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Strengthening climate resilience in water, sanitation and hygiene: Evaluating women-led enterprises in rural Ethiopia

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Background: Climate change and increasing water scarcity pose significant challenges to sustainable water, sanitation and hygiene (WASH) service delivery in rural Africa. In Ethiopia, poor maintenance of rural water schemes exacerbates vulnerability to climate stressors, disproportionately affecting women and marginalised communities. While women-led enterprises are emerging as a promising model, there is limited scholarship on how evaluation frameworks can capture their gender-transformative and climate resilience outcomes.

Objectives: This study examines how an adaptive Monitoring, Evaluation and Learning (MEL) framework, informed by the Water, Sanitation and Hygiene – Gender Equality Measure (WASH-GEM) and empowerment theory, was applied to assess the Strengthening Climate Resilience WASH (SCRS-WASH) Technical Assistance Project (TAP). It focuses on the methodological and analytical lessons for evaluating women-led micro and small enterprises (MSEs) in climate-vulnerable WASH systems.

Method: A qualitative design incorporated 13 key informant interviews with stakeholders in two Ethiopian regions, alongside document review. Data were thematically coded using NVivo, with findings organised according to empowerment domains and stakeholder collaboration dimensions from relevant evaluation frameworks.

Results: The adaptive MEL process captured early indicators of women's agency, leadership and stakeholder collaboration while revealing gaps in business capacity and institutional follow-up. Using a gender-transformative evaluation lens highlighted how flexible recruitment and localised capacity building supported inclusivity but also exposed region-specific social norms that influenced sustainability prospects.

Conclusion: Embedding gender-transformative frameworks in adaptive MEL enables evaluators to capture both empowerment processes and system resilience outcomes in complex, climate-vulnerable contexts. This study offers methodological insights for evaluators seeking to integrate feminist and climate justice principles into WASH-related evaluation practice.

Contribution: This research positions women-led enterprises not only as service innovations but as a case for advancing evaluation practice on measuring empowerment and resilience in multi-stakeholder, climate-affected systems.

Keywords: WASH; climate resilience; GESI; Women-led enterprises; Monitoring evaluation and learning.

Introduction

Access to safe water, sanitation and hygiene (WASH) services is a fundamental human right and a cornerstone of public health, education, economic development and gender equality. In sub-Saharan Africa, progress towards achieving universal and sustainable WASH services remains slow and uneven, with rural communities experiencing the greatest service deficits. Ethiopia, one of the most climate-vulnerable countries in the region, faces significant WASH-related challenges. As of 2022, approximately 58 million Ethiopians lacked access to basic drinking water services (WHO and UNICEF 2022), with rural communities disproportionately affected. Climate variability, including prolonged droughts and erratic rainfall patterns, further exacerbates water scarcity and WASH infrastructure breakdowns, undermining community resilience and deepening social inequities (Nhamo, Nhemachena & Nhamo 2019).

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Women and girls bear the brunt of WASH deficits. In rural Ethiopian communities, women are primarily responsible for water collection and management, often walking long distances to access unreliable or unsafe water sources. This burden restricts their time for education and economic activities and increases exposure to gender-based violence (Leahy et al. 2017). Moreover, limited access to safe sanitation and hygiene facilities compromises women's health and dignity, especially during menstruation and pregnancy. Despite their central role in WASH-related tasks, women remain underrepresented in WASH governance and decision-making processes (Carrard et al. 2013; Fisher, Cavill & Reed 2017). Empowering women through inclusive, locally led WASH initiatives presents a powerful opportunity to promote gender equality, strengthen community resilience and advance sustainable development goals (SDGs), particularly SDG 6 on clean water and sanitation and SDG 5 on gender equality.

While the global development agenda increasingly recognises the link between gender equality and sustainable WASH outcomes, many interventions still prioritise infrastructure over social inclusion and long-term sustainability. A growing body of literature highlights the importance of addressing gendered power relations, structural inequalities and community participation in WASH programming processes (Carrard et al. 2013; Macura et al. 2023). Yet, few studies have rigorously examined the role of women-led enterprises in strengthening WASH systems in climate-vulnerable settings or evaluated how gender-transformative approaches contribute to climate resilience. Furthermore, most WASH evaluations rely on short-term, quantitative indicators, often neglecting the nuanced, process-oriented dimensions of empowerment and stakeholder engagement. This gap is not only programmatic but also methodological, representing an underexplored area in evaluation scholarship.

