

Original Research Article

Factors Affecting Sustainability of Water Project in Dodoma City: A Case of Msalato Ward

Emanuelli Edward Massawe^{1*}, Dr. Rahma Mohamed Msofe¹¹Department of Economics and Community Economic Development (ECED), the Open University of Tanzania

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Abstract: This paper examines the factors affecting the sustainability of water projects in Dodoma City, focusing on Msalato Ward. Despite numerous investments by the Tanzanian government and development partners, many community water projects experience operational challenges, low reliability, and poor management. The study employed a mixed-methods approach involving 55 respondents, including households, ward leaders, and DUWASA officials. Data were collected using questionnaires, interviews, and observation. The results revealed that the sustainability of water projects in Msalato Ward is affected by technical, financial, institutional, and social factors. Frequent equipment breakdowns, limited spare parts, and insufficient community participation were major constraints. The study recommends strengthening technical capacity, enhancing community ownership, and ensuring transparency in fund management to promote project sustainability.

Keywords: Sustainability, Water Projects, Community Participation, Governance, Dodoma City.

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1.0 INTRODUCTION

Water is among the most essential natural resources for sustaining life and promoting social and economic development. Globally, the United Nations (United Nations, 2023) emphasizes access to clean and safe water as a fundamental human right and a prerequisite for achieving Sustainable Development Goal number six (SDG 6), which focuses on ensuring availability and sustainable management of water and sanitation for all. However, despite international and national efforts, billions of people worldwide particularly in developing countries continue to experience inadequate access to safe and reliable water services.

In many African countries, water projects are often established with donor or government support but fail to function sustainably once external support ends. According to the African Development Bank (2021), nearly 35% of rural and semi-urban water projects in Sub-Saharan Africa become non-operational within five years of completion due to poor maintenance, weak institutional structures, and inadequate financial mechanisms. Similar challenges have been reported in Tanzania, where several government and community-based water supply schemes fail to deliver services consistently despite initial investment.

In response to the need for improved water accessibility, the Government of Tanzania has implemented numerous water initiatives through agencies such as the Ministry of Water, the Rural Water Supply and Sanitation Agency (RUWASA), and the Dodoma Urban Water Supply and Sanitation Authority (DUWASA). These institutions were established to enhance equitable access to water, particularly in urbanizing regions like Dodoma City. Despite these interventions, access to sustainable water services remains a challenge due to rapid urban population growth, aging infrastructure, insufficient funds, and weak community participation in project management (Chumbula, 2019; Mwihambi, 2020).

Dodoma City, the administrative capital of Tanzania, is among the fastest-growing cities in East Africa, experiencing continuous migration and expansion of residential areas. Msalato Ward located in the northern part of Dodoma has been one of the areas facing persistent water shortages. Although the government and development partners have invested in several water supply projects in the ward, residents still experience irregular supply, frequent system breakdowns, and limited coverage. Water shortages in Msalato not only affect household welfare but also reduce productivity in sectors such as small-scale businesses, livestock keeping, and urban agriculture.

*Corresponding Author: Emanuelli Edward Massawe

Department of Economics and Community Economic Development (ECED), the Open University of Tanzania

The sustainability of water projects refers to the ability of these systems to continue delivering reliable and safe water services efficiently, equitably, and independently of external assistance (Msuya, 2021). In Msalato Ward, sustainability concerns arise from frequent technical failures, weak institutional coordination, limited spare parts, and inadequate community ownership. For instance, many residents are unaware of their role in project management, while others have lost trust in local committees due to poor transparency in financial contributions.

Therefore, this study seeks to examine the factors affecting the sustainability of water projects in Dodoma City, with a focus on Msalato Ward. The study was guided by the following specific objectives:

1. To assess the technical, financial, and institutional challenges affecting water project sustainability in Msalato Ward.
2. To examine the extent of community participation in planning, management, and maintenance of water projects.
3. To identify effective strategies for enhancing the long-term sustainability of water projects in Dodoma City.

The study is significant because it provides empirical evidence and practical insights for improving water management in Tanzania's rapidly urbanizing areas. Findings from this research will help policymakers, water authorities, and community leaders to design interventions that strengthen governance, promote accountability, and enhance community ownership of water systems. Ultimately, this research contributes to national and global efforts aimed at achieving sustainable access to clean and safe water for all.

