH initiatives in Kenya. The study employs quantitative survey to assess the perceptions of WASH practitioners." Based on the study findings, it was established that there is a strong correlation between risk management planning and the successful implementation of sustainable WASH initiatives, auguring the findings by Taherdoost (2021). The study recommends development of standardized risk assessment tools as well as training programs to promote effective risk management practices among practitioners to promote effectiveness of WASH programs especially in resource limited contexts. Nonetheless, the limiting factor of the study is its reliance of self –reported data which is susceptible to bias (Bauhoff, 2024). Moreover, exclusion of qualitative data limits the understanding of practitioner's perception and challenges they face in implementing risk management. A study adopting "both quantitative and qualitative data in a mixed research design could increase the robustness and generalizability of the findings."

2.3 Conceptual Framework

The conceptual framework illustrates the tentative influence of risk management planning on the sustainability of donor-funded WASH projects.

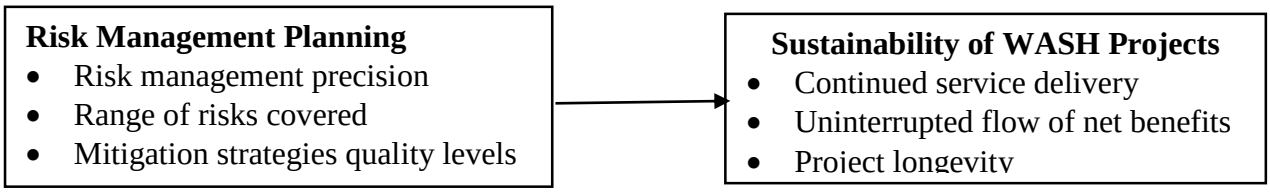

Figure 1. Conceptual framework

3. METHODOLOGY

3.1 Research Design

This study adopted a convergent (parallel) research design. The design is a type of mixed methods design, which combines qualitative and quantitative approaches in a single study to offer comprehensive understanding of the research problem (Creswell & Plano Clark, 2023). Adopting the design implied that the study collected, analysis and integrated both quantitative and qualitative data simultaneously.

3.2 Population and Sampling

The current study's target population included the expert staff responsible for WASH projects in Nairobi City County. The two main organizations that implement WASH projects in "Nairobi City County are Nairobi City Water and Sewerage Company (NCWSC) and Athi Water Works Development Agency (AWWDA)." Hence, the target population for the study includes the expert staff of completed donor-funded WASH projects by the two key organizations providing the

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services in Nairobi City County, including Nairobi City Water and Sewerage Company (NCWSC) and Athi Water Works Development Agency (AWWDA). Table 1 shows the study population targeted.

Table 1: Target population

Organization	Projects	Staff per project	Population (N)
Nairobi City Water and Sewerage Company	32	8	256
Athi Water Works Development Agency	21	7	147
Total	53		403

Source: NCWSC (2025); AWWDA (2025).

The sample size was determined using "Yamane's (1961) formula, as shown below.
$n = N/1 + N(e)^2$"
Where: "N = Population of study; e = degree of error expected; n=sample size."
$= 403/1 + 403(0.05)^2$
$=403/1 +1.0025000000000002)$
$n = 200.2496878901373 \sim 200$

Using the formula, the sample is 200 expert staff of NCWSC and AWWDA who oversaw the completed WASH projects in Nairobi County. The sample size was proportionately allocated to the two organizations, as detailed using Table 2.

Table 2: The study participants

Organization	Population (N)	Percentage	Sample size
NCSWC	256	63.5%	127
AWWDA	147	36.5%	73
Total	403	100.0%	200

The table categorizes participants involved in a study based on their organizations and the number of projects they represent. The research adopted a voluntary response sampling technique was used to select the participants. According to Hiratsuka (2025), a voluntary response sample involves selecting a sample from volunteered and qualified potential respondents in the target population. The participant recruitment process was through organizational permission, which involved contacts persons (gatekeepers) from NCWSC and AWWDA helping the researcher to disseminate the web-based questionnaire to the contact list of experts who have participated in completed donor-funded WASH projects and requesting them to participate. Official permissions were sought from the two agencies prior to the commencement of the data collection exercise by sending emails and text messages to the project managers and project officers.