This study responds to these gaps by evaluating the Strengthening Climate Resilience WASH (SCRS-WASH) Technical Assistance Project (TAP) in Ethiopia as a case for methodological learning in evaluation practice. This WASH initiative prioritises the creation of women-led micro and small enterprises (MSEs) to deliver spare parts and maintenance services for rural water supply systems in climate-vulnerable regions. The focus here is not only on the sectoral impacts of the intervention but also on how adaptive Monitoring, Evaluation, and Learning (MEL) frameworks – integrating gender-transformative evaluation approaches – can be used to assess the contribution of such enterprises to WASH sustainability, climate resilience and women's empowerment. The research is grounded in a gender-transformative development approach, drawing on theories of women's empowerment (Kabeer 1999; Sen 1999), participatory governance and adaptive programming. In this evaluation, empowerment is conceptualised as a multi-dimensional process involving access to resources, agency in decision-making and the ability to achieve valued outcomes (Kabeer 1999:437). Gender-transformative programming goes beyond accommodating women's participation, moving to challenge and shift power dynamics, social norms and institutional structures that perpetuate inequality (Van Eerdewijk et al. 2017). The study also engages with literature on public–private partnerships (PPPs) in WASH and adaptive MEL, emphasising the importance of iterative learning, stakeholder engagement and local ownership in ensuring the sustainability and scalability of interventions.

The aim of this study is to contribute to evaluation scholarship on how adaptive MEL frameworks can capture empowerment and climate resilience outcomes in complex, stakeholder interventions. Using SCRS-WASH as an example, it seeks to:

- Assess how an adaptive MEL framework captured the sustainability and empowerment impacts of TAP interventions.
- Examine the extent to which gender inclusion and women's leadership were mainstreamed across stakeholders.
- Identify enabling factors and barriers influencing the long-term sustainability of women-led WASH enterprises.
- Generate insights for evaluators on designing and applying frameworks that integrate gender-transformative and climate resilience objectives.

Background and literature

This literature review examines how evaluation frameworks can be applied to assess women's empowerment through entrepreneurship and other economic activities in the WASH sector. Specifically, it reviews evaluative approaches to measuring empowerment, the outcomes of mainstreaming Gender Equality and Social Inclusion (GESI) or Gender Youth and Social Inclusion (GYSI) in WASH, socio-cultural constraints in economic empowerment and the role of public stakeholders in fostering PPPs for women-inclusive WASH projects with climate-positive and resilient outcomes.

Women's empowerment has been defined and utilised in multiple ways across different contexts of development. Kabeer (1999) and Sen (1999) believe that empowerment is ongoing, with the ability to exercise choice and decision over one's life regarding different dimensions. While Kabeer (1999) conceptualises empowerment in terms of resources (pre-condition), agency (process) and achievements (outcome), Sen (1999) focuses on capabilities, functionings and the freedoms that enable a person to pursue and attain valued goals. Khader (2018:141) highlights the risk of 'passive empowerment', where interventions increase women's burdens rather than agency, through coercive choices. These are examples of disempowerment and counterproductively could leave more burden on women. Such critiques are relevant to evaluators, as they underscore the need for evaluation frameworks that capture how empowerment is experienced, not just whether women participate (Kabeer 2018).

Avoiding disempowerment and passive empowerment while ensuring meaningful participation require development interventions to adopt transformative participation approaches, viewing participants as agents with the capacity to assert their rights and promote accountability (Cornwall 2003). Gender-sensitive planning and gender mainstreaming, operationalised through frameworks such as GESI or GYSI, provide practical mechanisms for supporting this shift (Assefa et al. 2021; Grant et al. 2023; Kodama et al. 2017; Macura et al. 2023; Van Eerdewijk, Bråten & Danielsen 2021).

In the WASH sector, evaluative tools measuring both women's empowerment and climate resilience remain limited. In the past, most interventions have based their measurement and indicators of empowerment solely on public health outcomes (Bisung & Dicken 2019; Carrard et al. 2013; Fisher et al. 2017; Macura et al. 2023). Evaluators face challenges when attempting to capture strategic gender interests (e.g. leadership and decision-making power) alongside practical gender needs like access to water. Climate-induced water stress compounds these dynamics, increasing women's time burden and vulnerability. There is a critical need for WASH projects to bridge these practical gender needs (e.g. water supply availability and proximity) with strategic gender interests (e.g. decision-making roles and active participation) for successful 'transformative' gender and climate resilience outcomes (MacArthur, Carrard & Willetts 2020). Evaluators must assess not only whether women are involved but also how interventions alter resource distribution, decision-making processes and social norms (Assefa et al. 2021; Macura et al. 2023).