2.0 THEORETICAL FRAMEWORK

This study is anchored on the Sustainable Development Theory, which provides the conceptual foundation for understanding the long-term success and continuity of development initiatives such as water supply projects. The theory was advanced by the Brundtland Commission (2024) through its landmark report *"Our Common Future,"* which defined sustainable development as *"development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs."*

The theory rests on three fundamental and interdependent dimensions: economic sustainability, social sustainability, and environmental sustainability. These pillars collectively form the guiding framework for ensuring that development projects, including water schemes, are both effective and durable over time.

2.1 Economic Sustainability

Economic sustainability ensures that a project remains financially viable and capable of generating sufficient resources to cover its operational and maintenance costs. In the context of water projects, this implies establishing transparent cost-recovery mechanisms, affordable tariff systems, and effective financial management structures. According to Msuya (2021), financially sustainable projects depend on consistent revenue collection, efficient resource utilization, and regular auditing to build trust among users. Without proper financial accountability, communities lose confidence in management committees, leading to reduced willingness to pay and eventual project failure.

2.2 Social Sustainability

Social sustainability emphasizes community ownership, inclusion, and active participation throughout the project cycle. Chumbula (2019) argues that community involvement in the design, implementation, and monitoring of water projects enhances a sense of responsibility and long-term commitment to maintenance. Participation fosters social cohesion, transparency, and accountability—factors that are critical for the continued functionality of water systems. Furthermore, Mwihambi (2020) notes that gender inclusion, especially the involvement of women and youth in decision-making, strengthens social sustainability because these groups are often the primary users and caretakers of water resources.

2.3 Environmental Sustainability

Environmental sustainability focuses on conserving water sources, maintaining ecological balance, and preventing environmental degradation that could threaten the longevity of water systems. The African Development Bank (2021) emphasizes that protecting catchment areas and controlling pollution are essential measures for ensuring the continued availability and quality of water resources. In semi-arid regions like Dodoma, where rainfall is erratic and droughts are frequent, maintaining environmental integrity is vital to avoid the depletion of underground and surface water sources.

2.4 Relevance of the Theory to the Study

The Sustainable Development Theory is particularly relevant to this study because it highlights the interconnectedness of technical, financial, and social systems in maintaining sustainable water services. In Msalato Ward, the sustainability of water projects depends on more than infrastructure; it requires effective governance, community participation, financial accountability, and environmental conservation. As Whittington and Hope (2019) observe, sustainability is a process that involves balancing institutional efficiency with community engagement and ecological stewardship.

Therefore, this theory provides the analytical framework for examining the factors that influence water project sustainability in Msalato Ward. It guides the study in assessing how economic, social, and environmental dimensions collectively determine whether a water system can continue delivering safe, reliable, and affordable services to the community in the long term.

3.0 LITERATURE REVIEW

This section reviews previous studies related to the sustainability of community-based water projects, both globally and within Tanzania. The review focuses on identifying empirical findings, key themes, and theoretical gaps that guided this study.

3.1 Global Perspective on Water Project Sustainability

Globally, sustainability of water projects has been a major concern in development discourse for several decades. According to the World Bank (2023), nearly 30% of rural water supply systems in developing countries become non-functional within five years of completion. Common factors influencing sustainability include poor maintenance, weak institutional capacity, inadequate funding, and lack of community involvement. Studies by Whittington and Hope (2019) highlight that sustainable water management requires an integrated approach that balances technical performance, community participation, and environmental conservation.

In Asia, for instance, community-managed water projects in India and Nepal have achieved relative success due to the integration of local participation and effective cost-recovery mechanisms (African Development Bank, 2021). Conversely, projects implemented through top-down approaches—where communities have limited decision-making power—often face challenges of neglect, misuse, and premature breakdowns.

3.2 Empirical Studies in Africa

In Sub-Saharan Africa, several studies have emphasized the centrality of governance and community ownership in ensuring water project sustainability. The African Development Bank (2021) found that lack of technical skills, inadequate spare parts, and financial mismanagement were among the main causes of project collapse in Kenya, Uganda, and Tanzania. Similarly, Mogaka (2018) in Kenya reported that transparency in fund management and local leadership commitment were essential in promoting accountability and continued service delivery.

In Uganda, Musoke (2019) established that successful community-based water projects were those where local leaders were trained in basic maintenance and record keeping. The author concluded that capacity building and continuous monitoring are vital

components of sustainable water provision in developing contexts.