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3.3 Data Collection and Analysis

The study adopted survey questionnaires consisting of both "closed-ended and open-ended items to collect data. Quantitative data is numeric data mostly collected using the closed-ended questions while open-ended questions were used to collect qualitative data" (Rouder *et al.*, 2021, p. 12). Questionnaires were used "to collect quantitative data from the expert staff of each WASH project" (p. 32). Using a research tool with a mix of both closed-ended and open-ended questions ensured standardized data collection" for easy quantification and provide in-depth insights, allowing for a comprehensive analysis of both statistical trends and contextual nuances in a study. Data collection followed the University and NACOSTI approvals; data was collected via a Google Forms questionnaire distributed by NCWSC and AWWDA gatekeepers to 200 expert staff of completed WASH projects. Quantitative closed-ended questions measured prevalence and sustainability, while qualitative open-ended questions captured in-depth perceptions and experiences of strategic planning practices in WASH projects.

Quantitative data collected was "coded and entered into the Statistical Package for Social Sciences (SPSS) Version 25 after which it was cleaned and subjected to software commands that permits the researcher to generate descriptive statistics (frequencies, percentages, means and standard deviations) and inferential statistics (correlations and regressions. Linear regression was used to analyze the significance of the influence of risk management planning (independent variables) on the sustainability of donor-funded WASH projects (dependent variable). Correlation analysis was used to measure the strength and direction of associations between individual planning components and sustainability indicators." A linear regression equation was created from the findings in the form:

$Y= \beta_o+ \beta_1 X_1+ \varepsilon$ ……………………………………………………………………………..….(i)

Where: Y represents Sustainability of WASH projects; B_0 is the Constant term (intercept); β1 represents the coefficient of the risk management planning to be estimated while X_1 is risk management planning and ε stands for error term or Stochastic error.

3.4 Research Ethics

The study adhered to ethical standards by obtaining university and NACOSTI approvals, securing informed consent, ensuring anonymity, protecting data with strong passwords, avoiding harm, maintaining transparency, safeguarding privacy, and respecting cultural norms to ensure participants' safety, confidentiality, and community benefit.

4. FINDINGS

4.1 Response rate and Reliability

Analysis of the response rate revealed that there was a 77% response rate. Table 3 displays the detailed analysis of the response rate.

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Table 3: Response rate

Particulars	Frequency	Percentage
Sample size	200	100%
Number of respondents	159	79.5%
Incomplete cases	5	2.5%
Response rate	154	77%

The response rate of 77% was determined to be sufficient to proceed to data analysis because it exceeded the 75% response rate recommended by Ali *et al*. (2021). Similarly, Saunders (2019) equally recommended the response rate between 60% and 80% as sufficient rate to proceed to data analysis. The high response rate was made possible by an extensive collaboration between the contact persons and regular reminders sent to the respondents during the data collection period.

Reliability analysis revealed that all the items were reliable for analysis. Table 4 provides the details of the analysis.

Table 4: Reliability analysis

Variable	Reliability analysis		Validity analysis			
	Cronbach's alpha	Verdict	KMO	Barlett's Test	Factors	Verdict
Institutional support	0.747	Reliable	0.776	0.001	> 0.5	Valid
Sustainability of WASH Projects	0.890	Reliable	0.685	0.04	>0.5	Valid

All variables "demonstrated high internal consistency, with Cronbach's alpha values ranging from 0.747 to 0.890, indicating strong reliability. Validity analysis showed KMO values above 0.5 and significant Bartlett's Test results ($p < 0.05$)" for all variables, confirming sampling adequacy and construct validity.

4.2 Demographic Characteristics

The demographic characteristics of the respondents are detailed in Table 5.

