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Landscape and Research Findings

Tanzania Quantitative Findings

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PHOTO CREDIT: WADA, Tanzania, 2019.

Landscape and Research Findings

Landscape Review for Governance Research on Water Systems (GROWS)

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Global Water Institute (GWI)
The Ohio State University

Amanda Lea Robinson
Associate Professor of Political Science
Ohio State University
robinson.1012@osu.edu

Mary T. Rodriguez
Associate Professor of Community Leadership
Ohio State University
rodriguez.746@osu.edu

Vinicius de Melo Justo
Ph.D. Student, Political Science
Ohio State University
demelojusto.1@buckeyemail.osu.edu

Rafael Quijada Landaverde
Ph.D. Student, Agricultural Communication, Education, and Leadership
Ohio State University
quijadalandaverde.1@buckeyemail.osu.edu

Rebecca L. Gianotti
Senior Research Associate, Global Water Institute
Ohio State University
gianotti.4@osu.edu

Additional Contributors
Background research: Emily Issacs
Fieldwork logistics and research support: Kenneth Okumu, Samuel Olweny
Fieldwork support (drivers): Musa, William, Charles Lokuru, and Ali jirmo
Data collection: Ephraim Benson, Nuuru Kabahuma, Joshual Mwesigwa, Lydia Namayani, Sam Olweny, Tonny, Bernard Nabenyo, Amina Jilo, and Darius Bukuno
Data processing: Michael Vargo, Ephraim Benson, Nuuru Kabahuma, Joshual Mwesigwa, Peter Omwami, and John Etyang
Academic consultation: Stephen Mwangi Mureithi and Bamutaze Yazidhi
Feedback: Brian Banks, Marc Dettmann, Bryan Enslein, and Katy Sill

Executive Summary

Project Rationale and Objectives

The goal of the Governance Research on Water Systems (GROWS) project is to identify and disseminate innovative governance and private sector-derived models and tools that will help accelerate eliminating extreme poverty in sub-Saharan Africa. Ultimately, GROWS will create and disseminate a toolkit that will help USAID Mission staff to support an enabling environment for improved rural governance and sustainable rural water services. As an operational framework, the project considers "governance" to have four components: transparency, accountability, trust, and equity.

The work focuses on the **role of private sector services** because of USAID's broad interests in:

- new perspectives and solutions to improve governance and overcome challenges to private sector engagement in sub-Saharan Africa,
- new tools and approaches that can improve transparency and accountability both in government and private sector engagement,
- opportunities to promote good governance through private sector engagement, and
- ways to integrate democracy, human rights, and governance principles and practices across USAID's development portfolio.

This work uses **rural water services as a lens** through which to explore these interconnections between good governance and private sector engagement because of the critical role that water plays in community health and economic development. It is a fundamental human need that is still lacking in many rural communities in sub-Saharan Africa despite decades of investment. In recent years, multiple stakeholders in the water sector (e.g., national governments, donors, non-governmental organizations) have increasingly advocated for private sector services as a way to overcome historic sustainability challenges in water services, yet the emphasis thus far has largely been on the financial and technical implications of private sector services. Analysis of the ways in which this relatively new development in rural water services impacts local governance has received less attention, even though it has the potential to impact not only water provision but also other facets of rural economic development and local relationships that exist beyond water. Water as a lens for learning about governance and private sector engagement therefore crosses multiple USAID programming objectives and provides opportunities to improve the overall enabling environment for eradicating extreme poverty.

Work Scope

The role of Ohio State University was to undertake a landscape analysis to review existing evidence and knowledge around local-level governance models for rural water services, the role of private sector providers, and new and innovative models for rural water service delivery. The work had three parts:

1) **desktop literature review** incorporating peer-reviewed journal articles and books, program evaluations, government documents, and promotional materials

2) **interviews with water sector development actors and stakeholders**, including line ministries, funders/donors, implementing NGOs, private sector operators, and local government authorities responsible for oversight of projects in rural communities
3) **interviews and focus groups to get firsthand knowledge** directly from people involved in rural water service projects.

While some consideration was given to the whole of sub-Saharan Africa in the desktop review, the countries of focus for the fieldwork were Kenya, Tanzania, and Uganda.

Summary Findings

The work identified a large number of organizational frameworks, practices, and technologies at each stage of the water delivery chain that could be employed by private sector actors in rural water service provision, or which could be adopted by government, oversight agencies, communities, or user groups in order to make rural water services attractive to the private sector and to improve governance of rural water services.

Improved governance was generally found when the following were present:

1) technical and administrative support for service providers
2) access to financing for providers, particularly in areas without economies of scale
3) regular maintenance checks and repairs by a trained (qualified) provider
4) formal documentation of ownership, roles and responsibilities for water services and systems, including performance standards
5) effective process(es) for recourse/penalties if obligations are not met
6) equitable access to water, regardless of ability to pay
7) incentives (financial or regulatory) to provide water to marginalized groups
8) community involvement in planning, decision-making and oversight committees
9) well-defined, agreed-upon and well-known water tariffs
10) accurate information around water system technical and financial performance that is accessible, understandable, and useable for all users.

Implications for Governance Elements

Transparency was shown to be of critical importance across all countries and types of water service provision. Transparency in the system, especially when users were aware of how their money was being spent (e.g., repairs or maintenance), was more likely to increase users' willingness to pay for water and trust the service provider. The method of communication differed more by water provider than by country. The method preferred by communities was dialogue at community meetings. While the use of technology can be helpful in increasing the amount and accuracy of information, its effectiveness depends on it being made accessible, understandable, and useable for users. Transparency also has a positive influence on the other aspects of governance, particularly accountability and trust.

Accountability was shown to be an essential component of building trust, particularly among the users and with the water system. In all contexts, increasing a community's sense of ownership and involvement with the system led to greater accountability between the users and the service providers in a bidirectional manner. Two effective methods for ensuring accountability were the

use of sanctions (i.e., taking away access to water for an individual or a community in the absence of payment) and smart meter technology (i.e., automated methods for dispensing and paying for water at a communal tap or distribution point). Both methods ensured that users paid equitably for water. Smart meters also ensured that providers could not overcharge and helped to provide accurate information about billing, keeping the provider accountable for services.

Trust across the three focus countries was mostly focused on trustworthiness and reliability of the water system, rather than the quality of the water. Significant issues were identified in the ability of a user community to trust the service providers, attendants, and managers of the water system. If a community has a bad experience with one provider, they may be unwilling to pay for future water services or may seek water from other, potentially unsafe sources. Trust was eroded when users felt that a provider was dishonest and/or could not account for how much water was provided, at what price, and if payment was equitable for all users. Improved transparency, as noted above, can help with this issue. Users will increase their trust in a provider who demonstrates a record of providing rapid and appropriate responses to any system issues. Trust is also increased when the provider engages frequently and in a meaningful, inclusive way with the community. Technologies that help monitor the dispensing of water and money collected can increase trust in the fairness of the system and willingness to pay. In addition, communities in all three countries trusted a water system more if they felt a sense of ownership in it.

Equity was described in terms of ensuring accessible water for all people and ensuring equity in decision making, mainly through women's participating on community water boards. However, the inclusion of women did not necessarily equate to equitable decision making. Women were said to not speak up in meetings or engage in leadership. Their inclusion is necessary, but their engagement must go beyond just meeting quotas. Nearly all respondents mentioned the importance of ensuring the most vulnerable in their communities (e.g., the disabled) had access to clean, safe water. Users also felt it was important to make sure that no one in the community benefited from the system more than others. Transparency in decision-making, accountability and trust with system managers can help ensure equitable water access in the community.

Influence of Contextual Factors

Numerous contextual details influence rural water provision, private sector engagement and rural water governance. Significant considerations identified in this work include:

- economies of scale
- requirements for short-term and/or long-term profit
- population size and density
- convenience of alternative water source
- community resistance to viewing water as a commodity
- sense of community ownership
- comfort and experience with different technologies
- existing depth and strength of the private sector
- coordination within the water sector
- degree of political and fiscal decentralization
- strength and independence of oversight bodies
- political patronage and clientelism.