Two frameworks have been developed to explicitly measure gender equality in WASH: the Water, Sanitation and Hygiene Gender Equality Measure (WASH-GEM) (Carrard et al. 2022) and the Gender Equality in WASH Conceptual Framework (GECF) (Caruso et al. 2021). Water, Sanitation and Hygiene Gender Equality Measure is a quantitative measure across five domains: resources, agency, critical consciousness, well-being and structures (Carrard et al. 2022). The GECF, developed for the WHO and UNICEF Joint Monitoring Programme, focuses on meeting WASH needs, exercising agency, accessing resources and enabling environments at multiple levels (Caruso et al. 2021). In this framework, WASH needs refer to consistent access to safe WASH services, while the enabling environment spans household, community and institutional systems that shape people's ability to benefit from and sustain these services. While both frameworks overlap, WASH-GEM's emphasis on critical consciousness and well-being makes it particularly useful for evaluating women-led enterprise models like those in this study (Carrard et al. 2022; Caruso et al. 2021). In this study, the framework is applied during analysis, using interpretive lens, rather than being used deductively to structure data collection with components such as agency, critical consciousness and well-being informing the interpretation of women's reported decision-making process, constraints and perceived outcomes.

It is well established that entrepreneurship contributes to women's empowerment because of the accessibility to exercise decision-making through ownership and the practice of agency to varying degrees (Al-Dajani & Marlow 2013; Shingla & Singh 2015) both of which are critical for this sector to be climate resilient. In Africa and Asia, multiple countries have implemented women-owned and led micro, small and medium necessity-driven enterprises in the provision of WASH services (Bisung & Dicken 2019; Gero & Willets 2014; Grant et al. 2018; Indarti et al. 2019; Leahy et al. 2017; Sam & Todd 2020; Taylor 2013) to meaningfully include women, shift power dynamics and adapt to climate change. For evaluators, these enterprise models present opportunities to assess empowerment through ownership, leadership and integration into service delivery systems. Achieving active involvement of women in this sector is possible but complex.

Women's involvement in WASH can lead to empowerment, as seen in evaluations that took place in Ghana and Ethiopia (Hailu 2023; Hailu & Haile 2023; Sam & Tod 2020), especially when supported by training, capital and government (Grant et al. 2018). However, tokenism and socio-cultural, financial and institutional barriers remain challenges (Leahy et al. 2017; Moser 2014).

Public stakeholders are critical in supporting the success of women-led WASH enterprises (Harvey, Mukanga & Waibi 2015; Indarti et al. 2019; Leahy 2017; World Bank 2022; Ministry of Water and Energy 2022). From an evaluation standpoint, the effectiveness of PPPs can be assessed through both service delivery metrics and empowerment indicators. Public–private partnerships can enable governments to mobilise investment, technology and efficiency, improving WASH sector performance (World Bank 2022). For necessity-driven enterprises providing climate-adaptive public services, partnerships with government can create enabling environments for sustainability, an important dimension for evaluators tracking long-term outcomes.

Research methods and design

This study employed a qualitative research design to examine how an adaptive Monitoring, Evaluation and Learning (MEL) framework can be applied to assess women-led enterprises in rural Ethiopia (SCRS-WASH TAP). The focus was not only on project effectiveness but also on how evaluative methods could capture processes of empowerment, stakeholder collaboration and climate resilience.

The study was situated within an adaptive MEL framework that allowed for iterative data collection and reflection in alignment with the project's 'implement, monitor, adapt' learning cycle. The integration of WASH-GEM and the GECF provided the evaluative criteria for this MEL approach.

The research was conducted in two rural regions of Ethiopia: Amhara and Benishangul-Gumuz (see Figure 1 and Figure 2). These regions were selected based on their



Source: TUBS, 2011a, *Amhara in Ethiopia.svg, Wikimedia Commons,* Licensed under CC BY-SA 3.0

FIGURE 1: Map of Amhara region, Ethiopia.



Source: TUBS, 2011b, *Benishangul-Gumuz in Ethiopia.svg, Wikimedia Commons,* Licensed under CC BY-SA 3.0

FIGURE 2: Map of Benishangul-Gumuz region, Ethiopia.