3.3 Studies Conducted in Tanzania

In the Tanzanian context, sustainability challenges in water projects have been widely documented. Chumbula (2019) examined community participation in water projects in Iringa District and found that limited involvement of local users during planning and implementation stages led to weak ownership and poor maintenance. The study emphasized the importance of participatory decision-making in achieving sustainability.

Similarly, Mwihambi (2020) explored governance and sustainability of rural water systems in Singida Region and revealed that unclear roles between water committees and local government authorities reduced efficiency and accountability. Poor coordination and weak institutional frameworks were also identified as barriers to long-term functionality.

Furthermore, Msuya (2021) focused on financial transparency and community trust in water management in Arusha and found a positive relationship between financial openness and willingness of community members to contribute towards operation and maintenance costs. These findings imply that sustainability depends not only on technical inputs but also on trust and collaboration between service providers and beneficiaries.

3.4 Synthesis and Knowledge Gap

While previous studies provide valuable insights into the factors influencing the sustainability of water projects, most have concentrated on rural settings or isolated community-based systems. Few have examined sustainability issues within semi-urban contexts such as Dodoma City, where both government-managed and community-managed schemes coexist.

Moreover, limited empirical evidence exists on how governance, financial management, and community participation interact to influence sustainability in rapidly urbanizing areas like Msalato Ward. As noted by Msuya (2021) and Chumbula (2019), contextual variations such as population growth, infrastructure aging, and local institutional capacity affect how sustainability strategies are implemented.

Therefore, this study fills an important gap by providing empirical evidence on the factors affecting the sustainability of water projects in Msalato Ward, Dodoma City. It contributes to the broader discourse on sustainable water management by integrating technical, financial, institutional, and social dimensions within an urbanizing environment.

4.0 METHODOLOGY

4.1 Research Design

The study employed a mixed-methods research design, which integrates both quantitative and qualitative approaches. This design was adopted to provide a comprehensive understanding of the factors influencing the sustainability of water projects in Msalato Ward. The combination of the two approaches enabled triangulation, enhanced data accuracy, and allowed for the validation of findings through multiple perspectives (Creswell JW, 2014). The quantitative component provided measurable patterns related to respondents' opinions and experiences, while the qualitative component offered deeper insights into community perceptions, governance, and institutional practices.

4.2 Area of the Study

The study was conducted in Msalato Ward, located in Dodoma City Council, Dodoma Region, Tanzania. Msalato Ward lies approximately 12 kilometers north of the Dodoma City center. It is a semi-urban area characterized by a mixture of residential, institutional, and agricultural activities. The ward has an estimated population of 7,301 people (National Bureau of Statistics, 2022). The area was selected because it faces recurrent challenges of unreliable water supply, frequent system breakdowns, and poor maintenance despite having several donors- and government-supported water projects.

4.3 Research Approach

The study followed a descriptive research approach, which focuses on obtaining information that describes the existing conditions, opinions, and practices affecting water project sustainability. The descriptive approach was appropriate because it allowed the researcher to systematically collect and analyze data from different stakeholders involved in water supply management in Msalato Ward.

4.4 Target Population

The target population comprised household heads, community leaders, and DUWASA officials. These groups were selected because they are directly involved in water use, management, or decision-making regarding water service delivery in Msalato Ward. The inclusion of multiple categories of respondents enabled the study to capture diverse experiences and viewpoints related to water project operations and sustainability.

4.5 Sample Size and Sampling Techniques

The sample size was 55 respondents, determined using purposive and stratified random sampling techniques. Stratified sampling was applied to ensure representation from all key groups: households, local leaders, and water authority representatives. Out of the 55 participants, 40 were household heads, 10 were local government leaders, and 5 were DUWASA officials.

Purposive sampling was used for selecting DUWASA officials and key informants who possessed specialized knowledge on technical and administrative aspects of water management. This combination of sampling methods ensured that data were both representative and relevant to the study objectives.

4.6 Data Collection Methods

Multiple data collection tools were used to strengthen the validity of the results.

