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COMMUNITY PARTICIPATION IN OPERATION AND MAINTENANCE AND SUSTAINABILITY OF RURAL WATER SERVICE DELIVERY IN WALUNGU TERRITORY, DEMOCRATIC REPUBLIC OF THE CONGO

BY

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ABSTRACT

Keeping rural water services operational requires communities to organise routine maintenance and obtain help when repairs exceed local capacity. This study examined the relationship between community participation in operation and maintenance and sustainability of rural water service delivery in Walungu Territory, Democratic Republic of the Congo. A convergent parallel mixed-methods design combined household questionnaires with stakeholder interviews. Of 360 household questionnaires administered, 344 were completed, giving a response rate of 95.6%. Quantitative data were analysed using descriptive statistics, Pearson correlation and the operation-and-maintenance coefficient from the broader study's multiple regression model. Interview accounts were analysed thematically. Although 56.3% of respondents recognised a community committee responsible for operation and maintenance, 57.8% disagreed that breakdowns were repaired within a reasonable time. Interview participants described irregular contributions, local efforts to undertake minor repairs and dependence on external technicians for major faults. Operation and maintenance had a weak positive correlation with sustainability ($r = .199$, $p < .001$). The association remained statistically significant after adjustment for decision-making, capacity building and ownership ($B = 0.134$, $\beta = .180$, $p = .001$). These findings draw attention to the practical gap between having a maintenance committee and being able to restore interrupted services. They support attention to repair finance, clear maintenance responsibilities and accessible technical assistance. The cross-sectional design and inconsistencies in the reported measurement records limit interpretation; the findings establish an association rather than a causal effect. The article contributes evidence on the conditions surrounding community participation in maintaining rural water services in Walungu.

Keywords: community participation; operation and maintenance; sustainability; rural water service delivery; Walungu; Democratic Republic of the Congo

Introduction

A rural water project fulfils its purpose when households can continue to use its services after construction and handover. Keeping those services running involves cleaning facilities, identifying faults, arranging repairs and meeting maintenance costs. These responsibilities often bring communities into the everyday management of water infrastructure. When a major fault occurs, however, restoring service may require money, equipment or skills that users cannot provide immediately.

Community participation in operation and maintenance therefore deserves attention as a practical part of sustainability. The presence of a committee can provide an organizational starting point, but service continuity also depends on what that committee can do and whom it can call upon. This article examines that relationship in selected rural water project communities in Walungu Territory, South Kivu Province, Democratic Republic of the Congo (DRC).

Background to the Study

Research across rural water settings shows that functioning services depend on several connected arrangements. Foster (2013), in a study of more than 25,000 community-managed handpumps in Liberia, Sierra Leone and Uganda, identified technical, financial and institutional factors associated with functionality. Hutchings et al. (2015), reviewing successful community-management cases, emphasised the importance of continuing external support. Together, these studies suggest that local effort needs to be considered alongside the resources available for maintaining services.

Financing is one part of that wider picture. Truslove et al. (2020) examined rural water tariffs in Malawi in relation to both affordability and operation and maintenance costs. In South Kivu, Jimenez-Redal et al. (2021) studied willingness to pay for improved operation and maintenance of gravity-fed water schemes on Idjwi Island. These studies raise relevant questions about how contributions can meet maintenance needs while remaining affordable to users. Their findings cannot be assumed to describe Walungu, where local evidence is needed on participation and the difficulties communities encounter.

The present article focuses on the third objective of a broader thesis on community participation and sustainability. Its purpose is to examine how participation in operation and maintenance relates to sustainability of rural water service delivery in Walungu Territory. The guiding question is: How does community participation in operation and maintenance relate to the sustainability of rural water service delivery in the study communities?

Statement of the Problem

Community management arrangements are intended to help rural water services continue beyond project implementation. Yet establishing a committee and assigning local responsibilities may leave unresolved questions about repair finance, access to technicians and the work users can reasonably undertake. In Walungu, the extent to which participation in these maintenance activities was associated with sustained service delivery required empirical examination.