1. Introduction

The *U.S. Government Global Water Strategy 2017* notes that without sustainable supplies of water, many countries will suffer from increased poverty and disease, food and energy insecurity, economic dislocations, and cross-border and regional tensions (U.S. Government, 2017). These challenges have the potential to undermine economic development, exacerbate migration pressures, increase civil unrest, aid terrorist recruitment, reduce trade and export opportunities, and prevent countries from advancing policies and programs important to the United States.

Despite significant efforts, rates of clean water access have not improved in recent years at the pace required to meet the Sustainable Development Goals (Dickinson *et al*., 2017). This trend can be attributed to investment that does not match the demand due to population growth, and a high rate of infrastructure failure, especially in rural, economically marginalized communities in sub-Saharan Africa.

Inadequate governance contributes greatly to these challenges. Sub-Saharan nations often do not have the necessary monitoring procedures in place to track infrastructure operational status or resource sustainability, nor do they have or provide sufficient funding and guidance to local government authorities to ensure long-term operability (Fierro *et al*., 2019). While some problems with the provision of water in rural areas of East Africa are technical in nature, it is clear that governance issues also pose significant barriers to success. **The goal of this research project is to understand what these governance challenges are and explore examples of successful responses to them.** We consider four components of effective water system governance: transparency, accountability, trust, and equity (together, TATE).

The United States Agency for International Development (USAID) describes proper **transparency** as creating **"**an environment where governments and public officials engage in the clear disclosure of rules, plans, processes and actions in a form that is readily accessible to all. Transparency promotes accountability by providing the public with information about what the government is doing" (USAID, 2013). *With respect to water service provision, transparency requires that information be available and accessible to the public on all financial, political, and managerial transactions related to water systems.*

USAID defines **accountability** as "the systems, procedures and mechanisms that ensure that public officials and institutions perform their stated duties and uphold their responsibilities to the public while imposing restraints on their power and authority and providing for redress or sanction when these duties and responsibilities are not met" (USAID, 2013). We operationalized *accountability as structures and behaviors that ensure accountability between providers and users*. We were particularly interested in the degree to which users perceive water system providers as responsive to their needs, and the degree to which providers anticipate reliable payment from users.

The third component of governance under consideration is **trust.** The Organization for Economic Co-operation and Development (OECD) explains that "trust is important for the success of a wide range of public policies that depend on behavioural responses from the public. Trust is

necessary to increase the confidence of investors and consumers. Trust is essential for key economic activities, most notably finance. Trust in institutions is important for the success of many government policies, programmes and regulations that depend on cooperation and compliance of citizens" (OECD, 2018). Within the context of rural water provision, *trust manifests as confidence that providers will act in the best interest of users, maintain a reliable service, and secure technologies*.

The fourth component of governance is **equity.** Here, we are concerned with equality of opportunity as well as equality of outcomes associated with not only use of the water system but also level of participation in the governance of that system. In the context of water provision in rural East Africa, *we are concerned with inclusion along gender, ethnic, and economic lines*.

The decision to adopt this TATE framework rather than the more familiar USAID framework of Participation, Inclusion, Transparency, and Accountability (together, PITA) emerged from a series of conversations among the GROWS project team that sought to define, independent of any existing structures, the elements of governance that were most appropriate for the goals of this project. While transparency and accountability were obvious crossover elements between TATE and PITA, GROWS introduced trust as a separate element, worthy of exploration on its own merits, and decided to emphasize equity as a pillar of governance rather than the traditional participation (which emphasizes citizen involvement in governance) and inclusion (which focuses on the interventions that promote equity of opportunity) elements of PITA, which would seem at first glance to be similar and/or interchangeable concepts.

While trust is often not evaluated as an independent element of good governance in the context of rural water service delivery, the GROWS project team decided to make it a pillar of this research because of how important trust is to the success of public engagement and long-term sustainability of public services. As discussed by OECD, where a service or policy outcome depends upon full public participation and desired behavior, citizens are likely to support that service or policy only if they trust the institution requiring their participation. The results of distrust include failure to fully engage, failure to engage at all, early withdrawal of participation, and failure to comply with expected behavior. Trust is therefore critical to the success of interventions. At the same time, public trust may be built upon the demonstration of good governance rather than preceding it. Therefore, while trust may not be a target for governance interventions, it is intertwined in such a way to be worthy of examination.

We view equity as a more suitable mode of investigation for this work than participation and inclusion for the following reasons:

- Equity as we define it for this project encompasses equitable opportunity, participation, and outcomes, i.e., a more comprehensive assessment of equity in how citizens participate in governance, their access to opportunities for receiving services, and, importantly, whether that participation and inclusive access to opportunities actually results in equitable outcomes.
- The more traditional definition and use of Participation does not explicitly call out whether citizens' ability to influence governance elements is equitable for all citizens, not does it establish whether the outcomes of that influence are equitable.
- The traditional use of Inclusion focuses on equity of opportunity and access, but not equity in outcomes. As more recent social conceptions of equity have shifted in the general public,

there is greater recognition that what is needed is not equal provision of goods and services but rather goods and services that result in equitable outcomes, which may not be the same.

- Commonly, equal access to opportunity and engagement focuses on whether a marginalized or vulnerable population has equal representation. However, that definition does not examine whether that representation results in equitable governance processes. For example, there may be a quota set for involving women in water committees, but their presence alone may not result in their equal participation in discussion or the decision-making process. A focus on equity rather than inclusion allows for exploration of the outcome and not just the access. This was of particular interest to GROWS because of USAID's cross-programming objectives related to gender equity.

Understanding the governance of water systems is essential for the sustainability of improving water access and resources for water insecure people and communities. This report presents an in-depth literature review covering the topic of water governance. It covers numerous models and approaches to governing water resources. However, while literature can give us a broad overview of the subject, research can help ground and provide more context to this complex topic. Researchers sought to understand the concept of water governance from the perspective of people working in water provision, local officials, other stakeholders, and most importantly, from community members themselves.

Additionally, further questions and insights arose during the research that were not directly related to or answer the specific questions and focus of GROWS. The primary authors have included a note discussing these topics in Appendix 1 as considerations for further research.

2. Data and Methodology

To understand how different modes of engagement by private operators in rural water provision might affect governance, we:

1) completed a desktop review of academic literature, project reports, and policy briefs,
2) conducted interviews with key stakeholders in Kenya, Tanzania, and Uganda in 2019, 2020, and 2021, and
3) explored six projects in depth through interviews and focus groups.

Focus group discussion and interview guides, consent forms, and IRB research permission can be found in the appendices of the report.

Desktop review

We first referenced existing knowledge of rural water provision in Africa, governance challenges, modes of private sector engagement, and potential tools and approaches to improve governance. We incorporated peer-reviewed journal articles and books, program evaluations, government documents, and promotional materials.

Interviews

In each of the three countries, we conducted in-depth interviews with individuals or small groups with relevant expertise in rural water services and/or governance. We interviewed respondents in local and national government, the private sector, international and domestic non-governmental organizations (NGOs), civil society organizations (CSOs), academia, and bilateral and multilateral donors. These interviews followed a standard guide, which focused on understanding the challenges to rural water provision in each country, with a particular focus on issues of governance and tools and approaches to address them. The guides were all reviews by in country academic collaborators to ensure the questions were appropriately worded for the context. Each interview was audio recorded, transcribed, and deductively coded for relevant themes. We also conducted a handful of interviews remotely when face-to-face meetings were not feasible.

Appendix 2 contains details of the 57 interviews conducted with 82 individuals for this report, which includes interviews conducted for the six case studies discussed below. The interviewer codes and date in Table 1: Interviews are used as references throughout the report.

Case studies

We conducted six in-depth case studies across Kenya, Tanzania, and Uganda. We note that the countries of focus – Kenya, Uganda, and Tanzania – are some of the most studied in terms of water governance. Hepworth *et al.* (2020) found that these three countries and India together accounted for over half the published research on water governance globally. Nevertheless, there remain large gaps in our understanding of the day-to-day challenges and successes of various tools and approaches.

Case studies were chosen to cover as many different tools and approaches as possible, with a focus on those with the most potential to affect governance. We also selected case studies that

allowed us to learn about tools or approaches that were less well addressed in existing literature, or where the existing scholarship raised new questions about the governance implications of particular tools or approaches. For each of the six case studies, we did extensive desktop reviews and then collected original data through on the ground fieldwork. With the assistance of local research collaborators, we conducted key informant interviews with relevant individuals in each site, as well as focus group discussions with both local leadership and water users.