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Table 5: Respondents' demographic details

Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	71	46.1
	Female	83	53.9
Age	Below 20	1	0.6
	21–30 years	15	9.7
	31–40 years	61	39.6
	41–50 years	58	37.7
	51–60 years	15	9.7
	Above 61 years	4	2.6
Education Level	Secondary	9	5.8
	Tertiary	57	37.0
	First Degree	68	44.2
	Postgraduate	18	11.7
Years in Project	< 3 years	11	7.1
	3–4 years	143	92.9
Time Since Project Completion	< 6 months	24	15.6
	1–3 years	60	39.0
	4–6 years	61	39.6
	> 6 years	9	5.8
Occupational Role	Technical	41	29.6
	Managerial	49	31.8
	Community-facing	47	30.5
	Monitoring	3	1.9

The descriptive statistics reveal a well-balanced gender distribution, with slightly more female respondents, reflecting women's strong involvement in WASH-related community roles. Most respondents are middle-aged (31–50 years), indicating substantial professional experience, and the majority possess tertiary or degree-level education, ensuring informed contributions. Nearly all participants have been involved in WASH projects for 3–4 years, offering rich, relevant insights into project sustainability. The distribution of projects by completion time allows for both short- and long-term sustainability assessment. Diverse occupational roles, managerial, technical, community-facing, and monitoring, ensure a multidimensional perspective, enhancing the study's capacity to evaluate strategic planning practices influencing the sustainability of donor-funded WASH projects.

4.3 Descriptive Analysis for risk management planning

The study presented the respondents with a list of statements that they were required to provide ratings of "the extent to which they agree or disagree with each study questionnaire's item. Mean (M) and standard deviation (SD) were used to analyze the results," as shown in Table 6.

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Table 6: Likert-based descriptive table of environmental scanning

Statement	1	2	3	4	5	Mean	Std. Deviation
I execute a timely identification of emerging trends that impact the sustainability of WASH projects prior to implementation.	2(1.3)	2(1.3)	14(9.1)	119 (77.3)	17(11)	3.954	5.60866
The situational analysis-reports I prepare during strategic planning provide actionable insights for ensuring the long-term success of donor-funded WASH projects.		9(5.8)	3(1.9)	117(76)	25(16.2)	4.026	0.64624
I ensure strategic planning process does not effectively address environmental, social, and economic factors critical to the sustainability of WASH projects.	1(0.6)	6(3.9)	10(6.5)	97(63.0)	40(26.0)	4.097	4.73002
The integration of diverse information sources during strategic planning enhances the alignment of WASH project goals with sustainable development objectives.	2(1.3)	6(3.9)	6(3.9)	102(66.2)	38(24.7)	4.090	9.74416
Accurate information-integration in strategic planning practices positively influences the sustainability outcomes of donor-funded WASH projects.		9(5.8)	2(1.3)	97(63)	46(29.9)	4.168	8.72134
Total						20.338	3.450
Composite mean and standard deviation						4.0675	0.6900

The findings suggest that respondents generally view strategic planning as a crucial factor in enhancing the sustainability of WASH projects. With a total mean of 4.0675, there is an agreement that timely identification of emerging trends, accurate information integration, and addressing environmental, social, and economic factors enable the successful long-term outcomes for donor-funded projects in Nairobi City County. This coincides with the assertion by Fleisher and Bensoussan (2020), who argued that conducting environmental scanning increases project understanding and consequently the potential for improved performance. The majority of the

respondents, 119 (77.3%), agreed with the statement regarding the execution of a timely identification of emerging trends that impact the sustainability of WASH projects with only 17 (11%) strongly agreeing. According to Valcourt *et al.* (2020), environmental scanning should be conducted prior to project implementation to inform the process. However, 14 (9.1%) remained neutral, and only 2 (1.3%) disagreed, showing that most believe trends are identified effectively, though some are uncertain or disagree.