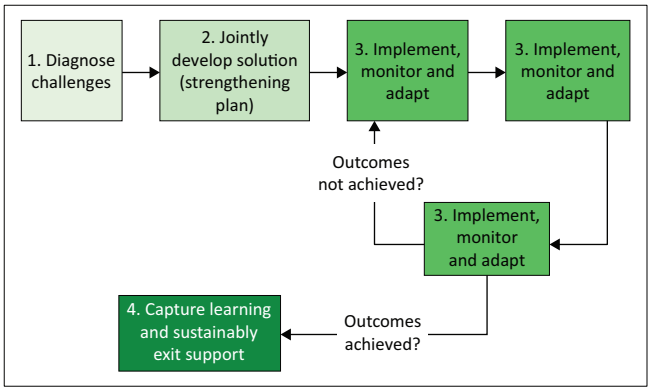
geographical diversity, accessibility and distinct socio-economic characteristics. Amhara represents a highland region with relatively stronger institutional presence, while Benishangul-Gumuz is a lowland, under-resourced region with higher levels of marginalisation. Both regions face severe climate-related water stress and limited access to sustainable WASH services. The study sites had newly established women-led MSEs supported by SCRS-WASH TAP to deliver spare parts and maintenance services for rural water supply systems.

The study population included key stakeholders directly involved in or impacted by the SCRS-WASH TAP intervention. These included female members and leaders of the MSEs, woreda[1]-level government officials from the Women and Social Affairs (WSA) and Job and Skills (JS) offices, TAP project implementers and a Ministry of Water and Energy (MoWE) national official. Purposive sampling was employed to ensure a representative cross-section of stakeholder experiences and perspectives. Thirteen key informants were interviewed, based on thematic saturation and logistical feasibility.

1.Woreda is a third level in the administrative division of Ethiopia after zones and the regional states.

The intervention studied was Task 2 of SCRS-WASH TAP, which aimed to strengthen the sustainability of rural climate-sensitive water supply systems through the creation of women- and youth-led MSEs. These enterprises were trained to provide spare parts supply and maintenance services, with strict inclusion criteria requiring at least 60% of female membership and leadership. Support included targeted training, apprenticeship programmes and mentorship and recruitment and support were adapted to local conditions in each region. Figure 3 shows TAP's intervention approach for Task 2.

Data collection involved two main sources: document review and semi-structured key informant interviews. Project documents – including the Diagnostic Assessment Report, MSE Establishment Report, Apprenticeship Report and Training Induction Report – were reviewed to contextualise the intervention and provide background themes. Thirteen key informant interviews were conducted with stakeholders from the two regions (see Table 1). Interviews with TAP implementers and government officials were conducted remotely via Microsoft Teams or telephone because of travel limitations in the regions. Interviews with MSE members were facilitated by regional coordinators during procurement



Source: TAP, S.-W., 2023d, *Year 2 work plan*, NIRAS International Consulting, Edinburgh

FIGURE 3: Technical assistance project's intervention approach for Task 2.

TABLE 1: Interview approach summary using the semi-structured key informant interview method.

Stakeholder	Mode	*n*
MSE female leaders and members	In-person, facilitated by regional coordinators	6
MoWE official	Telephone	1
Woreda level stakeholders: ▪ Job and Skills officials (x2) ▪ Women and Social Affairs officials(x2) 3x	Telephone	4
TAP Team: • Task 2 Lead • WASH and MSE Capacity Building Senior Expert	Teams meeting	2

MoWE, Ministry of Water and Energy; MSE, micro and small enterprises; WASH, water sanitation and hygiene; TAP, technical assistance project.

trips and conducted in Amharic and then translated into English. Semi-structured guides were used to ensure consistency across interviews while allowing for in-depth exploration of emergent themes.

Interviews were translated into English, transcribed and coded in NVivo. Initial codes were structured around four pre-identified evaluation themes, with additional sub-themes emerging inductively. Data from document review served to triangulate and enrich interview findings.

The four themes to which the interview data were coded are:

- **Women's empowerment:** Agency, decision-making, self-belief, confidence, social capital, gender-based barriers, including capacity building and gender mainstreaming. It also includes the women's perception of their capabilities.
- **Public–private partnerships (PPP):** Government support for MSEs, perceptions of MSE capability and policy implications for PPPs.
- **Stakeholder engagement:** Collaboration and participation among different government stakeholders and project implementers, including participatory methods, communication and inter-office coordination.
- **Establishment methodology:** MSE selection criteria, flexibility, contextualisation, suitability and perceived suitability of establishment processes.