Appendix 2 contains details of the six case studies considered in this research, including the various private sector tools and approaches used in each case study. Detailed descriptions of the individual tools and approaches are provided in Section 5 of the report. The interviewer codes and dates in Table 2: Case Studies and Constituent Tools are used as references throughout the report.

Focus group discussions

Across the six field sites, we conducted 19 focus group discussions. Focus group participants were recruited by residents and were either in positions of leadership related to water or water users. While we attempted to talk to committees or management structures separately from users, in some cases these groups were part of the same discussion. Attempts were made to recruit a diverse set of participants, and in one case, women were able to participate in a women-only discussion group. The focus groups followed a standard guide that was adjusted based on the case study project. The discussions were moderated by a local research assistant in the native language of the participants. The report authors were present in 9 of the 19 discussions.

Appendix 2 contains details of the locations, dates, and composition of each discussion group. The codes and dates in Table 3: Focus group discussions (FGDs) are used as references throughout the report.

Throughout the report that follows, quotes are occasionally provided from interviews and focus group discussions to illustrate and exemplify the conclusions and learnings. They should be taken as representative of common responses rather than the basis for individual conclusions, provided to give the reader a stronger sense of the conversations that were held.

Limitations of this study

The emergence of COVID-19 significantly impacted this research, primarily by disrupting data collection in March 2020. The U.S.-based researchers were unable to return to Kenya or to complete data collection themselves in Uganda. Key informant interviews and focus group discussions in the second Ugandan case study and in both Kenyan case studies were collected by local research consultants. Since the U.S. researchers were not present during these data collections, they were not able to ask follow-up questions or conduct member checks with research participants. Similarly, they were not there to take observational notes or conduct reflexive journaling throughout the data collection as they were able to in Tanzania and the first Ugandan case study before the pandemic. This may have affected the credibility and confirmability of those data.

However, the U.S.-based researchers worked closely with the Kenyan and Ugandan research consultants to ensure that they were familiar with the instruments and data collection processes through virtual conversations. The research coordinators completed data collection on behalf of the U.S. team in late 2020 (Uganda) and December 2020 and May 2021 (Kenya).

Other general limitations of this study unrelated to the COVID-19 pandemic include:

- purposive selection of the case study sites, which means that those data are not intended to be generalizable but rather provide in-depth views of those selected sites
- use of self-reported data requires that we rely on the truthfulness of answers from participants
- lack of sustained engagement with the participants did not allow for follow up or observations of participants' interaction with the water schemes being studied

One final limitation of this work is that the research in Tanzania was impacted by politics around water provision and claiming of credit for water services. In particular, in the second Tanzanian case study (T2), the local government was very hostile to the private sector being engaged in water services, which almost prevented our access to the research sites. While we did not see obvious manifestations of this antagonism, it is possible that political sensitivity around the privatization of water services affected the degree to which local government agents were forthcoming and truthful during key informant interviews.

3. Background on Rural Water Provision in East Africa

Rural water service provision in sub-Saharan Africa has steadily increased over the past several decades due to substantial effort and investment by national and international governments, NGOs, donors, communities, and other actors in the water development sector. However, access to safe, reliable water has not improved at the rates needed to reach the Sustainable Development Goals or ensure equitable access to this fundamental need. Below, we provide an overview of water provision specifically in East Africa.

Data on water coverage in East Africa

In July 2021, the Joint Monitoring Programme for Water Supply, Sanitation and Hygiene operated by the World Health Organization and UNICEF released updated data on drinking water supply coverage for a number of countries, including the three East Africa nations under analysis here (Figure 1). While "safely managed" services are the ultimate goal, "basic" service level is the minimum standard countries are trying to achieve. Note that Kenya and Tanzania do not have available data on safely managed services. The three countries have similar levels of basic level services coverage in rural areas: 52% of the population in Kenya, 45% in Tanzania, and 41% in Uganda. Uganda also has 8% coverage of safely managed services.

Figure 1. Coverage by water service level in rural households (JMP 2021) [Note: data on safely managed services are not available for Kenya or Tanzania]

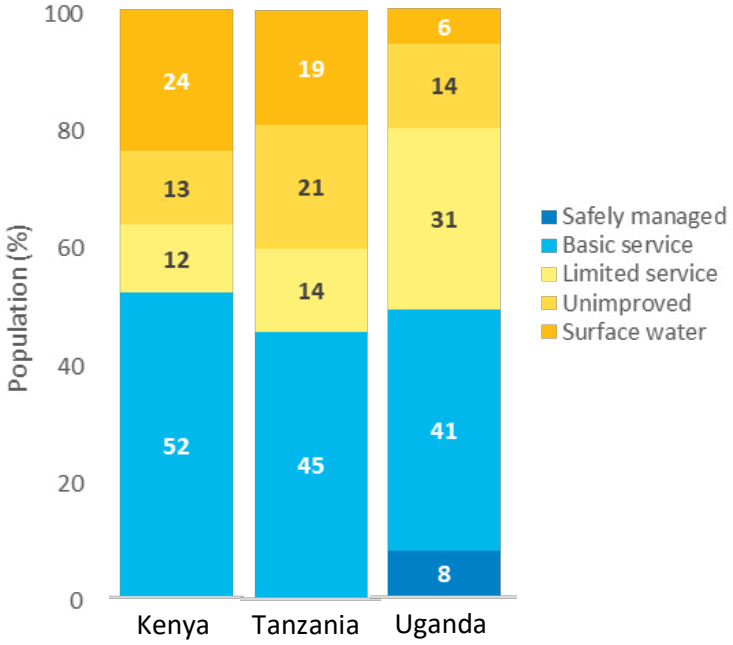
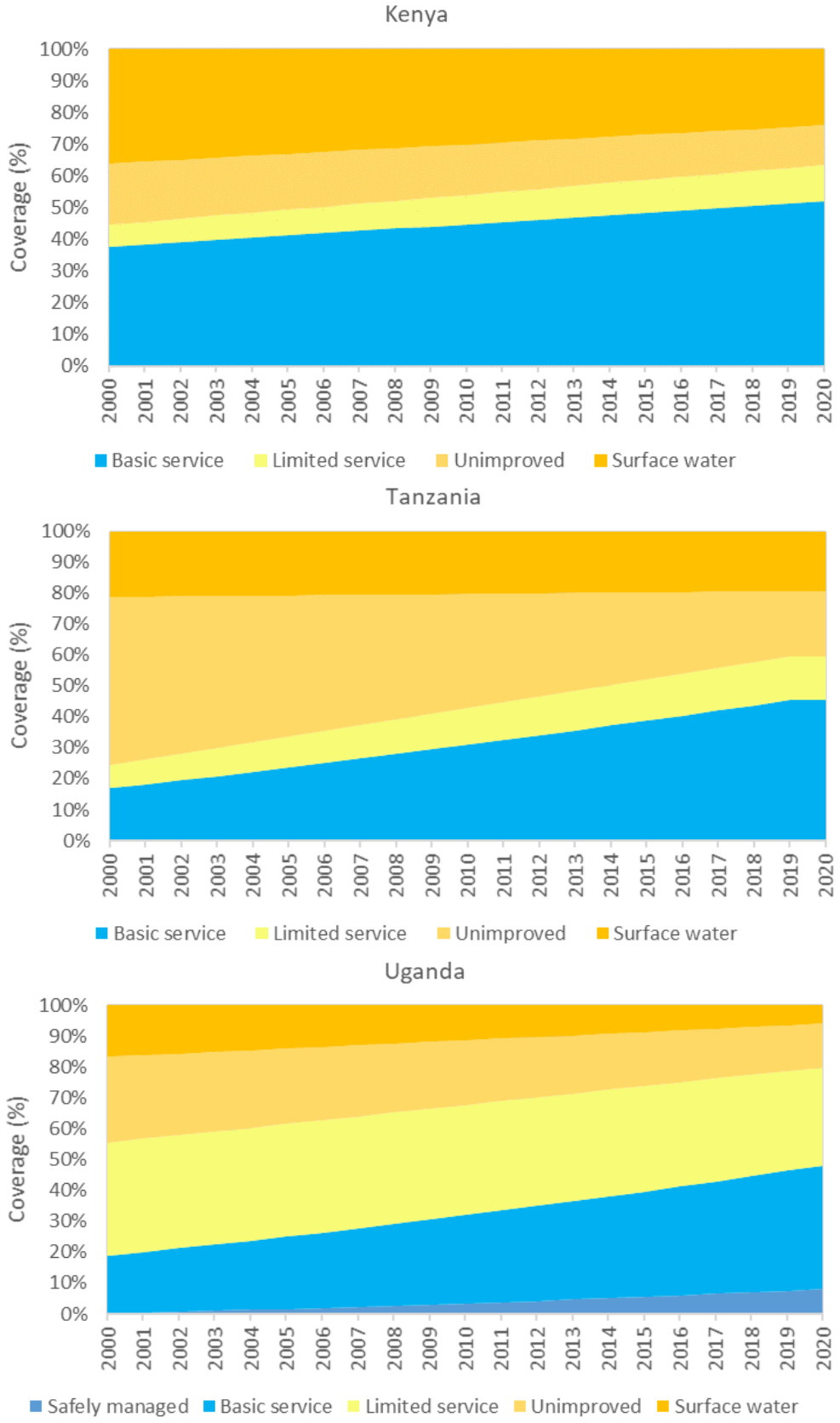


