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Sustainability Challenges And Success Factors Of The AFDB-Funded Integrated Small Towns Water Supply And Sanitation Program (ISTWSSP) In Mongu Town Of Zambia.

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Abstract
Donor-funded water supply programs in Sub-Saharan Africa have significantly expanded access to potable water infrastructure; however, sustaining service delivery beyond project completion remains a persistent challenge. This paper presents a research analysis case study of the African Development Bank (AfDB)-funded Integrated Small Towns Water Supply and Sanitation Program (ISTWSSP) in Mongu, Zambia, with the objective of examining both success factors and sustainability challenges associated with program implementation. A mixed-methods research design was employed, combining household surveys (n = 35), semi-structured interviews with key institutional stakeholders, and review of program documentation and sector performance reports. The findings indicate notable improvements in water quality, supply pressure, and network coverage following implementation, reflecting strong technical performance and early service delivery gains. Key success factors included expansion of treatment capacity, rehabilitation of transmission and distribution networks, and the introduction of basic operational monitoring tools within the local utility. Despite these achievements, several interrelated constraints threaten long-term sustainability. These include persistently high non-revenue water, non-cost-reflective tariffs, limited operational autonomy of the utility, weak community engagement across project phases, gaps in maintenance readiness for newly commissioned assets, and vulnerability to climate-induced energy disruptions. The study reveals a misalignment between infrastructure delivery and institutional preparedness, underscoring the need for donor-funded water supply program to integrate governance reform, financial sustainability mechanisms, and participatory approaches alongside physical investments. Practical lessons are drawn for utilities and development partners implementing small-town water supply program in similar contexts.

Keywords: *water supply sustainability; donor-funded programs; institutional capacity; non-revenue water; tariff reform; small towns.*

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I. Introduction

Water supply and sanitation services are fundamental to public health, economic development, and social wellbeing. Over the past two decades, donor-funded programs have played a critical role in expanding water infrastructure across Sub-Saharan Africa. While these investments have increased access to improved water sources, many systems experience declining performance once external funding and technical support are withdrawn. As a result, the sustainability of donor-funded water supply programs has emerged as a central concern for policymakers, practitioners, and development partners.

Empirical evidence suggests that the challenges associated with sustaining water supply systems are rarely technical alone. Instead, post-project decline is often linked to institutional weaknesses, inadequate financial planning, limited community ownership, and insufficient attention to long-term operation and maintenance arrangements (Harvey, 2007). Hutton and Varughese (2016) similarly argue that achieving sustainable development outcomes requires a balanced focus on infrastructure delivery, service management, and governance reform.

In Zambia, significant reforms have been undertaken to improve water service provision, including the corporatization of water utilities and establishment of an independent sector regulator. Despite these reforms, performance disparities persist across utilities, particularly those serving small and medium-sized towns. High non-revenue water (NRW), constrained cost recovery, limited operational autonomy, and exposure to climate variability continue to undermine service sustainability (NWASCO, 2023).

The African Development Bank's Integrated Small Towns Water Supply and Sanitation Program (ISTWSSP) was designed to address these challenges by expanding access to sustainable water and sanitation services in twelve Zambian small towns (AfDB, 2016). In Mongu, the program achieved substantial infrastructure completion; however, implementation delays, cost pressures, and questions surrounding institutional readiness

raise concerns about long-term sustainability. This paper examines the Mongu case as a research analysis, identifying success factors and sustainability challenges to inform future donor-funded small-town water supply interventions.

II. Programme And Sector Context

Small-town water supply systems occupy a unique and often vulnerable position within national water sector frameworks. Unlike large urban utilities, small-town systems typically operate with smaller customer bases, limited technical capacity, and higher unit operating costs. At the same time, they are expected to meet regulatory standards comparable to those of larger utilities. These structural constraints heighten the risk of service deterioration once donor support concludes.