As the findings further revealed about the usefulness of situational analysis reports, majority of the participants, 76% (n = 117) agreed that the reports provide actionable insights for ensuring the long-term success of donor-funded WASH projects. On the same note, 16.2% (n = 25) strongly agreed that reports from environmental scanning tend to provide actionable insights. Only 9 (5.8%) disagreed, and 3 (1.9%) were neutral. This indicates that there is a broad confidence in the utility of these reports for project success. Based on the study findings, it was evident that when it comes to addressing environmental, social, and economic factors in strategic planning, 97 (63%) of respondents agreed that they ensure environmental scanning reports emphasize the sustainability elements while 40 (26%) strongly agreed. Consistent with the argument by ockwood *et al.* (2020), this indicates that the three factors are generally well incorporated in the strategic planning process. However, 6 (3.9%) disagreed while 10 (6.5%) maintained neutrality, which shows some concerns about the thoroughness of this integration in the planning process.

The study results focusing on the integration of diverse information sources revealed that majority 66.2% (n = 102) of the participants agreed that integrating information sources enhances the alignment of WASH project goals with sustainable development objectives, and 38 (24.7%) strongly agreed with the statement. However, 6(3.9%) disagreed, and another 6 (3.9%) were neutral, suggesting that while most respondents see the value in diverse data sources, there is some disagreement about its effectiveness. The impact of accurate information integration on sustainability outcomes is evident, given that most of the respondents (97/63%) agreed with the statement while 29.9% (n = 46) strongly agreed, making it the most supported statement. Only 9 (5.8%) disagreed and 2 (1.3%) maintained neutrality, underscoring the widespread belief that accurate information is crucial for ensuring the success and sustainability of projects.

The highest mean (4.17) emphasizes the centrality of accurate information integration, indicating that respondents believe it significantly influences sustainability. However, while the overall trends are positive, there is some variability in responses, as reflected in the standard deviations ranging from 0.61 to 0.74, showing that perspectives on the effectiveness of specific aspects like situational analysis and the integration of diverse information sources differ. Despite the variability, it is evident that the responses indicate a consensus in the findings, given that the standard deviation values are below 1 and the mean standard deviation is 0.69 (SD < 1). Thus, the data highlights a general consensus on the importance of strategic planning, though some differences in opinion exist regarding its execution and impact. Consistency with existing literature, such as Win *et al.* (2024) and Fleisher & Bensoussan (2020), the current study revealed that environmental scanning is a crucial step in strategic planning processes.

However, “the study revealed that a greater proportion of the respondents (donor-funded WASH project experts) planned to conduct environmental scanning only at project inception. The questionnaire also required the respondents to indicate the extent” to which they had planned to

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conduct environmental scanning, as determined during the commencement of the project. The data was analyzed and the results indicated in Table 7.

Table 7: Timing of environmental scanning

		Frequency	Percent
Valid	Monthly	8	5.2
	Quarterly	37	24.0
	Annually	39	25.3
	Only at project inception	67	43.5
	Not all	3	1.9
	Total	154	100.0

While environmental scanning mostly occurs at project inception, Lockwood *et al.* (2020) suggested that it is necessary to execute the practice at each phase of the project to respond to any changes in priorities and preferences. Environmental scanning is primarily conducted at project inception (43.5%), limiting adaptability to emerging trends. Challenges such as limited capacity, funding, and organizational culture may hinder routine scanning. Moreover, the quality of environmental scanning depends on the differences in data sources as well as the depth of analysis which affect accuracy, (Roberts, 2022). The actors in WASH project should prioritize having continuous comprehensive scanning throughout the project cycle. To ensure responsiveness and promote the sustainability as well as long term impact of donor-funded projects.

The key theme that emerged from qualitative dataset is the collaborative and data driven research driven approaches that identify emerging trends in WASH projects. The participant's responses on open ended questions aimed at identifying the trends in WASH projects reflect a strong emphasis on community engagement, research, and stakeholder interaction. A significant number of respondent's mention "*research"* as a key method in using "*online platforms"* to gather information (Respondent 19). Several individuals noted the value of community-based engagement and note that "*conversations with target groups"* and *"engaging the community through complete member involvement"* are essential (Respondent 7, Respondent 9). Others highlight *"monitoring the aid landscape"* and *"tracking WASH indicators"* to identify the patterns in the sector (Respondent 12, Respondent 151). Some respondents mention informal engagement methods such as "*having informal conversations with different groups"* and *"sharing notes with stakeholders"* (Respondent 28, Respondent 117), which are suggestive of a collaborative approach to trend identification. Additionally, *"contextual analysis"* was frequently cited valuable tool for the comprehension addressing emerging and local dynamics in addressing emerging challenges in community (Respondent 106, Respondent 134). The overall responses demonstrate a multifaceted approach which blended research, collaboration and community feedback to stay tuned to trends that can impact the sustainability of WASH projects.

