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Responsible leadership and sustainability performance of health and sanitation projects: the mediating role of resilience

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Purpose: Globally, health and sanitation projects continue to face significant sustainability challenges, including weak governance, discontinuity in service delivery, infrastructure deterioration, and limited capacity to withstand operational, financial, and environmental shocks. These challenges are particularly pronounced in developing countries, where many projects struggle to remain functional beyond initial implementation phases, undermining progress toward Sustainable Development Goals (SDG 3 and SDG 6). Despite growing interest in project sustainability, limited empirical evidence explains how responsible leadership influences sustainability performance, particularly through resilience mechanisms in project-based health and sanitation contexts. This study therefore examines the effect of responsible leadership on sustainability performance, with resilience as a mediating variable, among health and sanitation projects in Uganda.

Methodology: A cross-sectional quantitative research design was adopted using data collected from 520 respondents across 86 health and sanitation projects in Central Uganda. Data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) to test the hypothesized relationships.

Findings: The findings indicate that responsible leadership significantly and positively influences sustainability performance. Responsible leadership also significantly enhances project resilience, which in turn positively affects sustainability performance. Mediation analysis reveals that resilience partially mediates the relationship between responsible leadership and sustainability performance, suggesting that sustainability outcomes are strengthened both directly through leadership practices and indirectly through enhanced adaptive capacity.

Practical implications: The findings suggest that policymakers, development partners, and project managers should strengthen ethical leadership, accountability systems, stakeholder engagement, and resilience-oriented project planning, including adaptive governance, contingency preparedness, and shock-response mechanisms, to improve project sustainability performance.

Originality/value: This study contributes to global sustainability and leadership scholarship by integrating responsible leadership, resilience, and sustainability performance within a single empirical framework. It extends relational leadership theory by demonstrating resilience as a key explanatory mechanism and provides evidence relevant to health and sanitation project sustainability in developing economies.

KEYWORDS
health and sanitation projects, resilience, responsible leadership, sustainability performance, Uganda

Introduction

Sustainability performance has emerged as a central concern in contemporary development discourse, particularly as organizations and projects are increasingly evaluated based on their ability to deliver economic, social, and environmental value simultaneously. Rooted in the triple bottom line perspective, sustainability performance reflects not only financial viability but also social inclusiveness and environmental stewardship (Abraham, 2024; Bananuka et al., 2022). At the global level, the United Nations Sustainable Development Goals (SDGs), particularly SDG 3 (Good Health and Well-being) and SDG 6 (Clean Water and Sanitation), underscore the urgency of ensuring sustainable health systems and equitable access to water and sanitation services. However, despite global efforts, many health and sanitation projects struggle to achieve long-term sustainability due to governance challenges, resource constraints, and weak institutional capacity (Ugwu et al., 2025). In the African context, these challenges are even more pronounced, where rapid population growth, infrastructural deficits, and limited resilience mechanisms continue to undermine the sustainability of essential service delivery systems. Although this study is situated in Uganda, the sustainability challenges affecting health and sanitation projects are not unique to one country. Similar concerns regarding project continuity, weak governance, donor dependency, infrastructure deterioration, and limited adaptive capacity have been reported across developing economies in Africa, Asia, and Latin America, making this a globally relevant sustainability and public health concern (Ugwu et al., 2025; Giordano et al., 2022; Sánchez-Silva et al., 2025; Mishra et al., 2025).

Leadership has been widely recognized as a critical driver of sustainability performance, with increasing scholarly attention directed toward responsible leadership as a transformative approach for addressing complex societal challenges. Responsible leadership emphasizes ethical decision-making, stakeholder engagement, accountability, and long-term orientation in organizational practices (Maak and Pless, 2006; Waldman et al., 2020). Empirical evidence suggests that responsible leadership significantly enhances sustainability outcomes by aligning organizational goals with societal expectations and fostering pro-environmental and socially responsible behaviors (Liu et al., 2023; Huo et al., 2024). Moreover, responsible leadership has been linked to improved environmental performance, innovation, and employee well-being, all of which contribute to broader sustainability objectives (Ahsan and Khawaja, 2024). Despite these advances, much of the existing literature has focused on corporate and manufacturing settings, with limited attention given to public sector projects, particularly in health and sanitation domains.

In parallel, resilience has gained prominence as a crucial capability for sustaining performance in uncertain and dynamic environments. Resilience refers to the ability of systems or organizations to absorb shocks, adapt to changing conditions, and maintain functionality in the face of disruptions (Sánchez-Silva et al., 2025). Within project contexts, resilience is often operationalized through dimensions such as shock absorption, redundancy in operations, and adaptability, which collectively enable projects to withstand environmental, social, and institutional pressures. Prior studies highlight that resilience enhances sustainable performance by strengthening risk management, fostering innovation, and ensuring continuity of operations (Khurshid et al., 2026; Mishra et al., 2025). In the healthcare sector, resilience is particularly critical, as demonstrated during global crises such as the COVID-19 pandemic, where resilient systems were better able to maintain service delivery and protect public health outcomes (Giordano et al., 2022). However, while resilience is acknowledged as a key enabler of sustainability, its role as a mediating mechanism in leadership–sustainability relationships remain underexplored.

Theoretical grounding for this study is provided by relational leadership theory (Uhl-Bien, 2006), which conceptualizes leadership as a social process embedded in relationships and interactions among stakeholders. This perspective emphasizes that leadership effectiveness is not solely dependent on individual traits but on the quality of relationships, trust, and collaborative processes that leaders foster within their networks. In the context of health and sanitation projects, responsible leadership can be understood as a relational process that builds stakeholder trust, promotes shared responsibility, and enhances collective capacity to respond to challenges. Through this lens, resilience emerges as a relational outcome, developed through continuous interaction, learning, and adaptation among project actors. Thus, relational leadership theory provides a robust framework for understanding how responsible leadership influences sustainability performance through the mediating role of resilience.