Zambia's water sector reforms sought to address these challenges through commercialization of utilities and regulation by the National Water Supply and Sanitation Council (NWASCO). While these reforms improved accountability and transparency, many utilities—particularly those serving geographically dispersed towns—continue to struggle with financial sustainability and operational efficiency. Western Water Supply and Sanitation Company (WWSSC), which serves Mongu and several other towns, has consistently ranked among the lower-performing utilities in national performance assessments, reflecting persistent challenges related to NRW, revenue collection, and service reliability.

The ISTWSSP, financed by the AfDB, aimed to address these challenges through a dual focus on infrastructure development and institutional strengthening. In Mongu, project interventions included construction and rehabilitation of water treatment facilities, upgrading of transmission and distribution networks, installation of metering and monitoring systems, and capacity-building activities for utility staff. By the time of this study, physical works in Mongu had reached over 97% completion. However, the program experienced implementation delays and projected cost overruns, highlighting the complexity of delivering infrastructure in small-town contexts with limited institutional capacity.

The Mongu case therefore provides an opportunity to assess whether donor-funded investments translated into sustainable service delivery outcomes, and to examine the extent to which institutional, financial, and social dimensions were effectively addressed alongside infrastructure delivery.

III. Literature Review

Sustainability of water supply services has been widely examined in the context of donor-funded infrastructure programs. Sustainability is commonly defined as the ability of a water system to continue delivering services at an acceptable level over time without reliance on continued external support. This concept encompasses technical functionality, financial viability, institutional capacity, and social acceptance (Lockwood & Smits, 2011).

Numerous studies have demonstrated that donor-funded water projects often prioritise infrastructure delivery at the expense of long-term service management. Harvey (2007) identifies inadequate financing for operation and maintenance as a primary cause of post-project failure, noting that systems frequently lack sufficient revenue to cover routine costs once donor funding ends. Hutton and Varughese (2016) further argue that achieving sustainable outcomes requires integrating service delivery models, tariff reform, and institutional strengthening into program design.

Small-town water supply systems face distinct challenges compared to large urban utilities, as their limited customer bases constrain revenue generation and make it difficult to achieve economies of scale, resulting in higher unit costs and financial vulnerability (Lockwood & Smits, 2011). Studies indicate that non-revenue water levels tend to be higher in small and medium-sized towns due to weaker asset management systems, limited enforcement capacity, and ageing infrastructure, which collectively undermine operational efficiency and financial sustainability (Harvey, 2007). Where tariff-setting authority is centralized, utilities may be unable to adjust prices in a timely manner to reflect rising operational costs, thereby constraining cost recovery and undermining financial sustainability (Gauff JBG Ingenieure, 2020)

Institutional capacity building is routinely incorporated into donor-funded water supply programs; however, evidence suggests that its effectiveness varies widely. While training and procedural reforms are commonly delivered, their translation into improved performance depends on enabling governance arrangements, incentive structures, and managerial autonomy. In the absence of these conditions, capacity-building interventions risk remaining nominal rather than transformative (African Development Bank Group, 2016; Hutton & Varughese, 2016; Gauff JBG Ingenieure, 2020).

Community engagement has also been identified as a critical determinant of sustainability (Cleaver & Toner, 2006). Participatory planning and transparent communication can enhance user trust, tariff compliance, and asset protection. Conversely, weak engagement can lead to resistance, illegal connections, and conflict, increasing operational and financial risks.

This body of literature underscores the importance of assessing donor-funded water supply programs through a holistic sustainability lens that integrates technical, financial, institutional, and social dimensions. The Mongu case contributes applied evidence from a small-town context within a large, multi-town program.

IV. Methodology

A convergent mixed-methods research design was adopted to examine sustainability outcomes of the ISTWSSP in Mongu. This approach enabled triangulation of quantitative and qualitative data, providing a comprehensive understanding of program performance and post-implementation risks.

Quantitative data were collected through structured household surveys administered to 35 households across low, medium, and high-density residential areas using stratified random sampling. The survey captured perceptions of service access, water quality, supply reliability, billing transparency, and perceived sustainability of services.

Qualitative data were obtained through semi-structured interviews with purposively selected stakeholders, including technical and managerial staff from the local water utility and representatives involved in program oversight. Interviews explored implementation experience, institutional capacity, tariff structures, community engagement, and sustainability risks.