The theme of information management that emerged from the study as key in promoting information accuracy. The responses to the questions about information accuracy and integration in WASH projects that highlight several key strategies such as focusing on data security, use of technology and focusing on data security. A common approach is the *"unification of data from various sources to a unified platform for final analysis and reporting"* (Respondent 1), which

ensures that all relevant Information is centralized for consistency and accuracy. A number of respondents also emphasized the importance of *"implementing robust security measures"* to protect sensitive data and *"guarantee confidentiality"* (Respondent 2, Respondent 5), which promotes free sharing of information. Training and education were also mentioned in various instances as they highlight the clients need to *"train data users on data quality and best practices"* (Respondent 3). Additionally, the adoption of *"modern technology"* was in multiple instances mentioned as a key tool for maintaining data integrity, as it entails various automated data quality checks, validation rules, and data cleaning processes being particularly valuable (Respondent 7, Respondent 8). Similar to the argument by Otundo *et al*. (2024), these measures are combined to foster an environment where accurate, high-quality data can be integrated and used effectively for developing strategies in WASH projects. Overall, the strategies revolve around ensuring data accuracy through comprehensive training, technological support, and robust data management systems.

4.4 Correlation between risk management planning and sustainability of donor-funded WASH projects

The correlation between "risk management planning and sustainability of donor-funded WASH projects is strong and positive (r = 0.669; r> 0.5), as detailed in table 8.

Tabe 8: Correlation analysis

Independent variable	Pearson correlation	Sustainability of donor-funded WASH projects
Risk management planning	Pearson Correlation	**.669****
	Sig. (2-tailed)	**0.00**
	N	**154**

The correlation is also significant, given the p-value of 0.00 ($p < 0.05$). The correlation value indicates that a unit change in risk management planning could result to a 0.669 change in sustainability of donor-funded WASH projects." Scholarly literature, such as Osei-Kyei *et al*. (2023) and Wong *et al.* (2022), has shown that planning for risk management enhances the extent to which projects meet the sustainability criteria in addition to other performance expectations.

4.5 The Influence of Risk Management Planning on the Sustainability of Donor-funded WASH Projects

The model summary demonstrates a moderate positive "influence of risk management planning on the sustainability of donor-funded WASH projects in Nairobi City County", as shown in Table 9.

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Table 9: Model summary for risk management planning

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.669[a]	.448	.444	.30596

a. Predictors: (Constant), Risk management planning

The model shows a moderate to "strong positive correlation between risk management planning and the dependent variable, with an R-value of 0.669." The R^2 value of 0.448 indicates that "44.8% of the variance in the dependent variable is explained by risk management planning while the remaining 63.2% is explained by factors outside this model. This suggests a moderate level of explanatory power. The adjusted R^2 of 0.444 confirms that the model is well-specified, with no unnecessary predictors included. The standard error of the estimate (0.30596) indicates that the predictions deviate from the actual values by approximately 0.306" units on average. Therefore, the model demonstrates solid predictive strength of the influence of risk management planning on the sustainability of donor-funded WASH projects in Nairobi City County.

The ANOVA analysis was computed to determine the significant of the model to determine the influence of risk management planning on the sustainability of donor-funded WASH projects in Nairobi City County, as detailed in Table 4.10.