Despite the growing body of literature on responsible leadership, resilience, and sustainability performance, significant research gaps remain. First, although studies have examined the direct effects of leadership on sustainable performance (Huo et al., 2024; Nakra and Kashyap, 2025) and the role of resilience in enhancing sustainability outcomes (Zouitini et al., 2026; Li et al., 2025), there is limited empirical evidence on the mediating role of resilience in the relationship between responsible leadership and sustainability performance. Second, existing studies that explore mediation mechanisms often focus on constructs such as ethical climate or human resource practices (Khanam et al., 2025; Ur Rehman et al., 2023), leaving resilience underexamined in this context. This gap extends beyond Uganda, as empirical studies integrating responsible leadership, resilience, and sustainability performance in project-based public service settings remain limited globally, despite increasing calls for context-sensitive sustainability governance models. Third, within Uganda, empirical research on sustainability performance has predominantly concentrated on sectors such as energy, manufacturing, and SMEs (Akankunda et al., 2024; Alinda et al., 2024; Sendawula et al., 2025), with limited focus on health and sanitation projects, despite their critical importance for national development. Furthermore, prior studies in the health and sanitation sector have largely emphasized institutional challenges and stakeholder engagement (Kyambade et al., 2026a,b) without empirically testing integrated models that link leadership, resilience, and sustainability performance. This study therefore addresses these gaps by examining the mediating role of resilience in the relationship between responsible leadership and sustainability performance in health and sanitation projects, thereby contributing to both theory and practice.

In light of the identified gaps, particularly the limited empirical examination of resilience as a mediating mechanism and the scarcity of studies within health and sanitation projects in Uganda, this study seeks to provide a more integrated understanding of leadership–sustainability dynamics. Accordingly, the aim of this study is to examine the influence of responsible leadership on sustainability performance in health and sanitation projects, with particular emphasis on the mediating role of resilience. Specifically, the study assesses the direct effect of responsible leadership on sustainability performance, the effect of responsible leadership on resilience, and the mediating effect of resilience in the responsible leadership–sustainability performance

relationship. Based on these objectives, the study hypothesizes that responsible leadership positively influences sustainability performance, responsible leadership positively influences resilience, and resilience positively mediates the relationship between responsible leadership and sustainability performance. Specifically, the study addresses the following research question: *How does responsible leadership influence sustainability performance of health and sanitation projects, and to what extent is this relationship mediated by resilience?* This question guides the empirical investigation and contributes to advancing both theoretical and contextual insights in sustainability research.

Literature review

Theoretical review

This study is anchored in relational leadership theory (RLT) as advanced by Uhl-Bien (2006), which conceptualizes leadership as a socially constructed process emerging through interactions, relationships, and networks rather than solely individual traits or hierarchical authority. RLT emphasizes that leadership effectiveness is embedded in the quality of relationships, trust, mutual influence, and collaborative engagement among stakeholders. In this regard, responsible leadership aligns strongly with relational leadership principles, as it prioritizes ethical engagement, stakeholder inclusion, and long-term value creation (Maak and Pless, 2006; Waldman et al., 2020). Within project environments, particularly health and sanitation initiatives, leadership is inherently relational due to the multiplicity of actors involved, including government agencies, communities, NGOs, and development partners. Responsible leaders foster trust, transparency, and shared accountability, which in turn enhance collective capacity to respond to uncertainties. RLT therefore provides a useful lens for understanding how leadership behaviors translate into resilience capabilities such as adaptability, redundancy, and shock absorption. These relational processes ultimately influence sustainability performance by enabling coordinated responses to environmental, social, and economic challenges.

Responsible leadership and sustainability performance

Responsible leadership has gained prominence as a critical determinant of sustainability performance, particularly in complex and stakeholder-intensive environments. Responsible leadership refers to a values-driven leadership approach that emphasizes ethical decision-making, stakeholder accountability, relational governance, and long-term value creation for both organizations and society (Maak and Pless, 2006; Voegtlin et al., 2012). Unlike traditional leadership approaches that prioritize internal performance outcomes, responsible leadership extends managerial responsibility to broader social, environmental, and stakeholder concerns, making it particularly relevant in sustainability-sensitive project contexts. It is characterized by ethical decision-making, accountability, stakeholder engagement, and a long-term orientation toward value creation (Maak and Pless, 2006; Voegtlin et al., 2012). Empirical studies indicate that responsible leadership significantly enhances economic, social, and environmental outcomes by aligning organizational strategies with sustainability principles (Abraham, 2024; Liu et al., 2023). Recent research demonstrates that responsible leadership positively influences sustainable performance through mechanisms such as innovation, stakeholder collaboration, and pro-environmental behavior (Huo et al., 2024; Khan et al., 2023). Similarly, Nakra and Kashyap (2025) found that responsible leadership strengthens organizational sustainability by promoting sustainable human resource practices, while Ur Rehman et al. (2023) highlight its role in improving both financial and environmental performance. However, much of this evidence is drawn from corporate, manufacturing, and SME contexts, with limited application to public sector projects such as health and sanitation. In developing countries, particularly Uganda, leadership plays a critical role in addressing sustainability challenges related to resource constraints, governance inefficiencies, and service delivery gaps (Kyambade et al., 2026a). Despite this, empirical studies examining the direct influence of responsible leadership on sustainability performance in health and sanitation projects remain scarce.