The study addressed this problem by combining household reports of maintenance practices with accounts from stakeholders involved in water management. It examined the relationship between reported participation and sustainability, while using interviews to understand how communities handled routine work, financial contributions and serious breakdowns. This focus provides a basis for discussing practical maintenance arrangements without assuming that community participation alone guarantees reliable services.

Literature Review

Arnstein's (1969) Ladder of Citizen Participation draws attention to the influence people exercise within participatory arrangements. Applied to maintenance, it encourages consideration of whether communities can make decisions about repairs and resources as well as contribute labour. The study did not measure the ladder's individual rungs. The framework instead helped distinguish responsibility for doing maintenance work from authority and capacity to organise it.

Sustainability also requires a clear definition of what continues over time. Purvis et al. (2019) trace the varied origins of sustainability's commonly used pillars and underline the need for conceptual clarity. In this study, sustainability of service delivery was measured through household reports about the continued functioning and usefulness of water services. These reports describe user perceptions rather than an independent assessment of the technical condition of the infrastructure.

Empirical studies offer reasons to examine participation through specific activities. Marks et al. (2014) distinguished forms of community participation when investigating handpump sustainability in rural Ghana. Hutchings et al. (2015) showed why community management must be considered together with the support that enables it to work. Whaley and Cleaver (2017) further emphasised the institutional context of rural water management, questioning narrow interpretations of functionality and committee performance. These perspectives support an examination of what communities do, the constraints

they face and the relationships through which they obtain assistance.

For Walungu, the resulting expectation was that greater participation in operation and maintenance would be positively associated with reported sustainability. This expectation concerned an association, not a predetermined causal effect. Household questionnaire items covered routine work, committee responsibility, repair timeliness, contributions, perceptions of poor maintenance and local responses to breakdowns. Stakeholder interviews explored how these arrangements operated in practice.

Methodology

Research Design and Sampling

The study adopted a convergent parallel mixed-methods design in four rural water project communities in Walungu Territory. Household questionnaires and stakeholder interviews were conducted during the same fieldwork phase, analysed separately and brought together during interpretation. Household responses were pooled across communities; the analysis did not compare individual projects.

The sampling plan used an estimated population of 3,600 households, derived from 18,000 inhabitants and an assumed mean household size of five. These were planning estimates rather than independently verified census figures. The household sample target was 360. Village registers and committee records provided the sampling frame, from which households were assigned identifiers and selected using a random-number procedure. The household was the unit of analysis, with one member answering the questionnaire.

The qualitative component targeted 35 key informants: 15 committee members, 10 local leaders, five local-authority representatives and five NGO representatives. Purposive selection reflected their involvement in rural water planning, management or oversight. This was the planned qualitative sample; the available reporting does not independently establish the final number of interviews completed. Participant codes are retained when presenting quotations.

Data Collection and Analysis

Questionnaires were administered face to face and used five-point Likert responses, ranging from strongly disagree to strongly agree. Semi-structured interviews explored maintenance practices, contributions, repair arrangements and access to support. Supervisors and subject specialists reviewed the instruments, and pretesting informed wording adjustments. The thesis reports an internal-consistency coefficient of .847 for the operation-and-maintenance measure, although inconsistent pilot counts prevent a definitive pilot sample size from being stated here.

SPSS version 27 was used for quantitative analysis. Descriptive results present the six maintenance items, followed by the Pearson correlation between operation and maintenance and sustainability. To retain the context of the original analysis, the article also reports the operation-and-maintenance coefficient from the existing regression that adjusted for decision-making, capacity building and ownership. These other dimensions are adjustment variables here, not additional article objectives. No new single-predictor regression was fitted.