Figure 2 presents how coverage has changed in the three countries over time relative to these categories, again according to the JMP classification and 2021 data. Tanzania and Uganda markedly and steadily improved basic coverage, while Kenya showed less dramatic improvement; however, Kenya had a better starting point than its neighbors, suggesting that it might be more difficult to improve upon an existing, comparatively larger system.

Figure 2: Change in coverage by water service level in rural households 2000-2020 (JMP 2021)
[Note: data on safely managed services are not available for Kenya or Tanzania]

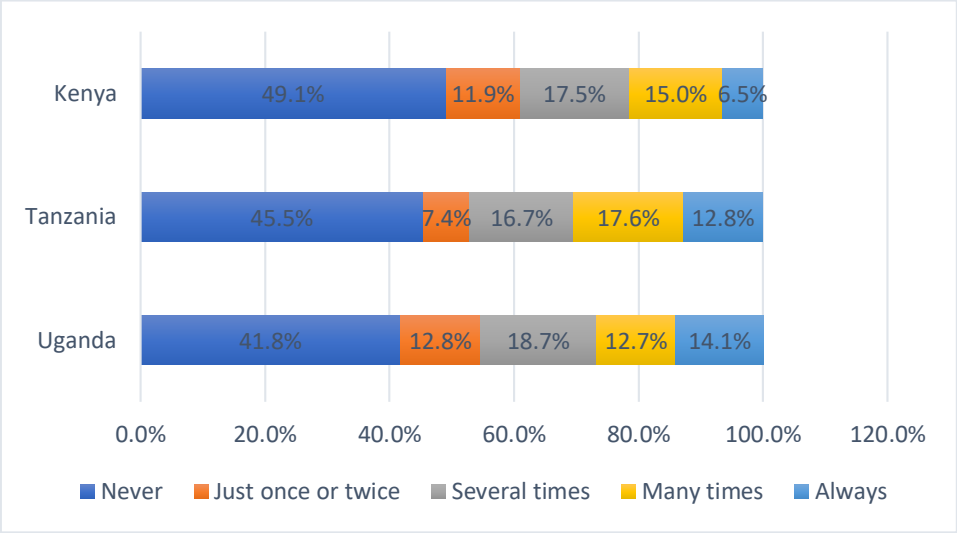


Beyond hard data on water access coverage, public opinion surveys help to understand the current state of water provision as perceived by communities in rural East Africa, particularly service quality. One of the main sources for public opinion in Africa is Afrobarometer (https://afrobarometer.org/), a continental survey conducted several times in many countries over the past two decades. Some of its questions deal with water provision and allow a reasonably direct comparison given the questionnaire consistency across countries.

Analyzing the Afrobarometer data over the past decade, Howard and Han (2020) found that Kenya experienced a small increase in the percentage of people who reported having continuous clean water, Uganda experienced a moderate decrease, and Tanzania saw a significant decline in the number of people who reported having continuous access to clean water for domestic use.

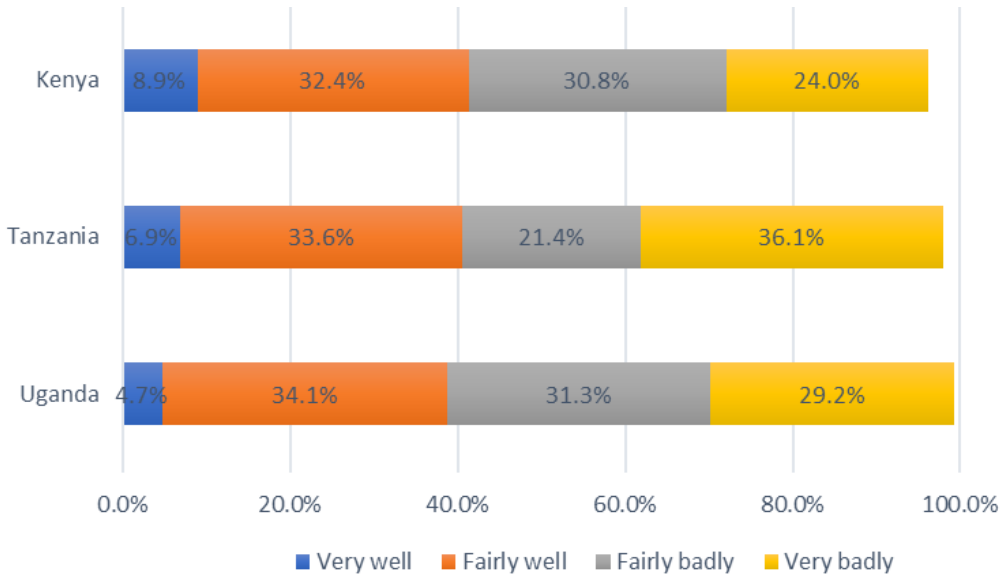
Survey respondents living in rural areas were significantly more likely to experience a shortage of clean water during their lives than urban residents. Figure 3 presents survey results of rural residents self-reporting on lack of access to clean water in Kenya, Tanzania, and Uganda.

Figure 3. How often have you gone without clean water for home use? (Afrobarometer)



Another Afrobarometer question asks respondents to evaluate how well the government is handling provision of water and sanitation services, using a four-category scale (very well, fairly well, fairly badly, and very badly). Most responses (Figure 4) fell in the two middle categories in all three countries, but the difference between the extremes is staggering: while the percentage of respondents answering “very well” does not reach double digits in any country, those answering “very badly” are 24% in Kenya, 29.2% in Uganda, and 36.1% in Tanzania.

Figure 4. How well or badly would you say the current government is handling providing water and sanitation services? (Afrobarometer)



Institutional contexts and legal frameworks

Kenya

In 2010, Kenya adopted a new constitution, which devolved many governance responsibilities to a set of new administrative units: 47 counties. It also established a constitutional right for all citizens of Kenya to have access to safe water and sanitation. Prior to this point, water services had been regulated by the 2002 Water Act, which called for bottom-up community participation in the planning and implementation of water projects, which would be overseen by autonomous water companies at the regional level (Ogendi, Ong'oa and Ong', 2009). With the new constitution in 2010, however, water services – along with most other service provision – were devolved to the newly created counties, while maintaining national-level oversight.

These constitutional changes were further reformed and clarified with the passage of the 2016 Water Act, which laid out a shared responsibility for water provision between the national and county levels (Kenya Water Act, 2016). At the catchment and county levels, the 2016 Water Act established catchment-level Basin Water Resource Committees (BWRC) and county-level Water Works Development Agencies (WWDAs, formerly referred to as Water Services Boards). These bodies are meant to work with community-level water committees, known as Water Resource User Associations (WRUAs). At the national level, the 2016 Water Act established or reformed several national-level agencies, including the Water Sector Trust Fund (WSTF), the Water Service Regulatory Board (WASREB), and the Water Resources Authority (WRA), which are responsible for policy formulation, sector coordination, and regulation (Orlendo, 2019).