The study acknowledged potesntial power imbalances between project-affiliated Regional Coordinators (who facilitated interviews) and MSE participants (as beneficiaries). To mitigate bias, coordinators received orientation on minimising influence, and reflexivity was practiced throughout. Cultural sensitivity was prioritised in research design and data collection.

Ethical considerations

Ethical clearance to conduct this study was obtained from the University of Edinburgh School of GeoSciences Research Ethics & Integrity Committee (No. 2023-726). Informed consent was obtained from all participants, either in written or verbal form depending on technology access. Information sheets detailed study objectives, procedures, risks, and rights, with confidentiality and secure data storage assured.

Results

The results first present the document review descriptively. This is followed by the thematically coded interview results, aligned with the four categories identified in the methodology, women's empowerment, stakeholder engagement, establishment methodology and PPPs. Evaluative interpretation of these results is provided in the Discussion section. Both project documents and key informant interviews informed the analysis.

Document review results

Review of TAP project documentation highlighted both systemic challenges and adaptive strategies shaping the establishment of WASH MSEs. The *Diagnostic Assessment Reports* confirmed that although 532 enterprises were created across 230 districts within 5 years (TAP 2022a, 2023c), significant operational barriers persisted. Woreda-level offices showed limited awareness of the MSE model, restricting their ability to provide adequate support, while entrepreneurs faced continued difficulties accessing finance for business start-up and growth.

Capacity-building interventions were a notable success. The Apprenticeship Report (TAP 2023b) and accompanying field evidence (Figure 4 and Figure 5) demonstrated the



Source: TAP, S.-W., 2022b, *Task 2 report and images from MSE establishment*, NIRAS International Consulting, Edinburgh

FIGURE 4: Amhara micro and small enterprise members during apprenticeship.

effectiveness of practical, woreda-facilitated training, with MSE members rehabilitating non-functional water schemes and restoring access for communities. These activities not only delivered immediate service improvements but also built participant confidence in technical roles.

Sustainability concerns were flagged in the Induction Training Report (TAP 2023a), which identified market linkage creation as critical but underdeveloped. This finding aligned with interview evidence highlighting the responsibility of local authorities in fostering enabling environments for enterprise operations. Importantly, reports also acknowledged persistent cultural resistance to women in technical roles, particularly in lowland areas where social norms discouraged female participation.

In response, TAP adopted two strategic adaptations: (1) reserving managerial roles for women to strengthen leadership representation, while allowing flexibility in technical assignments and (2) tailoring recruitment to reflect regional variations in education levels and social norms. Early outcomes suggest this dual strategy increased resilience, with women-led MSEs showing stronger continuity when male members disengaged.

Interview results

This section will discuss the results according to the four main themes, four of which were discussed in the methodology, which were women's empowerment, PPPs, engagement and establishment methodology. Figure 6 shows Nvivo-generated tree-map according to code reference, the number of times it was referenced in the total of the interviews.

As can be seen from the tree-map (see Figure 6), women's empowerment and stakeholder engagement were two prominent themes during the interviews, and PPPs are the least referenced.

Women's empowerment results

Government and TAP staff initially questioned whether enough women could be recruited and whether they could manage technical WASH responsibilities. However, these concerns eased after the apprenticeship, where women demonstrated competence in welding, pump repair and multi-village scheme maintenance on their own initiative. Stakeholders observed that women became more confident and skilled, and the women themselves reported feeling more motivated and proud of their contributions to their communities. As Task 2 Lead explained, 'we provided concrete evidence that women can deliver this'. Women in leadership roles also described increased confidence as they began taking responsibility for technical and organisational decisions during the establishment phase. Most women reported minimal gender-based barriers, though one member from the Amhara region mention safety risks in rural areas.



Source: TAP, S.-W., 2022b, *Task 2 report and images from MSE establishment*, NIRAS International Consulting, Edinburgh

FIGURE 5: Benshangul-Gumuz micro and small enterprise members during apprenticeship.