Contextual factors influencing leadership–sustainability relationships

Although responsible leadership is widely associated with improved sustainability outcomes, the strength of this relationship is often shaped by contextual factors such as institutional governance quality, stakeholder participation, resource availability, regulatory enforcement, and organizational culture. In project-based public service contexts, weak governance systems, donor dependency, fragmented stakeholder coordination, and financial constraints may either strengthen or constrain the ability of responsible leadership to translate into sustainability outcomes (Kyambade et al., 2026a; Abraham, 2024). Similarly, strong stakeholder collaboration and institutional support may enhance leadership effectiveness by facilitating accountability, trust, and long-term implementation commitment. These factors are particularly relevant in health and sanitation projects, where sustainability depends not only on leadership practices but also on broader governance and operational conditions.

Based on the foregoing discussion, the following hypothesis is proposed:

> *H1: Responsible leadership positively and significantly influences sustainability performance (economic, social, and environmental) of health and sanitation projects.*

Responsible leadership and resilience

Resilience has emerged as a key organizational capability that enables systems to withstand shocks, adapt to change, and sustain operations under uncertainty. It encompasses dimensions such as shock absorption, adaptability, and redundancy in operations (Sánchez-Silva et al., 2025; Khurshid et al., 2026). Leadership is increasingly recognized as a critical antecedent of resilience, as leaders shape organizational culture, resource allocation, and adaptive capacity. Responsible leadership, in particular, fosters resilience by promoting ethical decision-making, stakeholder collaboration, and proactive risk management. Prior literature suggests that the relationship between responsible leadership and resilience operates within broader organizational and institutional contexts, including organizational learning culture, resource redundancy, institutional flexibility, crisis preparedness systems, and stakeholder trust (Giordano et al., 2022;

Prayag et al., 2024; Sánchez-Silva et al., 2025). In project environments characterized by rigid institutional arrangements and limited adaptive capacity, translating leadership intentions into resilience outcomes may be more challenging (Ali et al., 2024). Studies have shown that leadership styles emphasizing responsibility and sustainability significantly enhance organizational resilience and employee well-being (Ahsan and Khawaja, 2024; Prayag et al., 2024). In project-based environments, responsible leaders facilitate learning, flexibility, and resource redundancy, which are essential for coping with disruptions. In the healthcare context, resilient leadership has been associated with improved crisis response and continuity of service delivery (Ali et al., 2024; Giordano et al., 2022). Furthermore, Kyambade and Namatovu (2026) demonstrate that leadership practices contribute to organizational resilience through mediating mechanisms such as well-being. However, there is limited empirical evidence linking responsible leadership directly to resilience in health and sanitation projects. Based on this evidence, the following hypotheses are formulated:

> *H2: Responsible leadership positively and significantly influences resilience in health and sanitation projects.*

Resilience and sustainability performance

The relationship between resilience and sustainability performance has attracted increasing scholarly attention, particularly in the context of dynamic and uncertain environments (Kyambade et al., 2025a). Resilience enables organizations and projects to maintain functionality, recover from disruptions, and adapt to changing conditions, thereby enhancing long-term sustainability outcomes (Sánchez-Silva et al., 2025; Kyambade et al., 2025b). Empirical studies suggest that resilience significantly contributes to sustainable performance by improving risk management, operational continuity, and innovation capacity (Mishra et al., 2025; Li et al., 2025). Existing literature indicates that the contribution of resilience to sustainability performance is often shaped by broader operational realities such as funding stability, infrastructural adequacy, policy support, and environmental uncertainty (Mishra et al., 2025; Li et al., 2025; Zouitini et al., 2026). In health and sanitation settings, resilience contributes to sustainability alongside these structural conditions, particularly where institutional and resource constraints persist (Ugwu et al., 2025). For instance, Zouitini et al. (2026) found that resilience positively influences sustainable performance through enhanced entrepreneurial capabilities, while Sharma et al. (2025) highlight the role of resilience in achieving sustainable supply chain outcomes. In healthcare systems, resilience is particularly critical for ensuring uninterrupted service delivery and effective response to public health emergencies (Ugwu et al., 2025). Despite this growing body of evidence, few studies have examined how resilience measured by shock absorption, redundancy, and adaptability contribute to sustainability performance, particularly in health and sanitation projects. Drawing from the literature, the following hypotheses are proposed:

> *H3: Resilience positively and significantly influences sustainability performance of health and sanitation projects.*

Mediating role of resilience

While prior studies have established direct relationships between responsible leadership and sustainability performance, emerging evidence suggests that this relationship is often indirect and operates through mediating mechanisms. For example, studies have identified mediators such as ethical climate, green human resource practices, and innovation (Khanam et al., 2025; Ur Rehman et al., 2023). However, resilience remains an underexplored mediating construct in this relationship. The literature further suggests that the translation of leadership-driven resilience into sustainability outcomes occurs within enabling governance and operational environments characterized by stakeholder commitment, adaptive institutional systems, and resource flexibility (Khurshid et al., 2026; Mishra et al., 2025; Kyambade et al., 2026a). Theoretically, relational leadership processes foster trust, collaboration, and shared learning, which enhance resilience capabilities. In turn, these resilience capabilities enable projects to sustain performance under adverse conditions. Empirical support for this perspective is found in studies linking resilience to sustainable performance outcomes (Khurshid et al., 2026; Mishra et al., 2025), as well as research demonstrating mediation effects of resilience-related constructs in organizational contexts. In the context of health and sanitation projects, resilience is particularly important due to exposure to environmental shocks, funding uncertainties, and institutional challenges (Kyambade et al., 2026a). However, no known empirical studies have simultaneously examined responsible leadership, resilience, and sustainability performance within this sector, particularly in developing countries such as Uganda. Therefore, this study proposes the following mediation hypothesis:

> *H4: Resilience mediates the relationship between responsible leadership and sustainability performance of health and sanitation projects.*

Figure 1 presents the conceptual framework of the study, illustrating the hypothesized relationships among responsible leadership, resilience, and sustainability performance. The framework shows that responsible leadership directly influences sustainability performance and also indirectly influences it through resilience. Resilience serves as a mediating variable that explains how leadership practices translate into sustainable outcomes. Overall, the framework provides a structured representation of the proposed relationships and guides the empirical testing of the study hypotheses.