WASREB serves as the central regulatory body of the water sector in Kenya, overseeing service provision agreements for WWDAs, which have the responsibility to provide water and sanitation services to their respective localities, licensed directly by the WASREB. Small projects,

especially in rural areas, have the ability to delegate most activities to water trusts, which in turn subcontract directly with small-scale providers or cooperatives encompassing multiple systems. The Water Resources Authority, in contrast, is charged with designing and enforcing standards and regulations for water resource management, as well as permitting water abstraction and use.

One major challenge that has emerged from the 2010 constitution and the 2016 Water Act is the division of responsibilities between the national and the county levels. In particular, while responsibility for water service provision has been devolved to the county level, most decision-making authority still lies with the national level (Orlendo, 2019). This has introduced tensions between the two levels of government, as well as opportunities for shifting blame in response to implementation failures (KNI5).

Tanzania

Water governance in Tanzania is currently oriented by three main pieces of legislation: the National Water Policy of 2002, the Water Resource Management Act of 2009, and the Water and Sanitation Act of 2019. At first, water systems were kept decentralized at the local level through a community-based management structure called Community-Owned Water Supply Organizations (COWSOs). COWSOs were registered with the national Ministry of Water and owned the local water schemes, though they could delegate operations to another party. The institutional structure was headed by District Executive Directors (DED), who reported to the President's Office of Regional Administration and Local Government (PO-RALG) and were responsible for the infrastructure installation and oversight, as well as operating and managing water systems. In practice, the District Water Engineers were the officers with most of the responsibility to keep the systems working under that system, reporting directly to the DEDs and then to the COWSOs (Origa *et al*., 2020).

After the Water and Sanitation Act was passed in 2019, the regional water offices under the Ministry of Water re-established a more centralized governance system, creating the Rural Water Supply and Sanitation Agency (RUWASA) to take over water provision in rural areas of the country. District water engineers became acknowledged as "district water managers" and were made part of RUWASA staff, reporting directly to the regional manager inside that institution rather than to PO-RALG. COWSOs were renamed and reorganized as Community-Based Water Supply Organizations and had to re-register to the new authority, although they still hold the expectation of self-sustenance. RUWASA's introduction into the framework also made them responsible for engaging the private sector and facilitating businesses with it over their jurisdiction areas.

Although it is contrary to the decentralization trend in other countries, Tanzanian authorities have justified the move to more centralization as a problem of capacity in multiple levels and sections of government (Origa *et al*., 2020). Another recent development coming from the Water and Sanitation Act of 2019 was the establishment of a National Water Fund, oriented by a model of financing based on results.

Extant legislation in recent decades aimed to enable private sector initiatives in the sector, with many attempts at bringing a private participation to rural water systems. Some of these failed,

like the government program to privatize a Dar es Salaam system in 2003 that was canceled after two years (Origa *et al*., 2020). The reasons cited for this failure were lack of payment from consumers, the large number of illegal connections, and a bigger than expected challenge of building infrastructure for the systems. Recent plans also tackle the issue of production for urban utilities and service-level contracts for operating and managing rural systems.

Overall, the legislative framework for private public partnerships (PPPs) in Tanzania is too cumbersome based on Origa *et al.*'s evaluation (2020), with the government not acting in a way that most effectively uses these instruments. The water sector business community in Tanzania is not as developed compared to its neighbors Uganda and Kenya, making it even more difficult to acquire the means for successfully operating rural water services, such as financing (Origa *et al*., 2020).

Uganda

Uganda presents a somewhat different background compared to its neighbors. Although the Water Act of 1997 established a highly decentralized system for water provision, implementation did not follow suit completely and its decentralization remained more of a theoretical proposition than a reality in many regions of the country. In Uganda, there is a variety of private operators, most of them too small to secure capital on their own. Historically, their focus has been on piped systems (UC1), which could explain why Uganda alone out of the three countries reports data on safely managed water access in rural areas (see Figures 1 and 2, above).

Starting in 2007, the government adopted a program to promote public-private partnerships for water systems in rural areas across the country: the Uganda Small-Scale Infrastructure Provider Water Program (SSIP). Measures included under this program were providing access to financial resources, facilitating funding for operators, and building capacity in the public sector to allow local operation and maintenance through government and technical staff. Despite these goals, the program never progressed beyond the pilot stage due to poor performance by some private actors, the lack of commercial viability that came from politician pressures to control prices, and some examples of collusion between private operators and local government (UNI2, UGN1, UNI6, UNI3).

According to Golooba-Mutebi (2012), the relative weakness of water provision in Uganda can be explained by a combination of factors, with the failure of coordination of efforts by the government contributing decisively. Lack of a sense of ownership over water projects by communities adds to the challenge, as responsibility for ensuring functionalities of the systems was murky at best. This led to a general discouragement among users to invest in the systems, including through paying for them (Golooba-Mutebi, 2012). Therefore, decentralization requires instilling popular participation and community oversight, with the government playing not only the role of facilitator but also coordinator.

Since around 2013, the National Water and Sewerage Corporation (NWSC), a public company owned by the national government, has consolidated many water systems into its operation, taking over private and public systems across the country, including in rural areas (Marks *et al*., 2020). These were mainly acquired through absorbing successful operations after some or most

of the required investments had already occurred and infrastructure was in place. From a handful of systems in places that lacked any infrastructure initially, NWSC expanded to over 200 water schemes during the last decade (UNI3; Marks *et al*., 2020). However, some worry that this expansion undermines oversight and regulatory authority, as the government has control of both the Ministry of Water and the NWSC, and the NWSC is significantly larger and better funded (UC1, UNI6).

In addition to the NWSC's direct participation in water services provision, the government established regional Umbrellas. Originally designed to coordinate and provide oversight to several water systems within the same district, funded by membership fees, the Umbrellas have transitioned to becoming operators themselves in some areas. As a result of this transition, the government's role in water provision has increased in the rural areas. The Umbrellas have been threatened by NWSC's efforts to take over the most lucrative water schemes in rural areas, but Umbrella advocates within the Ministry of Water and the Environment have been able to stop some NWSC takeovers in order to keep rural Umbrellas viable (UC1).

While there may be benefits to expanding government provided water in rural areas, such as economies of scale, Naiga *et al*. (2015) cautions that such government participation and increased centralization can hinder the flexibility and context-specific initiatives that promote good governance in water provision at the local level. They also point to the need for local action through community channels to counteract inconsistencies in national government policy.

Community-based management models

Prior to the 1980s, water provision around the world was primarily seen as the responsibility of the state, in terms of both infrastructure provision and management (Bayliss, 2014). In much of Africa, this mode of provision was not able to reach beyond urban areas into the rural areas, where the vast majority of populations resided. In response to such state failure, the community-based management (CBM) model was introduced with the goal of promoting sustainability of rural water provision in sub-Saharan Africa (SSA).

In the decades that followed, the CBM model became the dominant mode for water delivery in rural settings across SSA, with both donors and implementing agencies interested in generating sustainability through community management (Harvey and Reed, 2007). The principles that oriented such a shift include community participation in developing their water system, community's eventual ownership of the scheme, and sustained operation and maintenance (O&M) by community actors (Moriarty *et al*., 2013). Under the CBM model, international NGOs, governments or other donors usually provide investment at first, mainly in the form of infrastructure (such as installing hand pumps), but in some cases they also provide training on maintenance or management. Eventually the project is handed over to communities, which then have responsibility and authority over financial and operational aspects.

There were a few other motives for adopting the CBM model, usually associated with the theoretical benefits of decentralization of service provision. For instance, participation and ownership would lead communities to "buy into" the systems more rapidly and reliably. When able and willing to perform the O&M duties, the community would be faster to answer users'

concerns and issues, leading to better governance across the board – trust, accountability, transparency, and equity would be higher as the users could trust their own community with money and have privileged access to the leadership in charge of the system.

However, many challenges to the CBM model arose, which critics began documenting in the early 2000s. In Africa specifically, Harvey and Reed (2007) argued the model failed across many countries. Rates of water infrastructure non-functionality are very high. Foster *et al*. (2019) estimate that a quarter of handpumps in SSA are not functional at any given point in time. This number is likely an underestimate of how badly CBMs are performing as operational status does not include information on water or governance quality (Moriarty *et al*., 2013).