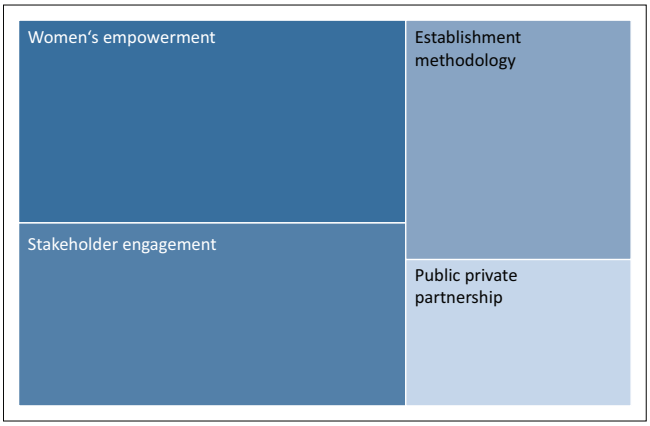


FIGURE 6: A tree-map visualisation of codes and their references.

Stakeholder engagement results

Stakeholder engagement was described as strong across both regions. TAP reported active involvement from MoWE and woreda offices in recruitment, training and early support to the MSEs. Government officials highlighted shared responsibilities across WASH, job creation and women's affairs offices and confirmed plans for continues monitoring, technical training and workspace support. Amhara officials emphasised efforts to ensure demand for services and provide facilities for nursing mothers, while Amhara MSE members identified needs for workspace, finance, market links and additional training. A Benishangul WSA official

also stated, 'we will not back away; we will ork on follow-ups regularly'. Officials and MSE members also identified gaps in business literacy, financing and consistent institutional follow-up as areas requiring on going support.

Establishment methodology results

Stakeholders noted that the establishment methodology supported women's leadership through strict selection criteria (minimum 60% women membership and female leadership) and by reserving management roles for women. The flexible recruitment process allowed adaptation to regional differences in education and experience while maintaining minimum standards. In highland regions, degree holders could be recruited, whereas in lowland areas, selection relied on women with secondary education. Training and apprenticeships were valued but widely viewed as insufficient because of the short duration and delays in procurement that created long gas between training and practice. Members and officials agreed on the need for ongoing technical, managerial and financial capacity building. This was captured by an Amhara MSE member's reflection: 'learning is a continuous process; the 13 days were not enough'.

Public–private partnerships results

Perceptions of PPPs were broadly positive. Technical Assistance Project and government representatives noted that MSEs can provide faster service delivery than overstretched public utilities and help improve the functionality of rural water schemes. Officials viewed these improvements in functionality and reduced downtime as contributing to more reliable rural WASH service delivery. Some officials also reported the absence of clear inter-regional mechanisms for sharing PPP experiences or outsourcing guidance, which they viewed as a barrier to scaling. Amhara officials reported efforts to locate workspaces near woreda offices to strengthen coordination. Benishangul officials expressed willingness to support MSEs as needed, while MSE members acknowledged existing support and expressed interest in stronger collaboration. As an Amhara WSA official observed, 'water supplies were closed for months, and now the MSEs can reopen them'.

Discussion

Women's empowerment discussion

Findings indicate that the SCRS-WASH TAP contributed to women's empowerment not only by creating economic opportunities but also by shifting institutional and community perceptions of women's technical competence. Initial scepticism from woreda officials and community leaders was gradually overturned through apprenticeship training and practical demonstrations. The women successfully rehabilitating non-functional multi-village water schemes provided tangible proof of capability.

These outcomes reflect what Kabeer (1999) defines as the resources-agency-achievements pathway of empowerment: training (resources) enabled women to demonstrate agency in technical domains, resulting in recognition and confidence gains (achievements). However, the evaluative finding is that short-term training interventions alone were insufficient for sustained empowerment. Both TAP implementers and government officials noted gaps in management and entrepreneurial skills, highlighting the importance of integrating multiple empowerment domains into evaluation frameworks (see WASH-GEM; Carrard et al. 2022).

Interestingly, while women reported increased agency and role-model visibility, they tended to downplay gender-based risks, such as exposure to harassment or violence when working in rural areas. This suggests a potential *normalisation bias* – an evaluative challenge when empowerment indicators rely heavily on self-reporting. It underscores the need for evaluators to triangulate perceptions with contextual gender analyses to avoid overstating empowerment gains.

Stakeholder engagement discussion

Stakeholder engagement findings reveal that government ownership was stronger than anticipated. Although some Woreda officials demonstrated commitment through resource allocation, TAP staff voiced concerns that this enthusiasm may not be sustained – echoing common evaluation challenges around attribution vs. contribution in partnership-driven interventions.