Interview recordings were transcribed and analysed thematically, with Orange version 3.40.0 supporting text organisation and exploration. Interpretation focused on patterns of meaning in participants' accounts, consistent with Braun and Clarke (2006). Survey findings and interview accounts were compared during interpretation to identify agreement, complementary explanations and differences (Fetters et al., 2013). The article uses the analyses reported in the thesis and does not reanalyse individual-level data.

Ethical Considerations

The thesis records permission from the university and community authorities before data collection. Participants were informed of the study's purpose and their right to decline or withdraw, and informed consent was obtained. Respondent codes protected identities in reporting. Access to research records was restricted, with electronic files password protected and paper records stored securely.

Results

Household Responses on Operation and Maintenance

Of 360 household questionnaires administered, 344 were completed, representing a response rate of 95.6%. Sixteen questionnaires were not returned or were incomplete. Table 1 presents the reported responses to the six operation-and-maintenance items. The table retains the wording and numerical results from the thesis.

Table 1. Household responses on participation in operation and maintenance

Statement	SD f (%)	D f (%)	N f (%)	A f (%)	SA f (%)	Mean	Std. dev.
Community members participate in cleaning and maintaining water facilities.	18 (5.2)	64 (18.6)	133 (38.7)	89 (25.9)	40 (11.6)	3.20	1.04
There is a community committee responsible for the operation and maintenance of water facilities.	9 (2.6)	58 (16.9)	83 (24.1)	124 (36)	70 (20.3)	3.55	1.07
Breakdowns of water facilities are repaired within a reasonable time.	82 (23.8)	117 (34)	104 (30.2)	38 (11)	3 (0.9)	2.31	0.98
Community members contribute labour or money for maintenance and repairs.	29 (8.4)	83 (24.1)	129 (37.5)	98 (28.5)	5 (1.5)	2.90	0.96
Poor maintenance contributes to frequent breakdowns of water facilities.	1 (0.3)	53 (15.4)	111 (32.3)	81 (23.5)	98 (28.5)	3.65	1.06
When water facilities break down, community members take initiative before external help arrives.	54 (15.7)	75 (21.8)	107 (31.1)	102 (29.7)	6 (1.7)	2.80	1.08

Note. n = 344. SD = strongly disagree; D = disagree; N = neutral; A = agree; SA = strongly agree. Values are reproduced as reported in the thesis. Percentages may not total 100 because of rounding. The poor-maintenance item is worded negatively; agreement does not indicate greater positive participation.

The clearest contrast concerned committee presence and repair timeliness. A total of 56.3% of respondents agreed or strongly agreed that a community committee was responsible for operation and maintenance. However, 57.8% disagreed or strongly disagreed that breakdowns were repaired within a reasonable time, while only 11.9% agreed or strongly agreed. These responses indicate that having an organisational structure did not necessarily mean households experienced prompt repairs.

Participation in maintenance work and contributions was less widely endorsed. For cleaning and maintaining facilities, 37.5% agreed or strongly agreed, while 38.7% remained neutral. For contributions of labour or money, 30.0% agreed or strongly agreed, 32.5% disagreed or strongly disagreed and 37.5% were neutral. Similarly, 31.4% agreed or strongly agreed that communities took the initiative before external assistance arrived, compared with 37.5% who disagreed or strongly disagreed.

Half of respondents, 52.0%, agreed or strongly agreed that poor maintenance contributed to frequent breakdowns. This item records a perception about the consequences of poor maintenance. Agreement should not be interpreted as evidence of a high level of positive participation. Its direction also makes the scoring procedure relevant when interpreting the composite association results.

Relationship with Sustainability of Service Delivery

Operation and maintenance had a weak positive correlation with reported sustainability ($r = .199$, $p <$

.001). The adjusted coefficient from the broader regression was also positive and statistically significant (B = 0.134, β = .180, p = .001), as shown in Table 2. Holding the other participation dimensions constant, a one-unit difference in the reported maintenance score corresponded to a 0.134-unit difference in the sustainability score.