Methodology

Population

This study adopted a cross-sectional quantitative research design to examine the relationship between responsible leadership and sustainability performance, with resilience as a mediating variable in health and sanitation projects in Central Uganda. Specifically, the study sought to; (i) examine the effect of responsible leadership on sustainability performance, (ii) assess the influence of responsible leadership on resilience, (iii) determine the effect of resilience on sustainability performance, and (iv) examine the mediating role of resilience in the relationship between responsible leadership and sustainability performance. The study was conducted in Kampala, Wakiso, and Mukono districts due to their strategic importance in

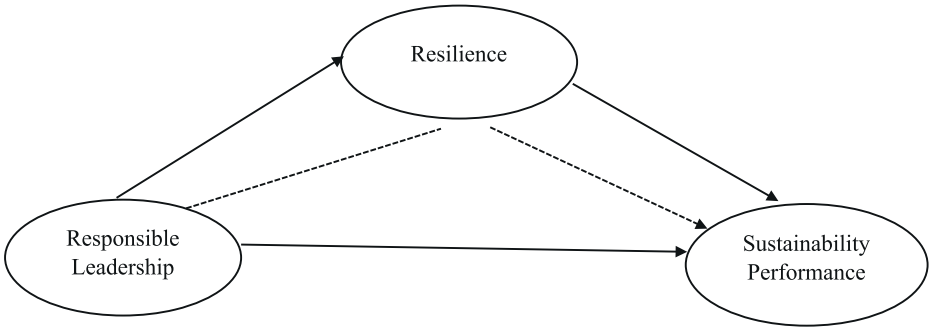

FIGURE 1
Conceptual framework. Source: author's own work.

Uganda's health and sanitation service delivery landscape and the high concentration of public, donor-funded, and NGO-supported projects. The unit of analysis was the project, while the unit of inquiry included key stakeholders such as project managers, engineers, public health officers, monitoring and evaluation staff, procurement officers, and beneficiary representatives. The study population comprised 110 concluded health and sanitation projects located in Kampala, Wakiso, and Mukono districts. These projects comprised Ministry of Health-affiliated public sector, donor-funded, non-governmental organization (NGO)-supported, and community-based health and sanitation initiatives involved in service delivery, infrastructure development, sanitation improvement, public health interventions, and water access programs. The projects were selected because they represent the dominant health and sanitation implementation landscape in Central Uganda and involve structured leadership, stakeholder coordination, and sustainability management processes relevant to this study. The sample size for projects was determined using Yamane's (1967) formula for finite populations, $n = N/(1 + N(e)^2)$, where n represents the sample size, N is the population size, and e is the level of precision (0.05). Based on this formula, a sample of 86 projects was obtained from the total population of 110 projects. To ensure proportional representation across the study area, stratified sampling was employed, resulting in the selection of 31 projects from Kampala, 35 from Wakiso, and 20 from Mukono. In addition, an *a priori* power analysis was conducted using G*Power* 3.1, assuming a medium effect size ($f^2 = 0.15$), a significance level of $\alpha = 0.05$, and statistical power of 0.80, which indicated a minimum sample requirement of approximately 92 respondents.

A total of 600 questionnaires were distributed, and 520 valid responses were obtained, representing a response rate of 86.7%. The targeted respondents were individuals directly involved in project leadership, implementation, monitoring, governance, procurement, technical operations, and beneficiary representation. These included project managers, engineers, public health officers, monitoring and evaluation personnel, procurement officers, environmental officers, and community beneficiary representatives, whose roles provided relevant insights into leadership practices, resilience capacity, and sustainability performance. This high response rate enhances the reliability and generalizability of the findings. The sample size also exceeds the recommended thresholds for PLS-SEM, ensuring statistical power and model stability (Hair et al., 2017). Partial Least Squares Structural Equation Modeling (PLS-SEM) was selected because it is appropriate for examining complex relationships involving multiple latent constructs and mediation effects, particularly in prediction-oriented studies and applied social science research (Hair et al., 2017). The method is advantageous because it accommodates non-normal data distributions, performs well with relatively complex models, and enables simultaneous assessment of measurement and structural models. However, PLS-SEM has limitations, including its comparatively weaker emphasis on global model fit compared to covariance-based SEM and its primary orientation toward prediction rather than strict theory confirmation. Nevertheless, given the exploratory and predictive nature of this study, PLS-SEM was considered the most appropriate analytical approach. Ethical considerations were strictly observed. Respondents were informed about the purpose of the study, assured of confidentiality, and participation was voluntary. This ensured compliance with ethical research standards and enhanced the credibility of the data collected.