Some of the challenges are directly related to infrastructure costs, capacity and personnel. Rural communities often lack the ability to provide the managerial, financial and technical support necessary for sustaining long-term water service provision and operational infrastructure. For example, UN13 noted:

> "training a water committee and forgetting about it has limited success. And it is limited […] to the pre-existing trust and leadership capabilities of the community prior to getting the borehole." The community water boards did not always have skilled personnel: "The board would […] have the mayor, a few people at that level. And then there will the governance board. But that's the board that really didn't have high skills" (UN13).

Related, it was reported that communities tended to become too reliant on external support even after the system was handed over (Lockwood, 2002; Lockwood *et al*. 2003; Harvey and Reed, 2007). This is compounded by the difficulty in accessing spare parts or trained personnel who can make repairs when needed; involvement from third parties is unlikely as it is not financially viable to provide maintenance for rural, dispersed communities (McNicholl *et al*., 2019). Costs for O&M can be higher than what can be recovered, and it is often common that revenue collection happens only when there is a breakdown; investments are uneven and unpredictable coming from the government or NGOs.

It is also frequent that users may simply not pay. The challenge of generating enough revenue for keeping systems afloat would be significant even if the entire community contributed, given that they tend to have low income compared to the costs of installing and operating water schemes, but it could be even greater if many users systematically do not pay their share. In some cases, people may refuse to pay for water because it is viewed as a free resource that belongs to all (Gilbert, 2007), a view that is widespread given the fundamental necessity for water, encoded as a human right by the United Nations (UN Resolution 64/292, July 2010). Compounding unwillingness to pay for a basic good such as water, other concerns from citizens include political manipulation by candidates promising free water (Gilbert, 2007) and the skepticism generated by past and present breakdowns. It has been shown that people are willing to pay when and if access to water is reliable and quality is assured, with acceptance higher for drinking water (Bey *et al*., 2013), but such reliability is not always guaranteed.

Another common issue with CBM models is their reliance on volunteering to get the community involved. Members must willingly give their time and labor to manage and operate water systems, and such an assumption is not guaranteed (Harvey and Reed, 2007). This expectation of

a "demand responsive approach" had the intention of ensuring an adequate level of water supply based on the community's demand (World Bank, 1998), and it has been somewhat successful but not sufficient to address issues of sustained community involvement (Moriarty *et al*., 2013). Ultimately, labor requirements also may lead to the necessity of leaders having to pay themselves to operate the system as well as other professionalism issues, potentially reducing the accountability and trust benefits that were theorized with giving the community the authority to manage their own systems (Moriarty *et al*., 2013).

Finally, there are specific governance challenges for CBM models related to capacity. Communities may trust CBM regarding financial management more than outsiders due to existing relationships:

> "they select someone to be a treasurer based on how they trust them. Someone of their own, someone they know […] it's that social trust that makes you the treasurer" (UN18).

However, trust in financial management by CBM depends on how information about the system is delivered or kept; while it is easier for a CBM model to communicate with local users, maintaining and sharing the relevant information can be more difficult due to a lack of specific capabilities within a CBM, such as book-keeping. Fonseca *et al*. (2011) pointed to the cost components for offering information, including capital for installing hardware and software appropriate for the function, operating and supporting directly and indirectly; all of these need to be available in order for transparency to be effective. In addition, water user committees may not be trusted by the community due to perceived lack of technical capacity (Olaerts *et al.*, 2019; Harvey and Reed, 2007).

Due to these significant challenges related to CBM models, stakeholders began advocating for different forms of management for rural water services, particularly towards a "service delivery approach". This approach emphasizes sustainability of water service and system management, shifting the focus from infrastructure provision towards expansion of sustained water access. This new focus emphasizes three main conditions: professionalization of service providers for communities, including ways to make providers accountable and to evaluate them based on performance; willingness of communities to deviate from the CBM model, expanding it to either self-supply at the household level (Sutton, 2004) or to hybrid forms of delegated management; and financing the water system's whole cycle, including ongoing operations and maintenance, instead of solely providing initial infrastructure investments. Some of these principles can be observed in a few examples of rural water service provision in East Africa, such as UF1's focus on ensuring financial sustainability:

> "…based on past experiences, you want something that generates revenue for [the communities]. Such that if they experience any breakdowns, they have money to go […]. This has worked quite well in so many communities in Kenya. Well, we've escalated more of these units. And similarly, we see that the same is actually being replicated in Uganda" (UF1).

4. Private Sector Participation in Rural Water Provision

Defining private actors

Engagement of the private sector in the provision of basic services such as telecommunications, electricity, and water has been promoted by the international community (as part of the Washington Consensus) since the late 1980s with the belief that private sector engagement would improve services through increased investment (Prasad, 2006). In many types of service provision, private actors participate in building, managing, and operating the systems regulating and providing public goods. Critics pointed to this trend as a "financialization" of water in the form of increased commercialization, privatization, and commodification, meaning that water provision became subject to global private capital and its interests (Bayliss, 2014). However, there are many ways to incorporate the private sector into public services provision in general, and also variation in what it means to be a private actor depending on the setting. It is no different in water service provision, which in recent years has seen growing participation of private actors in a variety of forms around the world, including East Africa.

Defining what constitutes a private sector actor requires differentiating its goals from those of governments and users. Prasad (2006), in his relatively early review of how private actors fared in water governance, focused on the "commercial objective of making a profit", which sets private actors – be they organizations or individuals – apart from not-for-profit organizations like governments and NGOs. While this definition helps illustrate one of the critical issues in water governance (i.e., financial sustainability), it sidelines the importance that not-for-profit firms might have in some settings, particularly when they operate more independently from governments or other parties.

Thus, we prefer to define "private sector service providers" as those non-governmental entities overseeing water system operations daily as a business, providing safe and reliable water supplies, and being at least partially financed by charging fees to the consumers. Operating like a business does not necessarily lead to the assumption of profit-making as the goal under this definition, as some private actors could monetize solely to cover operation costs and investment. Private actors here could be companies, individual entrepreneurs, NGOs, social enterprises, or other actors, if they are clearly separate from national and/or local governments, as well as from community leadership.

Responsibilities for the private actor could include many elements, from infrastructural needs – especially for initial installation of a given system – to water distribution and storage, along with other forms of technical support such as ongoing maintenance. The array of responsibilities allows for further divisions within the concept of private actors to differentiate between those focusing on operating water systems and those solely providing support and/or capital, although a few private actors could engage in all of these. Additionally, the private sector could play a role in improving governance without direct engagement in system operations or support (e.g., manufacturers of technology used by water systems, communication and logistics services such as WhatsApp or other electronic means, etc.).

Finally, the private sector as defined above should operate within a legal framework, circumscribed by national and local governments when applicable. Evaluations of their participation and impact for water provision governance are possible under such a framework but could be impaired in its absence.

Classic forms of private sector participation

Modes of engagement for the private sector in water service provision can be subdivided into two large groups. First, the offering of services and/or support to water systems, which includes the several phases of implementation including planning, construction, consulting on technical terms, training, etc. This mode also features a few supporting activities, such as maintenance, repair, or preventative care for the infrastructure associated to the system. A second mode comprises the private actors who are directly in charge of operating the systems through utilities and water supply, management, distribution, etc. This can be further subdivided into systems that are wholly operated and/or owned by private actors and those in which the community or the government owns the system, merely allowing for private operation.

Among the different forms of engagement in provision of public services, currently one of the most dominant is public-private partnerships (PPPs). This mode of private sector engagement can be defined as "contractual arrangements between public and private sectors to provide a public asset or service for the public benefit, where the private sector makes a financial investment in the project and there is substantial risk sharing between the public and private sectors" (Devcar *et al*., 2013). There is significant variance between types of PPPs used for water schemes across the African continent (World Bank Group, 2014). Below we refer to the classifications used by the World Bank (2006 and 2014) and Devcar *et al*. (2013) (any of which could apply for urban and rural applications at varying degrees of scale):

- Service contracts: usually reserved for short term interventions, such as providing durable goods for construction or construction itself, very specific services (such as billing or collection), and other kinds of one-time services. Private actors operate within a limited service provision scope, while public actors own, finance, and are responsible for the remainder of operations.
- Management contracts: in these cases, a private actor supplies management services for the community in exchange for a fee, but do not invest themselves in the system. Their goal is to manage but not to influence decision-making or to realize investments, which are the responsibility of public actors.
- Affermages and leases: these are similar models in which the private actor runs the business without financing investments for infrastructure. The difference between these models is that affermages work by fee payment to the private actors by the owners based on how much water was sold, while in leases the private operator retains the revenue from tariffs and then pays a lease fee to the owners.
- Concessions: management and investment responsibilities are given to the private actor, but the public remains (or becomes) the owner of infrastructure.
- Divestitures: the public does not own the system, which is entirely operated, financed, and ultimately owned by the private operator.