In addition, program appraisal reports, engineer's monthly progress reports, and sector performance documents were reviewed to contextualize primary data. Quantitative data were analysed using descriptive statistics, while qualitative data were analysed thematically, with recurring patterns coded under institutional, financial, technical, and social themes.

Ethical clearance for the study was obtained in accordance with UNZABREC requirements. Participation was voluntary, informed consent was obtained, and confidentiality of respondents was maintained.

V. Findings/Results

Success factors

The findings indicate that the ISTWSSP delivered significant improvements in water supply services in Mongu. A large proportion of surveyed households reported connection to the upgraded piped network, with notable improvements in water quality and supply pressure. Improved pressure reduced reliance on household storage and alternative water sources, contributing to improved perceptions of water safety and convenience.

Stakeholder interviews confirmed that expansion of treatment capacity and rehabilitation of transmission and distribution networks were key contributors to these improvements.

Institutionally, the program supported staff training and community empowerment initiatives. Although still limited in scope, these interventions improved internal coordination and awareness of performance issues. Revenue collection improved following project implementation, reflecting early operational gains.

Sustainability challenges

Despite these achievements, several interrelated challenges threaten long-term sustainability. Financial sustainability emerged as the most significant constraint. NRW remained high, driven more by commercial losses than physical losses. High NRW continued to reduce billable volumes.

Tariffs were reported to be below cost-reflective levels, limiting the utility's ability to recover operation and maintenance costs amid rising energy prices. Centralized tariff approval processes further constrained the utility's capacity to respond to financial pressures.

Institutional constraints compounded these risks. Decision-making authority over tariffs, and key procurements remained centralized, limiting managerial autonomy and responsiveness. Staff turnover disrupted continuity, particularly in specialised technical roles required to operate and maintain new equipment.

Community engagement was weak across project phases. Many households reported limited consultation during planning and implementation, reducing awareness of project objectives and tariff implications. This weakened social ownership and increased resistance to project land acquisition and billing changes.

Climate-related energy disruptions further exposed system vulnerabilities. Power rationing during drought periods reduced treatment plant operating hours and delayed commissioning activities, highlighting the need for resilience-oriented planning.

VI. Discussion

The findings from the Mongu case study reinforce a recurring pattern observed in donor-funded water supply programs across Sub-Saharan Africa: substantial success in infrastructure delivery is often accompanied by persistent challenges in sustaining services after project completion. While the ISTWSSP achieved its primary objective of expanding water supply infrastructure and improving service quality, the long-term viability of these gains remains uncertain due to institutional, financial, and social constraints.

From a technical perspective, the improvements in water quality, pressure, and network coverage demonstrate that the engineering design and construction components of the programme were largely effective. These outcomes are consistent with findings from other donor-funded interventions, where physical infrastructure targets are typically met or exceeded. However, as highlighted in the literature, technical success alone is insufficient to guarantee sustainability (Lockwood & Smits, 2011). The Mongu experience illustrates that without adequate supporting systems for operation and maintenance, even well-designed infrastructure remains vulnerable to gradual performance decline.

Financial sustainability emerged as the most critical constraint in Mongu. Persistently high non-revenue water undermines revenue generation and limits the utility's ability to finance routine operation and maintenance activities. This finding aligns with regional evidence indicating that NRW is both a technical and governance challenge, often driven by weak enforcement capacity, ageing infrastructure, including metering and billing inefficiencies. In Mongu, the inability to effectively reduce NRW further complicates revenue collection efforts.

Tariff-related challenges further compounded financial risks. Although tariff reviews were undertaken (Gauff JBG Ingenieure, 2020), the resulting tariffs remained below cost-reflective levels, limiting the utility's capacity to recover the full costs associated with expanded infrastructure and rising energy prices (World Bank, 2019). Centralized tariff approval processes constrained the utility's ability to respond flexibly to changing operational realities. This reflects a broader tension within regulated water sectors, where the need to balance affordability and cost recovery is often resolved in ways that prioritise short-term political considerations over long-term service sustainability.