Measurement of variables

The study examined responsible leadership as the independent variable, resilience as the mediating variable, and sustainability performance as the dependent variable. Data were collected using a structured questionnaire measured on a five-point Likert scale, which balances measurement sensitivity and respondent simplicity (Spector, 1992; Field, 2009). Responsible leadership (RL) was operationalized as a higher-order construct comprising ethical decision-making, accountability and transparency, and long-term orientation, consistent with established responsible leadership literature (Maak and Pless, 2006; Waldman et al., 2020; Abraham, 2024). Resilience (RS) was conceptualized as a multidimensional construct reflecting shock absorption, redundancy in operations, and adaptability, capturing the capacity of projects to withstand and respond to disruptions. Sustainability performance (SP) was measured using the triple bottom line dimensions of economic, social, and environmental sustainability (Liu et al., 2023; Abraham, 2024). Validity and reliability were rigorously assessed. Content validity was ensured through expert evaluation, while internal consistency reliability was confirmed using Cronbach's alpha and composite reliability (CR), with values exceeding 0.70 (Nunnally, 1978). Convergent validity was established through AVE values above 0.50, and discriminant validity was confirmed using the Fornell–Larcker criterion and HTMT ratios (Henseler et al., 2015).

Results

Demographic characteristics

The demographic composition of the sample is shown in Table 1 and reveals a workforce dominated by male participants, who constituted 60.0%, while females accounted for 40.0%. In terms of age distribution, the largest proportion of respondents fell within the 36–45 years category (47.7%), followed by those aged below 35 years (27.3%), 46–55 years (19.4%), and above 55 years (5.6%). This pattern suggests that health and sanitation projects are primarily managed by individuals in their mid-career stage, who are likely to possess both technical competence and practical experience necessary for effective project delivery. With respect to educational qualifications, the majority of respondents held Bachelor's degrees (58.5%), followed by Master's degrees (33.8%), while a smaller proportion (7.7%) had attained doctoral-level education. This distribution indicates a relatively high level of academic preparedness among respondents. Overall, the demographic characteristics suggest that the study participants possessed sufficient professional expertise and educational grounding to provide credible and informed perspectives on responsible leadership, resilience, and sustainability performance in health and sanitation projects.

Measurement model assessment

The measurement model was first evaluated to establish the reliability and validity of the constructs. The results presented in Table 2 indicate that all constructs met the recommended thresholds for internal consistency and convergent validity.

All Cronbach's alpha and composite reliability values exceed the recommended threshold of 0.70, confirming strong internal consistency (Hair et al., 2017). Additionally, AVE values above 0.50 indicate that the constructs explain more than half of the variance in their indicators, thus confirming convergent validity.

Table 3 presents the outer loadings of measurement items for the three constructs that is responsible leadership, resilience, and sustainability performance. All indicator loadings exceeded the recommended threshold of 0.70, confirming that the indicators reliably measure their respective constructs (Hair et al., 2017). Beyond statistical adequacy, the loadings provide substantive insight into the dimensions that most strongly define the study variables within health and sanitation projects. For responsible leadership, the retained indicators (RL10, RL5, RL6, RL7, RL8, and RL9), with loadings ranging from 0.777 to 0.887, suggest that dimensions such as ethical accountability, stakeholder inclusiveness, transparent decision-making, and long-term strategic orientation are central features of effective leadership in project sustainability contexts. Notably, RL6 (0.887) emerged as the strongest indicator, implying that this leadership attribute was particularly influential in reflecting responsible leadership practices.

For resilience, indicator loadings ranged from 0.722 to 0.820, indicating that adaptive capacity, preparedness, responsiveness to disruptions, recovery capability, and institutional learning are meaningful components of resilience in health and sanitation projects. The relatively stronger loading of RS2 (0.820) suggests that resilience in these projects is particularly associated with the ability to adapt and respond effectively to operational or environmental uncertainties.

Similarly, sustainability performance indicators demonstrated strong loadings ranging from 0.765 to 0.858, confirming that sustainability performance was robustly measured as a multidimensional construct. These indicators reflect practical sustainability outcomes such as efficient resource utilisation, continuity of service delivery, stakeholder satisfaction, environmental stewardship, and long-term project viability. The strongest loading observed for SP7 (0.858) suggests that this aspect represented a particularly salient dimension of sustainability performance within the study context. Overall, these findings confirm both indicator reliability and the practical relevance of the selected measurement items in explaining sustainability performance in health and sanitation projects.

Table 4 reports the Fornell–Larcker criterion used to assess discriminant validity. The diagonal elements represent the square root of the Average Variance Extracted (AVE) for each construct, while the off-diagonal elements represent inter-construct correlations. The results show that the square root of AVE for each construct (Resilience = 0.774, Responsible Leadership = 0.826, Sustainability Performance = 0.805) is greater than its corresponding correlations with other constructs. This indicates that each construct shares more variance with its own indicators than with other constructs, thereby confirming adequate discriminant validity (Fornell and Larcker, 1981). In practical terms, this means that responsible leadership, resilience, and sustainability performance are empirically distinct concepts and are not measuring the same phenomenon.

Table 5 presents the Heterotrait–Monotrait (HTMT) ratios, which provide a more stringent assessment of discriminant validity. The

TABLE 1 Respondent demographic characteristics.

Characteristic	Category	Frequency (n = 520)	Percentage (%)
Gender	Male	312	60.0
	Female	208	40.0
Age group	Below 35 years	142	27.3
	36–45 years	248	47.7
	46–55 years	101	19.4
	Above 55 years	29	5.6
Education level	Bachelor's degree	304	58.5
	Master's degree	176	33.8
	Doctorate (PhD)	40	7.7

Source: primary data.

TABLE 2 Reliability and convergent validity.

Construct	Cronbach alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	AVE
Resilience	0.868	0.888	0.900	0.599
Responsible leadership	0.907	0.915	0.928	0.682
Sustainability performance	0.865	0.874	0.902	0.649

Source: SmartPLS output. Created from SmartPLS GmbH, https://www.smartpls.com.

TABLE 3 Indicator loadings.