Preference and growth of different types of PPPs is changing over time. In a 2009 review by Gassner *et al.*, water service concessions were responsible for 66% of their sample of 141 water systems with private sector participation around the world. For comparison, their sample of participations in electricity services retrieved only 9% of concessions. After concessions, the next most common types of private participation in water schemes were lease and management contracts, together comprising 24% of the sample, with just a handful of divestitures (partial or full); by contrast, divestitures comprised 90% of their electricity services sample. Their sample, however, was relatively limited when accounting for sub-Saharan Africa, with just nine examples of private sector participation. In 2014, the World Bank Group noted that lease and management contract models were the newest version of PPPs in sub-Saharan Africa and by 2012 had become the most common form of private sector engagement in water services across that region (World Bank Group, 2014).

A wide range of PPPs models can now be observed across Africa, with the exact structure and risk allocation depending on the specific context. However, most tend to be in North Africa (World Bank Group, 2014), and the last 10 years has seen very little private participation in water infrastructure in sub-Saharan Africa compared with other regions (World Bank, 2018). However, official statistics on PPPs are not adequate in capturing the extent of private sector engagement, including the role of local entrepreneurs, since that engagement may take the form of management skills and efficiencies rather than infrastructure investment (World Bank, 2018). Additionally, rural water provision involves a very large number of individual systems in East Africa and beyond, requiring acknowledgment of a much more complex set of ways for private actors to engage. As noted by Bayliss (2014), these include several possible arrangements or mixes not entirely covered by the categories discussed above, from formal contracts to private financing and other means of engagement.

Evaluation of private sector water services

Improving the quality of water services has been a difficult challenge for many communities across the globe. Poor governance is identified as a significant barrier to achieving that goal (Hepworth *et al.*, 2020), and introducing more participation from the private sector has been identified as a potential solution for many settings. Here we evaluate some of the arguments in favor of privatization and private operation, as well as some criticisms and challenges to its success.

Firstly, the main argument for private operation in services provision relates to the incentives that private actors have compared to public ones; private actors should outperform government-owned enterprises because of their comparative efficiency given by financial incentives to reduce losses and waste, by clearly defining interested parties within each setting, and by improving the ability to advocate or lobby for some reforms that might increase the service quality either directly or indirectly. In addition to this, public ownership is often regarded as inherently flawed due to political pressures that lead to the operations becoming “bloated” and thus inefficient (Bayliss, 2014) and also due to limitations in government capacity (World Bank Group, 2014).

There are expectations that private actors would also overcome other obstacles. For instance, their profit incentives would result in installing and operating under a more financially

sustainable framework compared to approaches based on donations (World Bank, 2006; Foster, 2012), despite concerns that users may only contribute a small fraction of the costs (McNicholl *et al*., 2019). PPPs can reduce construction time and cost overruns since they usually do not allow adjustment of contract price for any cost changes (World Bank Group, 2014). Monitoring would be undertaken more regularly and locally, instead of relying on large and inefficient national agencies. Private investment would allow for improvements in technology and access to financing not typically available to more traditional sources of donor funding (WSP, 2010), and customer satisfaction could be improved while costs would be reduced due to expected efficiency increases (World Bank, 2006). Finally, private operation should improve governance through increased efforts toward accountability and transparency, while trust between actors should also increase given the better predictability associated with legal arrangements binding both governments and private operators (World Bank, 2006).

Despite all these arguments, and some evidence that demonstrates the expected benefits of private water service provision (World Bank Group, 2014), there are also some unique challenges.

A comparatively early study by Bayliss (2003) focusing on private sector water services in East Africa found that countries adopted different privatization strategies but overall there were limited benefits. The regulatory environments failed to reduce water costs through efficiency gains, while political interference and compliance to regulations, including respect of contracts, were doubtful. Better initial conditions usually led to better outcomes from privatization, as expected (Bayliss, 2003). More recently, the World Bank Group (2014) noted that two non-negotiable criteria for the success of PPPs are strong political support and a long-term commitment from both partners. Since PPPs involve complex risks and uncertainties, they can fail if these political commitments are uncertain or falter. Other analysis has shown that private water service provision may require substantive organization from the community to successfully introduce and manage a private actor compared to a more traditional publicly owned and run or CBM form of water service provision (Olaerts *et al*., 2019).

Requirements for investment tend to be much larger in rural communities, as many lack even the most basic infrastructure or capabilities for maintenance; these communities tend to be underfunded due to poverty and may be unable to pay the costs of implementation and/or operation (McNicholl *et al*., 2019). Additionally, private sector engagement is no guarantee that sufficient revenues will be collected to sustain operations or cover the cost of repairs (Carter *et al.*, 2010) and water user committees may be unable to effectively comply with payment schedules (Olaerts *et al*., 2019). The profit margin may be very low or even non-existent in rural settings, reducing the likelihood of market formation and introduction of interested actors. In some cases, political pressure might add to this problem, as water is universally needed; keeping prices lower than costs becomes socially advisable, even more as water provision is a natural monopoly and thus subject to even more pressure (World Bank, 2006).

Other financial challenges include the comparative disadvantage that for-profit companies have when there are grant-making or not-for-profit NGOs in the business of water provision also participating in a region, as they "crowd out" profit-incentivized initiatives (Oxfam, 2018) and

the risks associated with making investments in settings with lower levels of institutional stability, such as expropriation, political interference, or corruption (Carlitz, 2017).

Additionally, there are several reasons why people in rural communities may be unwilling to pay for water services. First, a history of low functionality and lack of reliability in water provision is a factor that reduces their trust in water schemes, leading to fewer citizens interested in paying for a faulty service (Oxfam, 2018). Second, water is seen in many contexts as a natural good that everybody should have access to as a human right, a divine gift, or both (FGD TF1). In this case, private actors have found improvements in payment by conveying the notion that citizens are not paying for water *per se*, but for the service of water provision:

> "So it's the idea that to be providing water free of charge for a certain amount of time until people can afford to pay or is it as soon as you start providing water that you're going to ask people to start paying" (FGD TF1).
>
> "From our experience as soon as you start uplifting service levels, the willingness to pay also goes up with it because once you see what you get for your money you're more, you're willing more willing to pay for it" (UN16).

Finally, as water is often considered a common good, it is considered that it should not be exploited in any capacity for profit: "Because it is the essence of life itself, water should never be treated as a commodity based on market principles" (Prasad, 2006). For example, in our research participants mentioned:

> "Other places they are paying. But some places, it's a challenge. The mentality amongst the Ugandans is that water is a free good. So, it's... you need to take steps to mobilize communities to appreciate and begin contributing for" (UGN1)
>
> "I've heard people say water should be free and it's a God given, right? They say, well, fine water is free. You can go pick it up from a ditch, but that water, you drink that water and it's going to make you sick. And we've gone through all the explanation of why, but you know, safe water. There is a cost associated with making water safe and, and that costs needs to be covered." (TNI6).

Some studies have shown mixed results from private sector engagement. Focusing on models that combine community and private management, Tiberghien (2013) emphasized the need to establish well-defined functions applying to each party involved, taking advantage of their different roles and abilities under the design of "hybrid models". Even with well-defined responsibilities, the author emphasized the crucial roles of financial sustainability, planning for long-term engagement, and a focus on poorer communities.

Other mixed results come from Devcar *et al.*'s (2013) evaluation of private sector participation in water and sanitation (along with electricity and telecommunications) in terms of access, water quality, and service quality. In a synthesis of over 65 studies from around the world, they find that private sector participation generally improved all three outcomes, with the largest effects for the quality of service. However, these initial results obfuscate issues of equity. The authors found that while outcomes improved overall, they do so at the expense of rural and poor households. Private sector engagement in the water sector tended to increase prices and

disconnections for non-payment at a higher rate – thus, creating clear equity implications of private sector involvement. This problem is driven by the fact that most water tariffs prior to privatization are much too low to recover investments and finance maintenance and expansion.