Institutional capacity and governance arrangements also played a decisive role in shaping sustainability outcomes. While institutional strengthening activities were included in the ISTWSSP design, their impact on operational autonomy and managerial decision-making was limited. Training and procedural reforms did not sufficiently alter incentive structures or accountability mechanisms within the utility. As noted in the literature, capacity-building interventions are most effective when accompanied by governance reforms that empower local managers to make timely decisions regarding staffing, procurement, and resource allocation. In the absence of such reforms, institutional strengthening risks becoming nominal rather than transformative.

Community engagement represents another dimension where sustainability outcomes were constrained. Limited consultation during project planning and implementation reduced community awareness of program objectives and tariff implications. Weak engagement undermined social ownership of the infrastructure and contributed to resistance against project land acquisition (AfDB-ISTWSSP, 2022), billing changes and enforcement measures. Evidence from comparable contexts suggests that sustained community participation enhances transparency, trust, and compliance, thereby supporting both financial and technical sustainability. The Mongu case underscores the importance of moving beyond one-off consultations toward continuous engagement throughout the project lifecycle.

Climate-related energy disruptions further exposed systemic vulnerabilities. Power rationing during drought periods constrained treatment plant operations and delayed commissioning activities, highlighting the dependence of water supply systems on reliable energy sources. As climate variability intensifies, water utilities increasingly require resilience-oriented planning, including backup power solutions and adaptive operating strategies. The Mongu experience demonstrates that failure to integrate climate and energy considerations into program design can undermine sustainability even where infrastructure delivery is successful (Ayyub, 2018).

Overall, the Mongu case confirms that sustainability in donor-funded water supply programs is a multi-dimensional outcome that depends on the alignment of technical, financial, institutional, and social systems. Infrastructure delivery must be accompanied by deliberate efforts to strengthen governance, improve cost recovery, enhance community ownership, and build resilience to external shocks. Without this alignment, donor-funded investments risk achieving short-term gains without long-term impact.

VII. Conclusion And Recommendations

This study assessed the success factors and sustainability challenges of the AfDB-funded Integrated Small Towns Water Supply and Sanitation Program in Mongu, Zambia. The findings demonstrate that the program achieved significant progress in expanding water supply infrastructure and improving service delivery outcomes, particularly in terms of water quality, pressure, and network coverage. These achievements reflect effective technical design and implementation, confirming the capacity of donor-funded programs to deliver tangible infrastructure outputs in small-town contexts.

However, the analysis also reveals that long-term sustainability remains constrained by a combination of financial fragility, limited institutional autonomy, weak community engagement, and vulnerability to climate-related energy disruptions. High non-revenue water levels, non-cost-reflective tariffs, and centralized decision-making processes undermine the utility's ability to finance and manage expanded infrastructure. Institutional strengthening interventions, while present, did not sufficiently transform governance arrangements or managerial incentives to support sustained performance.

The Mongu case highlights the importance of adopting a holistic approach to sustainability that extends beyond infrastructure completion. Donor-funded water supply programs must integrate governance reform, financial sustainability mechanisms, and participatory approaches into program design and implementation. Strengthening utility autonomy, enhancing tariff-setting processes, institutionalizing community engagement, and embedding climate resilience are critical to ensuring that infrastructure investments translate into durable service outcomes.

For policymakers and development partners, the findings underscore the need to recalibrate program success metrics to emphasize post-project performance and long-term service sustainability. For utilities, the study highlights the importance of prioritising NRW reduction, cost recovery, and institutional capacity alongside infrastructure expansion. The lessons from Mongu are directly relevant to other small-town water supply programs in Zambia and similar contexts across Sub-Saharan Africa, where achieving sustainable water services remains a central development challenge.

Ethical Approval and Conflict of Interest Statements

Ethical Approval

Ethical clearance for this research was granted by the University of Zambia Biomedical Research Ethics Committee (UNZABREC), Approval Ref: 6536-2025.

Conflict of Interest

The author declares no conflict of interest

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