- **Questionnaires:** Structured questionnaires were administered to household respondents to collect quantitative data on technical, institutional, and social aspects of water project sustainability.
- **Interviews:** Key informant interviews were conducted with DUWASA officials, ward leaders, and members of water committees to gather detailed qualitative information on governance, maintenance, and community participation.
- **Focus Group Discussions (FGDs):** FGDs were held with selected community members to explore their perceptions, attitudes, and experiences regarding project ownership and sustainability challenges.

The use of diverse instruments allowed for triangulation of findings, thus enhancing the credibility and reliability of the study outcomes.

4.7 Data Analysis Techniques

Quantitative data were analyzed using the Statistical Package for Social Sciences (SPSS) to generate descriptive statistics such as frequencies, percentages, and means. Tables and figures were used to summarize data for clarity. Inferential statistics, particularly correlation analysis, were employed to examine relationships between variables such as community participation, financial management, and sustainability levels.

Qualitative data obtained through interviews and focus group discussions were analyzed thematically. Thematic analysis involved coding and categorizing responses to identify recurrent themes and patterns related to governance, participation, and institutional challenges. The qualitative findings were used to complement and interpret quantitative results, providing a more holistic understanding of the issues under investigation.

4.8 Validity and Reliability

To ensure the validity of the instruments, the questionnaires and interview guides were pre-tested in a nearby ward with similar characteristics to Msalato. Adjustments were made to improve clarity and relevance. Reliability was maintained by standardizing the administration of tools and using consistent procedures throughout data collection. The triangulation

of data sources and methods further strengthened the credibility of the study findings.

4.9 Ethical Considerations

The study adhered to ethical research principles, including informed consent, confidentiality, and voluntary participation. Permission to conduct the research was obtained from the Open University of Tanzania and the Dodoma City Council. Respondents were informed about the purpose of the study, and their participation was voluntary. No identifying information was disclosed in the final report, ensuring anonymity and privacy.

5.0 RESULTS AND DISCUSSION

5.1 Technical, Financial, and Institutional Challenges Affecting Sustainability

This section presents findings related to the first specific objective:

“To assess the technical, financial, and institutional challenges affecting the sustainability of water projects in Msalato Ward.”

The study analyzed both descriptive and inferential data to identify how these three factors contribute to water project sustainability.

Table 1: Technical, Financial, and Institutional Challenges Affecting Water Project Sustainability in Msalato Ward (n = 55)

Category	Indicator	Frequency (%)	Interpretation
Technical Factors	Frequent breakdown of pumps and boreholes	70.9	Systems often fail due to lack of preventive maintenance
	Inadequate technical skills among local operators	63.6	Communities depend heavily on DUWASA technicians
	Limited spare parts and maintenance tools	67.3	Repairs delayed due to lack of local spare-part shops
Financial Factors	Irregular financial contributions by users	60.0	Weak payment compliance undermines cost recovery
	Lack of transparency in fund management	52.7	Users have little trust in committee financial reports
	Absence of clear budgeting and record-keeping	49.1	Reduces accountability and planning efficiency
Institutional Factors	Weak coordination between DUWASA and local committees	58.2	Overlapping roles and poor communication observed
	Limited community awareness of management roles	54.5	Majority unaware of committee responsibilities
	Political interference in decision-making	47.3	Undermines committee autonomy and project consistency

Source: *Field Data, 2025*

Table 2: Regression Results on the Influence of Technical, Financial, and Institutional Factors on Water Project Sustainability

Independent Variable	Unstandardized Coefficient (B)	Standard Error	Beta (β)	t-value	Sig. (p-value)
Technical Factors	0.364	0.089	0.422	4.102	0.001
Financial Factors	0.295	0.072	0.316	3.875	0.002
Institutional Factors	0.248	0.068	0.275	3.619	0.004
Constant	1.342	0.191	—	7.029	0.000
Model Summary: R ² = 0.658, Adjusted R ² = 0.643, F(3,51) = 32.94, p < 0.001					

Source: *Field Data, 2025 (SPSS Output)*

6.0 DISCUSSION OF RESULTS

The regression results in Table 2 show that all three independent variables—technical, financial, and institutional factors—significantly influence the sustainability of water projects in Msalato Ward (p < 0.01). The model’s R² value of 0.658 indicates that approximately 65.8% of the variation in project sustainability is explained by these factors, suggesting a strong combined effect.