Indicator	Responsible leadership	Resilience	Sustainability performance
RL10	0.841		
RL5	0.777		
RL6	0.887		
RL7	0.817		
RL8	0.814		
RL9	0.813		
RS10		0.749	
RS2		0.820	
RS6		0.722	
RS7		0.781	
RS8		0.799	
RS9		0.770	
SP1			0.822
SP3			0.765
SP5			0.787
SP7			0.858
SP9			0.791

Source: SmartPLS output. Created from SmartPLS GmbH, https://www.smartpls.com.

HTMT values for all construct pairs are below the recommended threshold of 0.90 (Henseler et al., 2015). These results further confirm that the constructs are sufficiently distinct from one another. The relatively moderate HTMT value between responsible leadership and sustainability performance (0.713) suggests that while the constructs are related as expected theoretically, they are not redundant. Thus, the HTMT results reinforce the findings from the Fornell–Larcker criterion and provide strong evidence of construct discriminant validity within the model.

Collinearity diagnostics were conducted to assess potential multicollinearity among the predictor variables as shown in Table 6. The results indicate that all Variance Inflation Factor (VIF) values ranged between 1.773 and 3.062, which are well below the commonly accepted threshold of 5 (Hair et al., 2017). Substantively, this suggests that while the indicators within responsible leadership, resilience, and sustainability performance are conceptually related, they capture sufficiently distinct dimensions of the constructs without excessive overlap. For instance, responsible leadership indicators reflect complementary but distinct governance and leadership behaviors, while resilience indicators represent different adaptive capabilities rather than redundant measures of the same phenomenon. Similarly, sustainability performance indicators capture diverse performance outcomes across social, environmental, and operational dimensions. The absence of multicollinearity strengthens confidence in the reliability of the path estimates and supports the interpretation that each indicator contributes unique explanatory value to the model.

The model fit results presented in Table 7 indicate an acceptable overall fit of the model. The Standardized Root Mean Square Residual (SRMR) value of 0.079 is below the recommended threshold of 0.08, suggesting a good fit between the observed and predicted data (Hair et al., 2017). The Normed Fit Index (NFI) value of 0.787, although slightly below the ideal benchmark of 0.90, is considered acceptable in PLS-SEM studies, particularly in exploratory and prediction-oriented research. Additionally, the d_ULS and d_G values further support model adequacy, indicating minimal discrepancy between empirical and model-implied covariance matrices. Overall, these results confirm that the model demonstrates a satisfactory level of fit and is suitable for subsequent structural model analysis.

Structural model assessment

The structural model was evaluated using path coefficients, *t*-statistics, and significance levels obtained through bootstrapping (5,000 resamples). The model also demonstrated acceptable fit (SRMR = 0.079), indicating a good approximation between the observed and predicted covariance matrices (Hair et al., 2017). Figure 2 illustrates the structural relationships among the key constructs in the study, namely responsible leadership, resilience, and sustainability performance. The model shows that responsible leadership has a direct positive effect on both resilience and sustainability performance, while resilience also influences sustainability performance. Additionally, the figure highlights the mediating role of resilience in the relationship between responsible leadership and sustainability performance. Overall, the structural model provides a visual representation of the hypothesized paths and the direction of influence among the study variables.

The results in Table 8 indicate that responsible leadership has a strong and statistically significant positive effect on sustainability performance ($\beta = 0.607$, $t = 12.184$), thus supporting *H1*. This implies that projects led by responsible leaders are more likely to achieve improved economic, social, and environmental outcomes. Similarly, responsible leadership significantly influences resilience ($\beta = 0.335$, $t = 6.972$), supporting *H2*. This finding suggests that responsible leaders enhance project capacity to absorb shocks, adapt to change, and maintain operational continuity. Resilience also has a positive and significant effect on sustainability performance ($\beta = 0.126$, $t = 2.431$), supporting *H3*. Although the magnitude of the effect is smaller, it remains statistically meaningful, indicating that resilience contributes to sustainability outcomes by enabling projects to withstand disruptions. The mediation results further show that resilience significantly mediates the relationship between responsible leadership and

TABLE 4 Fornell–Larcker criterion.

Construct	Resilience	Responsible leadership	Sustainability performance
Resilience	0.774		
Responsible leadership	0.335	0.826	
Sustainability performance	0.329	0.649	0.805

Source: primary data.

TABLE 5 HTMT ratios.

Construct	Resilience	Responsible leadership	Sustainability performance
Resilience	1.00		
Responsible leadership	0.369	1.00	
Sustainability performance	0.343	0.713	1.00

Source: SmartPLS output. Created from SmartPLS GmbH, https://www.smartpls.com.

TABLE 6 Collinearity assessment using Variance Inflation Factor (VIF).

Indicators	VIF
RL10	2.887
RL5	2.256
RL6	3.062
RL7	2.622
RL8	2.486
RL9	2.284
RS10	1.971
RS2	2.109
RS6	1.943
RS7	2.273
RS8	2.157
RS9	2.111
SP1	2.253
SP3	1.996
SP5	1.773
SP7	2.348
SP9	1.968

Source: SmartPLS output. Created from SmartPLS GmbH, https://www.smartpls.com.

TABLE 7 Model fit indices.

Index	Saturated model	Estimated model
SRMR	0.079	0.079
d_ULS	0.954	0.954
d_G	0.376	0.376
Chi-square	530.496	530.496
NFI	0.787	0.787

Source: SmartPLS output. Created from SmartPLS GmbH, https://www.smartpls.com.

sustainability performance ($\beta = 0.042$, $t = 2.118$), supporting *H4*. The presence of both significant direct and indirect effects indicates partial mediation, meaning that responsible leadership influences sustainability performance both directly and indirectly through resilience.