A key evaluative insight was the divergence between TAP's perception of 'reluctant' government support and woreda officials' framing of themselves as active enablers. This mismatch points to the importance of incorporating stakeholder perspective analysis within adaptive MEL systems. Evaluations that only track implementer-reported barriers risk overlooking local expressions of ownership and agency.

Moreover, examples such as the provision of nursing facilities and prioritisation of women-led enterprises in government planning suggest that engagement extended beyond tokenism, aligning with transformative participation principles (Cornwall 2003). From an evaluation standpoint, this highlights how process indicators (e.g. inter-office collaboration, creation of enabling environments) can be as important as output indicators when assessing sustainability.

Establishment methodology discussion

The recruitment criteria ensured gender inclusivity, but the adaptive flexibility across regions illustrates an important evaluative finding: uniform frameworks must be contextually tailored to avoid exclusion.

This adaptive methodology demonstrates the tension between standardisation and contextualisation in evaluation design. It reinforces calls in the evaluation literature for

'principled flexibility' (Bamberger, Rugh & Mabry 2016), where criteria maintain equity goals while being adapted to diverse socio-cultural contexts.

Capacity building was another critical area. The need for continuous technical and managerial training, rather than one-off inputs aligns with arguments in evaluation research – that empowerment and institutionalisation are *processes*, not outcomes, and must therefore be measured iteratively across the project lifecycle.

Public–private partnerships discussion

Findings on PPPs highlight the evaluative challenge of assessing 'emerging' partnerships in sectors where private provision is limited. TAP positioned MSEs not as competitors but as collaborators to government utilities. Officials echoed this perspective, describing MSEs as complementary service providers capable of reducing downtime in rural water schemes.

From an evaluation standpoint, two insights emerge. Firstly, policy and institutional gaps remain, such as the absence of legal frameworks for knowledge sharing across regions, limiting the scalability of PPPs. Secondly, demonstration effects are significant: early successes of women-led MSEs provided governments with evidence of the viability of outsourcing, potentially informing future policy shifts.

These findings contribute to evaluation debates on how to assess system-level change. Rather than measuring immediate outputs (e.g. number of pumps fixed), evaluators must consider how projects contribute to *institutional learning* and *policy experimentation*. In this case, TAP acted as a catalyst for shifting perceptions about the role of women in private sector WASH provision.

Summary of key findings

This study generated three interrelated findings. Firstly, the gender-transformative MSE model successfully disrupted entrenched WASH sector norms by positioning women as both technical actors and organisational leaders, thereby expanding evaluative understandings of empowerment as dynamic and multi-dimensional (Kabeer 1999; Rowlands 1997). Some early indicators of well-being also emerged, such as increased confidence, recognition from government stakeholders and women's pride in contributing to community water access although these remain preliminary at the establishment stage. Secondly, multi-stakeholder engagement demonstrated potential but was uneven across regions, reflecting persistent governance gaps that resonate with equity-focused evaluation debates (Mertens 2015). The results also highlight the emergence of enabling environments across multiple administrative levels, including the involvement of Woreda offices, WSAs and Women's Affairs structures, though these conditions were uneven across regions. Thirdly, PPPs offer clear opportunities for strengthening service delivery, but their scalability remains constrained by policy and institutional barriers, an issue widely recognised in the sustainability literature (Bamberger et al. 2016; World Bank IEG 2020). These institutional barriers reflect deeper structural constraints, such as limited financial systems, unclear PPP frameworks and inconsistent inter-regional coordination, that shape the long-term viability of women-led enterprises. Collectively, these findings suggest that evaluation must attend to both gender and climate resilience not as parallel outcomes but as co-constitutive dimensions of system change.

How is gender youth and social inclusion mainstreamed across stakeholders to promote women's empowerment in water, sanitation and hygiene micro and small enterprises for climate resilience?

The study highlights that GYSI mainstreaming was pursued through deliberate recruitment criteria, allocation of leadership roles to women and strict non-negotiable selection processes. These mechanisms created enabling conditions for women's agency, echoing frameworks such as WASH-GEM that emphasise decision-making, access to resources and changes in social norms (Caruso et al. 2021). Early evidence of women's critical consciousness, demonstrated through strategies to overcome time poverty and resist restrictive gender norms, illustrates the type of 'transformative outcomes' theorised in feminist evaluation literature (Mertens 2015).