Table 2. Association between operation and maintenance and sustainability

Predictor	r	p (r)	B	SE	β	p (B)
Operation and maintenance	.199	< .001	.134	.041	.180	.001

Note. n = 344. r = Pearson correlation; B = unstandardised coefficient; SE = standard error; β = standardised coefficient. The regression coefficient is taken from the broader model adjusting for decision-making, capacity building and ownership. It is not a new single-predictor analysis.

The full four-predictor model explained 4.8% of the variation in sustainability (R^2 = .048; F(4, 339) = 4.297, p = .002). This percentage belongs to the full model and cannot be attributed to operation and maintenance alone. The results identify a weak association in the reported data; they do not show how much a maintenance intervention would improve service delivery.

Experiences of Maintaining Water Services

Interview participants described several forms of practical involvement. M1 explained: "Community members participate in cleaning activities around the water point and contribute labour when minor repairs are needed. Households are expected to contribute small maintenance fees, although not everyone pays regularly." This account connects routine work with the difficulty of sustaining contributions.

Committees had a recognised role in managing these resources. According to M4: "The committee is responsible for collecting maintenance contributions from users. These funds are used to cover routine expenses and minor repairs." The account helps explain what committee responsibility involved, while distinguishing routine expenses from the resources needed for larger failures.

Major breakdowns exposed the limits of local resources. M8 reported: "Major breakdowns usually require assistance from external technicians. In some cases, insufficient funds delay repairs and increase the risk of service interruptions." This experience is consistent with the survey finding that many households did not consider repairs timely.

Irregular payments added to these difficulties. M2 stated: "Contributions are collected from users to support maintenance costs, but payment is sometimes irregular. This creates financial challenges when repairs are needed." Taken together, the interviews show communities undertaking maintenance responsibilities while depending on additional resources and technical assistance. They provide context for the survey patterns without establishing how common each experience was outside the interviewed group.

Discussion

The main finding is a gap between community responsibility for maintenance and the ability to restore services promptly. Committee presence was recognised by more than half of respondents, yet a similar proportion disagreed that repairs were completed within a reasonable time. The interviews help explain this contrast: committees collected contributions and organised minor work, but larger faults required technicians and funds that were not always immediately available.

This pattern is compatible with research that places community management within wider support arrangements. Foster (2013) identified multiple factors associated with rural handpump functionality, and Hutchings et al. (2015) highlighted continuing assistance in successful community-management cases. In Walungu, the evidence suggests examining the connections between community committees and those able to provide technical support, rather than evaluating committee presence on its own.

The financial accounts also give practical meaning to the observed relationship. Participants described contributions as a source of repair finance, but

irregular payments made resources uncertain. The questions of affordability and maintenance costs examined by Truslove et al. (2020), together with the Idjwi study by Jimenez-Redal et al. (2021), are relevant to this concern. The Walungu findings do not establish an appropriate tariff or demonstrate that larger payments would improve sustainability. They suggest a need to understand payment arrangements and repair requirements together.

The statistical association supports attention to maintenance but should be kept in proportion. Its magnitude was weak, and the full regression explained little of the variation in sustainability. The maintenance dimension was selected as the focus of this article after the broader thesis results had been examined. Its significant coefficient therefore should not be treated as an independently confirmed finding from a new study. Technical conditions, governance and the availability of support remain relevant questions for further investigation.

Whaley and Cleaver's (2017) attention to institutions is useful here. Assigning responsibility to communities may have limited practical value if the arrangements for obtaining help are unclear. The contribution of this study lies in bringing household reports and stakeholder experiences together to show where those difficulties arise in the sampled Walungu communities.

Limitations

The cross-sectional design cannot establish causation or determine whether participation preceded sustained service performance. Household perceptions were not independently verified through engineering inspections or long-term operational records. Responses were pooled across communities, so differences between individual water projects were not estimated. The sampling estimates and coverage of the household lists also limit generalisation beyond the study communities.