Model explanatory power and effect sizes

The model explains 11.2% of the variance in resilience and 43.5% of the variance in sustainability performance, indicating moderate explanatory power, particularly for sustainability performance as shown in Table 9.

Findings in Table 10 show that responsible leadership exhibits a large effect on sustainability performance, highlighting its critical role in driving sustainability outcomes. Its effect on resilience is small to moderate, while resilience has a small but meaningful effect on sustainability performance. Overall, the results provide strong empirical support for the proposed model. Responsible leadership emerges as a key predictor of sustainability performance, both directly and indirectly through resilience. While the direct effect is dominant, resilience plays a complementary mediating role by enhancing the ability of projects to adapt, absorb shocks, and sustain operations. These findings reinforce the importance of integrating leadership and resilience perspectives in improving sustainability performance in health and sanitation projects.

Discussion

The results reveal that responsible leadership has a significant and positive effect on sustainability performance. This finding aligns with prior studies which demonstrate that leadership grounded in ethical decision-making, accountability, and long-term orientation enhances economic, social, and environmental outcomes (Abraham, 2024; Liu et al., 2023; Huo et al., 2024). In the context of health and sanitation projects, this suggests that leaders who prioritize stakeholder interests and sustainability principles are better positioned to ensure project effectiveness and long-term impact. However, while most studies report strong positive relationships, some scholars argue that leadership alone may not guarantee sustainability outcomes without supportive institutional and resource conditions (Boeske, 2023). This highlights the contextual nature of leadership effectiveness, particularly in developing countries where systemic constraints may moderate outcomes.

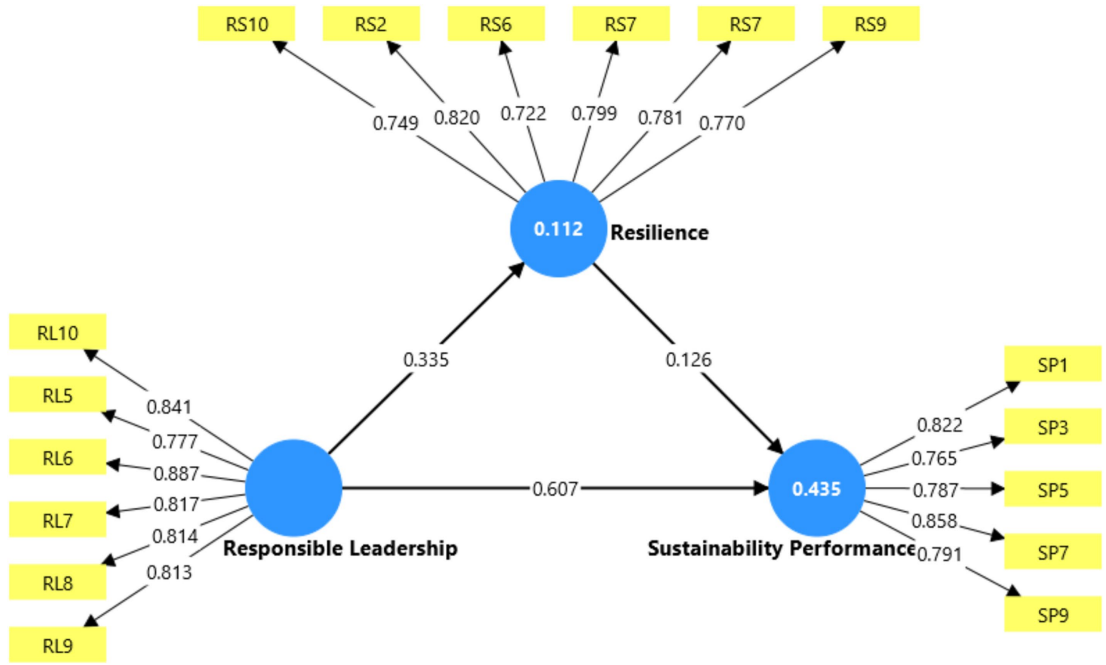

FIGURE 2
Structural model. Source: SmartPLS output. Created from SmartPLS GmbH, https://www.smartpls.com.

TABLE 8 Hypotheses testing results.

Hypothesis	Path	*B*	*t*-statistics	Result
H1	RL → SP	0.607	12.184	Supported
H2	RL → RS	0.335	6.972	Supported
H3	RS → SP	0.126	2.431	Supported
H4	RL → RS → SP	0.042	2.118	Supported (partial mediation)

Source: SmartPLS bootstrapping output. Created from SmartPLS GmbH, https://www.smartpls.com.

TABLE 9 Coefficient of determination (R^2).

Construct	R^2	Adjusted R^2
Resilience	0.112	0.108
Sustainability performance	0.435	0.430

Source: SmartPLS output. Created from SmartPLS GmbH, https://www.smartpls.com.

TABLE 10 Effect Sizes (f^2).

Relationship	f^2	Interpretation
RL → RS	0.126	Small
RL → SP	0.579	Large
RS → SP	0.025	Small

Source: SmartPLS output. Created from SmartPLS GmbH, https://www.smartpls.com.

The study further establishes that responsible leadership significantly influences resilience. This finding is consistent with research indicating that leadership practices that emphasize trust, collaboration, and ethical conduct enhance an organization's capacity to absorb shocks and adapt to change (Ahsan and Khawaja, 2024; Prayag et al., 2024). In line with relational leadership perspectives, responsible leaders foster social capital and shared understanding among stakeholders, which are critical for building resilience (Maak, 2007). However, some studies suggest that resilience is not solely leadership-driven but also depends on structural factors such as resource availability and institutional support (Sánchez-Silva et al., 2025). This indicates that while leadership is a key enabler, resilience is a multidimensional construct influenced by both human and systemic factors.