Among the predictors, technical factors (β = 0.422) had the greatest influence, followed by financial (β = 0.316) and institutional factors (β = 0.275). This means that improvements in the technical operation and maintenance of water systems contribute the most to ensuring project longevity and reliability. These findings are consistent with Mwihambi (2020), who found that technical breakdowns and lack of skilled personnel are among the main causes of unsustainable water systems in Singida Region.

The financial dimension was also critical. Respondents highlighted irregular contributions, low transparency, and weak financial reporting as persistent problems. Regression results confirm that financial management significantly predicts sustainability ($p = 0.002$). This agrees with Msuya (2021), who found that financial accountability enhances community trust and willingness to pay for services. Hence, promoting transparent record-keeping and regular financial disclosure meetings could strengthen cost recovery and ensure long-term maintenance funding.

Institutional factors also showed a statistically significant relationship with sustainability ($p = 0.004$). The findings revealed overlapping roles between DUWASA and local committees, limited supervision, and political interference in resource allocation. This mirrors Chumbula (2016), who reported that weak governance structures often undermine collective ownership and accountability in rural water projects. Strengthening coordination between DUWASA and community management structures, alongside leadership training, could mitigate these challenges.

Overall, both descriptive and inferential results support the Sustainable Development Theory, which emphasizes balance among economic (financial), social/institutional, and environmental (technical infrastructure) dimensions. The significant regression coefficients indicate that improvements in technical capacity, financial transparency, and institutional governance can substantially enhance water project sustainability in Msalato Ward and beyond.

6.0 CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

This study set out to examine the factors affecting the sustainability of water projects in Msalato Ward, Dodoma City. Specifically, it focused on assessing technical, financial, and institutional challenges that hinder consistent and reliable water service delivery.

The findings revealed that technical factors—such as frequent breakdowns of pumps, limited spare parts, and inadequate local maintenance skills—pose the greatest threat to sustainability. Water systems are often non-functional for long periods due to delayed repairs and overdependence on external technicians from DUWASA.

Financial factors also significantly affect sustainability, as the study found weak accountability, irregular user contributions, and lack of transparency in fund management. These shortcomings reduce community trust and weaken the financial base needed for continuous operation and maintenance.

Similarly, institutional and governance issues—including poor coordination between DUWASA and

local committees, limited community awareness of roles, and occasional political interference undermine management effectiveness.

Regression analysis confirmed that these three dimensions collectively explain 65.8% of the variance in project sustainability, with technical factors having the strongest predictive effect. These results underscore the interdependence of technical efficiency, financial transparency, and institutional governance as drivers of sustainable community water services.

In light of the Sustainable Development Theory, the study concludes that achieving sustainability in urban and semi-urban water projects requires balancing economic, social, and environmental elements through community participation, institutional accountability, and continuous capacity development.

6.2 Recommendations

Based on the findings, the following recommendations are proposed to improve the sustainability of water projects in Msalato Ward and similar settings:

1. **Strengthen Local Technical Capacity:** DUWASA and the Ministry of Water should organize continuous technical training for local operators and water committees. Building local expertise will reduce dependence on external technicians and ensure timely maintenance of infrastructure.
2. **Enhance Financial Transparency and Accountability:** Community water committees should implement clear financial reporting procedures. Regular public disclosure of income and expenditure statements, coupled with independent audits, will enhance user trust and improve payment compliance.
3. **Improve Institutional Coordination:** There is a need to clarify and harmonize the roles of DUWASA, ward authorities, and community water committees. Regular joint meetings and communication frameworks should be established to facilitate collaboration and quick problem-solving.
4. **Promote Community Awareness and Participation:** Awareness campaigns should be conducted to educate residents about their roles in managing and sustaining water projects. Inclusive participation, especially of women and youth, should be prioritized in decision-making and management processes.
5. **Integrate Environmental Conservation Measures:** Water project sustainability should be linked to catchment protection and reforestation initiatives. Local by-laws should promote tree planting and discourage environmental degradation around water sources.
6. **Policy Implications:** Policymakers should consider institutionalizing community-based management frameworks within urban settings to complement

public water authorities. Future water development programs should integrate sustainability indicators—technical, financial, and institutional at both planning and implementation stages.

6.3 Areas for Further Research

Although this study focused on technical, financial, and institutional factors, other aspects such as climate variability, user behavior, and governance reforms could further influence sustainability. Future research should therefore examine how these additional factors interact with community and institutional capacities to enhance or hinder sustainable water provision in rapidly growing cities.

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