Table 10: Analysis of variance for risk management planning

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	11.541	1	11.541	123.291	.000[b]
	Residual	14.229	152	.094		
	Total	25.770	153			

a. Dependent Variable: Sustainability of donor-funded WASH projects
b. Predictors: (Constant), Risk management planning

The results of the ANOVA analysis show that "the regression model is statistically significant, with a p-value of 0.000 ($p < 0.05$). This indicates a strong relationship between risk management planning and the sustainability of donor-funded WASH projects in Nairobi City County. The regression sum of squares (11.541) represents the variation explained by the model, while the residual sum of squares (14.229) reflects unexplained variation. The large F-statistic ($F = 123.291$) confirms the model's overall significance, which suggests that risk management planning is a key predictor of sustainability of donor-funded WASH projects. The results indicate that risk management planning" plays a crucial role in determining the sustainability of WASH projects.

The regression analysis generated the coefficient of risk management planning showing the significant influence of risk management planning on the sustainability of donor-funded WASH projects in Nairobi City County, as detailed in Table 11.

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Table 11: Coefficients for risk management planning

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	1.455	.236		6.171	.000
	Risk management planning	.645	.058	.669	11.104	.000

a. Dependent Variable: Sustainability of donor-funded WASH projects

The regression coefficients show that "risk management planning significantly influences the sustainability of donor-funded WASH projects. The unstandardized coefficient (B) for risk management planning is 0.645; this means that for each unit increase in risk management planning, the sustainability of the projects increases by 0.645 units. The standardized coefficient (Beta) is 0.669," indicating a strong effect of risk management planning on project sustainability. The t-values (6.171 for the constant and 11.104 for risk management planning) are both large, and the "p-values are 0.000 ($p < 0.05$)," which confirms that both coefficients are statistically significant. This shows that risk management planning has a significant influence on the sustainability of donor-funded WASH projects.

5. CONCLUSIONS

Risk management planning "has a significant positive influence on the sustainability of donor-funded WASH projects in Nairobi City County, Kenya. Project experts identify clearly project risks, adopt precise risk management process, applying a risk management plan that comprehensively addresses a wide range of risks cutting across financial, operational, and environmental spectrums." Optimizing risk management planning for sustainability benefits from covering a wide scope of risks to improve the level of preparedness for challenges while ensuring that the mitigation strategies outlined in the risk management plan are well-developed and practical.

6. RECOMMENDATIONS

Based on the study findings, it is recommended that project managers should develop comprehensive risk management plans. Such plans should focus on identifying potential risks such as political instability, financial constraints, or natural disasters that may affect the sustainability of donor-funded WASH projects. Risk management planning continues to be a vital component for safeguarding the success of the project. A proactive approach to risk management stands to provide WASH projects with the resilience needed to overcome unforeseen uncertainties.

7. LIMITATIONS OF THE STUDY

Despite the robustness of the study, it is now without limitations. First, the study was limited by its reliance on "self-reported data, which is prone to social desirability and recall bias, potentially affecting accuracy. Second, the cross-sectional design restricted the ability to assess long-term causal relationships" between risk management planning and WASH project sustainability. The

exclusion of longitudinal tracking also constrained the assessment of evolving sustainability outcomes over time. Third, the study focused only on Nairobi City County, limiting "the generalizability of findings to other regions with differing socio-economic and environmental contexts." Finally, the sample was confined to experts from NCWSC and AWWDA, excluding perspectives from other WASH stakeholders such as community beneficiaries and non-governmental organizations.

7.0 SUGGESTIONS FOR FUTURE RESEARCH

Future research may adopt a longitudinal mixed-methods approach to examine the long-term influence of risk management planning on WASH project sustainability, capturing evolving trends and impacts. Similarly, expanding the geographical scope beyond Nairobi City County would enhance the generalizability of findings. At the same time, future research may Incorporate a broader range of stakeholders, including community members, NGOs, and private sector partners, would provide a more holistic perspective. It is also worth noting that triangulating survey data with documentary reviews, site observations, and performance audits could strengthen validity. Additionally, future studies could explore the interplay between risk management planning and other strategic planning dimensions, such as stakeholder engagement and institutional support, to identify synergistic effects on project sustainability.

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