However, these impacts are emerging at the establishment stage, prior to full operationalisation. From an evaluative standpoint, this limitation underscores the importance of adopting developmental or adaptive approaches (Bamberger et al. 2016; Patton 2011) that treat empowerment not as an endpoint but as a process of continuous negotiation. The project's insistence on 100% female leadership positions, tailored to diverse regional contexts, demonstrates both the promise and the fragility of gender-transformative WASH interventions, providing a valuable case of how design features can be evaluated for their capacity to shift social norms.

What start-up and ongoing support do female members need to overcome gender-based constraints?

The findings revealed disparities between regions: Amhara officials offered critical feedback and specific recommendations, while Benishangul-Gumuz officials were more passive. Such variation highlights not only contextual differences but also the need for stronger accountability mechanisms within MEL systems to ensure equitable government engagement across geographies. Equity-focused evaluation frameworks stress that marginalised groups require not only inclusion at entry points but also sustained institutional support (Mertens 2015).

Enterprise members and woreda officials consistently identified ongoing capacity building, financial access, market linkages and cross-office collaboration as essential. These requirements move beyond one-off training models towards iterative, systems-oriented support – a shift that aligns with

calls for evaluation to capture institutional learning and adaptive processes, rather than solely output indicators (Bamberger et al. 2016). The persistence of low education levels in emerging regions such as Benishangul-Gumuz further underscores the need for evaluation approaches attentive to context, capacity and differentiated pathways to empowerment.

What are the opportunities and challenges of private–public partnerships in addressing women employment in the water, sanitation and hygiene sector?

Public–private partnerships arrangements in this study demonstrated a mutually beneficial dynamic: MSEs could deliver services faster and closer to communities, while government offices gained efficiency and extended reach. These findings resonate with evidence that PPPs can strengthen service sustainability where governments face resource and capacity constraints (World Bank IEG 2020). Importantly, positioning women as service providers rather than passive recipients reframes gender inclusion as a climate adaptation strategy, enhancing resilience in contexts where water stress is intensifying (Assefa et al. 2021; Leahy et al. 2017).

Nevertheless, the absence of legal frameworks for knowledge-sharing between utilities and enterprises reveals a critical institutional gap. From an evaluation perspective, this gap reflects broader concerns about the scalability of pilot interventions without systemic policy reform (Trevisan & Walser 2015). Future evaluations should therefore integrate 'evaluability assessments' to identify institutional preconditions for successful PPP models, ensuring that women-led enterprises can transition from localised projects to durable components of national WASH ecosystems.

Conclusion

One of the most salient implications of this study is that evaluation in fragile systems must simultaneously attend to gender equality and climate resilience – not as separate goals but as interdependent domains that co-produce sustainable outcomes. Adaptive MEL frameworks proved valuable in surfacing early indicators of women's empowerment and institutional engagement, underscoring the importance of evaluative designs that privilege learning, reflexivity and responsiveness (Patton 2011).

This study found that women-led MSEs, supported through the SCRS-WASH TAP, contributed to sustainable WASH service delivery and localised climate resilience in rural Ethiopia. Promoting gender inclusion through women's leadership enhanced confidence, technical capacity and visibility among female participants. Enabling factors included flexible recruitment practices, local partnerships and tailored training models. Yet persistent gaps in business literacy, financing and institutional follow-up highlight the need for evaluation approaches that monitor not just immediate functionality but also longer-term empowerment and systemic sustainability.

Ultimately, the study offers two sets of contributions. Substantively, it demonstrates the transformative potential of women's entrepreneurial leadership in advancing WASH and climate resilience objectives. Methodologically, it shows the value of integrating feminist and climate justice principles into evaluation practice, positioning empowerment and resilience as central evaluative criteria. By drawing lessons from Ethiopia's experience, this research underscores how evaluation can both document and enable gender-transformative, climate-resilient development pathways.

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CRediT authorship contribution

Elshaday Girma Berhanu: Conceptualisation, Formal analysis, Methodology, Writing – original draft, Writing – review & editing. The author confirms that this work is entirely their own, has reviewed the article, approved the final version for submission and publication and takes full responsibility for the integrity of its findings.

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Data availability

The data supporting this study are available from the corresponding author upon reasonable request. Because

of confidentiality agreements with participants and stakeholders, these data are not publicly available.

Disclaimer

The views and opinions expressed in this article are those of the author and are the product of professional research. It does not necessarily reflect the official policy or position of any affiliated institution, funder, agency or that of the publisher. The author is responsible for this article's results, findings and content.

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