Measurement consistency requires further checking. Some questionnaire wording differs from labels in the results, and the available reporting does not fully establish reverse scoring or reconcile composite calculations. The sustainability table contains six items while its questionnaire section contains seven. These issues may affect the reported association estimates. The descriptive item results and the regression coefficients should therefore be interpreted with these constraints in mind. Full residual and multicollinearity diagnostics, and any adjustment for household clustering, were not available for this article.

Conclusions

Community participation in operation and maintenance was weakly but positively associated with sustainability of rural water service delivery in the selected Walungu communities. The relationship remained statistically significant in the broader study's adjusted model. Household responses and interviews nevertheless showed that committees and local maintenance activities could coexist with delayed repairs. Irregular contributions and reliance on external technicians were recurring concerns in the accounts. Sustaining rural water services therefore requires attention to the practical conditions under which communities carry out maintenance, while the study's design and measurement limitations prevent a causal conclusion.

Recommendations

Community water committees should keep clear records of faults, contributions, repair expenses and unresolved work, and share this information with users. Local authorities and technical service providers should agree with committees on whom to contact when a fault exceeds local capacity and how repair requests will be followed up. These arrangements respond directly to the reported delays and dependence on external technicians.

NGOs and development partners should include maintenance responsibilities, access to technical assistance and follow-up support in project handover arrangements. Discussions about contributions should consider households' circumstances alongside likely repair costs. The effectiveness of these measures should be monitored through service records, including breakdown duration and repair completion, rather than assumed from the present associations. Further research should verify the existing measures and follow clearly identified facilities over time.

References

Arnstein, S. R. (1969). A ladder of citizen participation. *Journal of the American Institute of Planners, 35*(4), 216–224. https://doi.org/10.1080/01944366908977225

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77–101. https://doi.org/10.1191/1478088706qp063oa

Fetters, M. D., Curry, L. A., & Creswell, J. W. (2013). Achieving integration in mixed methods designs—Principles and practices. *Health Services Research, 48*(6, Part 2), 2134–2156. https://doi.org/10.1111/1475-6773.12117

Foster, T. (2013). Predictors of sustainability for community-managed handpumps in sub-Saharan Africa: Evidence from Liberia, Sierra Leone, and Uganda. *Environmental Science & Technology, 47*(21), 12037–12046. https://doi.org/10.1021/es402086n

Hutchings, P., Chan, M. Y., Cuadrado, L., Ezbakhe, F., Mesa, B., Tamekawa, C., & Franceys, R. (2015). A systematic review of success factors in the community management of rural water supplies over the past 30 years. *Water Policy, 17*(5), 963–983. https://doi.org/10.2166/wp.2015.128

Jimenez-Redal, R., Arana-Landín, G., Landeta, B., & Larumbe, J. (2021). Willingness to pay for improved operations and maintenance services of gravity-fed water schemes in Idjwi Island (Democratic Republic of the Congo). *Water, 13*(8), Article 1050. https://doi.org/10.3390/w13081050

Marks, S. J., Komives, K., & Davis, J. (2014). Community participation and water supply sustainability: Evidence from handpump projects in rural Ghana. *Journal of Planning Education and Research, 34*(3), 276–286. https://doi.org/10.1177/0739456X14527620

Purvis, B., Mao, Y., & Robinson, D. (2019). Three pillars of sustainability: In search of conceptual origins. *Sustainability Science, 14*(3), 681–695. https://doi.org/10.1007/s11625-018-0627-5

Truslove, J. P., Coulson, A. B., Nhlema, M., Mbalame, E., & Kalin, R. M. (2020). Reflecting SDG 6.1 in rural water supply tariffs: Considering "affordability" versus "operations and maintenance costs" in Malawi. *Sustainability, 12*(2), Article 744. https://doi.org/10.3390/su12020744

Whaley, L., & Cleaver, F. (2017). Can 'functionality' save the community management model of rural water supply? *Water Resources and Rural Development, 9*, 56–66. https://doi.org/10.1016/j.wrr.2017.04.001