The findings also show that resilience positively influences sustainability performance, although the effect size is relatively modest. This supports existing literature emphasizing the role of resilience in enhancing sustainable outcomes by enabling continuity, adaptability, and risk management (Mishra et al., 2025; Li et al., 2025). In health and sanitation projects, resilience allows systems to maintain service delivery despite environmental, financial, or operational disruptions. Nonetheless, the relatively small effect size observed in this study suggests that resilience may function more as a supporting mechanism rather than a primary driver of sustainability performance. This observation aligns with studies that position resilience as a complementary capability rather than a dominant predictor (Zouitini et al., 2026).

Importantly, the mediation analysis reveals that resilience partially mediates the relationship between responsible leadership and sustainability performance. This finding extends previous research that has primarily focused on mediators such as ethical climate and human resource practices (Khanam et al., 2025; Ur Rehman et al., 2023), by demonstrating that resilience also serves as a critical pathway through which leadership influences sustainability outcomes. The partial mediation indicates that responsible leadership affects sustainability both directly and indirectly through resilience. This suggests that while resilience enhances

the translation of leadership practices into sustainable outcomes, leadership itself remains a dominant driver. This integrated perspective contributes to bridging gaps in the literature, particularly within health and sanitation projects where such relationships have been underexplored (Kyambade et al., 2026a).

Beyond the theoretical and empirical implications, these findings have important relevance for the achievement of Sustainable Development Goals (SDG) 3 and 6, which emphasize good health and well-being, and access to clean water and sanitation, respectively. The positive influence of responsible leadership on sustainability performance suggests that leadership practices grounded in accountability, ethical governance, and long-term stakeholder orientation can strengthen the continuity, quality, and sustainability of health and sanitation service delivery. Similarly, the mediating role of resilience highlights the importance of adaptive project systems capable of withstanding operational, financial, and environmental shocks, thereby ensuring uninterrupted health and sanitation interventions. In developing-country contexts, where health and sanitation projects frequently face donor dependency, institutional fragility, and infrastructural constraints, strengthening responsible leadership and resilience can contribute to more sustainable public health systems, improved sanitation outcomes, and long-term progress toward global sustainable development targets.

Theoretical implications

This study makes several important theoretical contributions. First, it extends relational leadership theory (Uhl-Bien, 2006) by empirically demonstrating how leadership relationships translate into resilience and sustainability outcomes in project-based contexts. The findings reinforce the view that leadership is not merely an individual attribute but a relational process that shapes collective capacity and adaptive performance. Second, the study contributes to sustainability literature by integrating responsible leadership, resilience, and sustainability performance into a single framework. While prior studies have examined these constructs in isolation, this study provides empirical evidence of their interconnectedness, particularly highlighting the mediating role of resilience. This advances theoretical understanding by positioning resilience as a key mechanism linking leadership to sustainability outcomes. Third, the study enriches the contextual literature on sustainability in developing countries, particularly Uganda. By focusing on health and sanitation projects, it addresses a critical gap in existing research, which has largely concentrated on sectors such as manufacturing, energy, and SMEs (Akankunda et al., 2024; Alinda et al., 2024). This contextual contribution enhances the generalizability of leadership and sustainability theories to public sector and development-oriented projects.

Practical implications

The findings of this study offer important practical insights for policymakers, project managers, and development practitioners. First, the strong influence of responsible leadership on sustainability performance underscores the need to prioritize leadership development in health and sanitation projects. Training programs should focus on enhancing ethical decision-making, accountability, and long-term strategic thinking among project leaders. Second, the significant role of resilience suggests that project planners should incorporate resilience-building strategies into project design and implementation. This includes strengthening shock absorption mechanisms, promoting operational redundancy, and enhancing adaptability through continuous learning and innovation. Such strategies are particularly critical in environments characterized by uncertainty and resource constraints. Third, given the partial mediation effect, interventions should adopt an integrated approach that simultaneously strengthens leadership practices and resilience capacities. Policymakers and development partners should therefore design frameworks that align leadership development with resilience-building initiatives to achieve sustainable project outcomes.

Limitations and future research directions

Despite its contributions, this study has several limitations that should be acknowledged. First, the use of a cross-sectional design limits the ability to establish causal relationships among the variables. Future studies could adopt longitudinal designs to examine how leadership, resilience, and sustainability performance evolve over time. Second, the study focused on health and sanitation projects within Central Uganda, which may limit the generalizability of the findings to other regions or sectors. Future research could replicate the study in different geographical contexts and sectors to enhance external validity. Third, while the study examined resilience as a multidimensional construct, other potential mediators such as innovation, stakeholder engagement, or institutional governance were not included. Future studies could explore multiple mediation models to provide a more comprehensive understanding of the mechanisms linking leadership to sustainability performance. Finally, the reliance on self-reported data may introduce common method bias. Although statistical procedures were employed to ensure validity, future research could incorporate mixed-method approaches, including qualitative insights and objective performance measures, to strengthen the robustness of findings. Overall, future research should continue to explore the dynamic interplay between leadership, resilience, and sustainability, particularly in developing country contexts where these relationships are critical for achieving long-term development goals.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

The studies involving humans were approved by Makerere University Business School ethics approval. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

MK: Conceptualization, Formal analysis, Methodology, Project administration, Writing – original draft, Writing – review & editing. RM: Conceptualization, Methodology, Project administration, Supervision, Writing – original draft, Writing – review & editing. KA: Conceptualization, Supervision, Writing – original draft, Writing – review & editing. ST: Conceptualization, Supervision, Writing – original draft, Writing – review & editing. FL: Supervision, Writing – original draft, Writing – review & editing.

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