In this research, we focus on the reasons why private operator models may be well-positioned or not to address governance challenges. Therefore, our focus is not on performance in terms of water quality or coverage specifically, although these might influence some views on governance or impact it directly. However, we consider that governance outcomes are important in and of themselves, with the ability to "spillover" into other sectors or areas of social and political life.

5. Private Sector Tools and Approaches

This section details tools and approaches that could be employed by private operators or members of the private sector in rural water service provision, or which could be adopted by government, oversight agencies, communities, or user groups in order to make rural water services attractive to the private sector.

Each tool or approach is classified as a framework, a practice, or a technology:

- A framework refers to a way of structuring relationships among actors and interactions. This category of tools and approaches is focused on structural factors that shape how rural water provision is achieved, including the nature of the relationships between different actors and the sources and distribution of resources.
- A practice is a tactic, a process, or a way of doing things. This category includes rules or best practices for how to do something, specific content and materials for trainings or assessments, guidelines to transform an aspect of the system, or ways of structuring decision-making. This category is closest to the definition of a "tool" by Schweitzer *et al.* (2014), who define tools as having specific content (questions or observations), a clear and reproducible process (instructions for application), and synthesis of data to produce an output (method for aggregating information into an easily interpreted output or indicator).
- A technology is a tangible product designed to improve some aspect of the overall system. This category includes new products – either physical or electronic – that are designed or employed to improve some component of water service delivery.

Table 4 provides an overview of the tools and approaches within each category described above and maps them onto steps in the water service delivery chain. This list of tools and approaches is by no means exhaustive, as we focus only on tools and approaches that are expected to have governance implications. In the following sections, each tool or approach is described, and existing examples are provided.

Table 4: Private sector tools and approaches across the water service delivery chain

	Framework	Practice	Technology
Institutional Structure, Funding & Planning	Umbrella Organizations Rural Utilities Funding Pools Franchising Microfinancing	Participatory Planning Contingent Funding Legal Registration & Formal Contracting	
Sourcing, Treatment & Distribution		Water Treatment	Retrospective Monitoring
Tariff Collection		Collective Payment Social Costing	Electronic Taps & Smart Meters Electronic Payment
Operations & Revenue Management		Training & Capacity Building (O&M) Audits	Information Dashboards

Monitoring & Maintenance		System-Wide Assessment Tools Subscription Maintenance Technical Associations Training & Capacity Building (Technical)	Remote Monitoring
Communication		Community Meetings Publication of Performance Information	Electronic Communication Platforms

Frameworks

Umbrella Organizations

Umbrella organizations – sometimes referred to as federations, cooperatives, or trusts – refer to institutional arrangements through which multiple organizations that each manage a water point or system form an aggregate, overarching organization (World Bank, 2006). The overarching umbrella organization will typically provide technical or financial services to the lower-level member organizations in exchange for some financial transfer from constituent water organizations, sometimes subsidized by government or donors. The nature of the relationships between personnel from constituent organizations and the overarching organizations vary considerably across contexts.

Over time, some of these umbrella organizations have transformed into service providers, sometimes maintaining constituent organizations and other times replacing them. In this sense, umbrella organizations may serve the function of bridging the transition from myriad water point-level service providers toward larger, regional service providers. The model, thus, seems promising in terms of managing issues of organizational capacity and community distrust during efforts to aggregate rural water services.

The Professionalized Rural Service Area (PRSA) strategy advocated by the Rural Water Supply and Sanitation Initiative (Rural Water Supply and Sanitation Initiative, 2010) includes aggregation of individual water systems and water points into larger groupings as a major pillar of transformation. They highlight the main benefits of aggregation to be economies of scale and the creation of a larger financial basis for attracting financial investments and private sector management interests. In many ways, this model is akin to umbrella organizations and other coordinated approaches to grouping smaller rural systems. An aggregation strategy has been introduced in Senegal, where the Government advocated for grouping several villages around a single water storage facility providing access via a reticulated system to relatively large villages (1,500 to 2,000 inhabitants) surrounded by smaller satellite villages (200 to 700 inhabitants) with which they have strong socio-economic and cultural linkages.

One example from our field study took the form of a federation of Community Owned Water Supply Organizations (COWSOs) within Tanzania. In this federation, each COWSO elected two of its members to serve on the board of the federation. The incorporation of COWSO-level representatives into the federation allowed it to operate with concrete information about the local

context of each water system under its jurisdiction, while also allowing communities to have representatives to provide direct oversight of the federation. The federation hired professional staff to help manage day to day operations and provided numerous services to constituent COWSOs: spare parts supply, technical teams for maintenance and repair, bookkeeping and audits to track financial flows. While this particular federation was aided by past infrastructural investments by donors and low-cost water sourcing, the federation was quite successful in reducing non-revenue water and providing high quality services.

The federation was taken over by the government and subsumed under the newly established national Rural Water Supply and Sanitation Agency (RUWASA) in 2019. Changes in the quality of water services after the federation was subsumed by RUWASA were difficult to discern through our interviews and focus group discussions. Perspectives differed by the positionality of the respondent. Community members mentioned that they felt they were no longer as responsible or engaged with management of the system as before but did not mention any other significant changes to the system. The perspective from a former scheme manager was that the quality of the service had declined since the takeover. Since the takeover had occurred only shortly before the interviews were conducted, it is possible that perspectives on quality of service would change over time.

A second example comes from the regional umbrellas in Uganda. The first umbrella organization within Uganda was established in the southwest region as part of an Austrian aid project. The South Western Umbrella for Water and Sanitation (SWUWS) original structure included an umbrella general assembly with two members from each constituent water board and a professional secretariat of four engineers and two water quality experts (Koestler, 2008; Hirn, 2013). The umbrella staff were funded by membership fees paid by constituent water boards using water tariffs, and through donor funding. Additional regional umbrellas were established over time, and one of our field sites fell under one of the newer regional umbrellas. While the umbrellas initially functioned as a support service for smaller water operators within its jurisdiction (Hirn, 2013), providing technical help for complex repairs and management support, umbrellas have transformed into water service providers themselves. They are meant to report to and receive funding from the Ministry of Water, functioning very similarly to a utility (UNI2).

In one of our Uganda field sites, an umbrella employee at the local level explained the organizational structure this way:

> "Now, we have the main [regional] office, which is the Umbrella of water, then we have the branch of [community]. When we need materials or any other things, we get them from the head umbrella, we make a quotation of what we want and they send it. Then, here [in the community] we have the cluster manager…and the plumber, then the commercial assistant and then we have the cleaners…The cluster manager takes over around 3-4 schemes, then we have here the commercial and the assistant who manages here" (UL7).

In addition to direct management of individual schemes by the Umbrella, regional Umbrellas in Uganda also contract out operations and management of individual water schemes to private operators, including both local companies and sole proprietors (UNI3).

There are numerous other examples of umbrella organizations in the water sector. For example, water service providers in small French towns organized themselves into a collective and hired a private operator (World Bank, 2006). In Mali, small water systems could pay a membership fee to an umbrella organization – the Cell for Advice and Support for Small Water Providers – and receive financial and technical support in return (World Bank, 2006). Unofficial umbrella associations of Water Resources User Associations (WRUAs) in Kenya have also emerged at the district or water basin level, primarily aimed at sharing information and coordinating collective efforts (Richards and Syallow, 2018). The Improving Water Supply Sustainability (IWAS) project in northern Uganda provides another example: with funding from SNV, IWAS is creating water supply boards at the sub-county level to manage the operation and maintenance of point water systems (UNI6).

Rural Utilities

Public utilities are another framework for rural water provision. Utilities are typically publicly owned but independently run organizations. In some sense, they are simply a particular form of an umbrella organization, but they are considered separately here given their prominence in water management globally. Although present in other regions around the world, rural water utilities are quite rare in sub-Saharan Africa.

In theory, a rural utility framework can engage the private sector in a number of distinct ways. Utilities can engage operators through a management contract, in which the private operator is paid a fee from the government or constituent communities to maintain and operate the water scheme. Alternatively, a lease-affermage contract requires that the private operator pay for operation and maintenance but keeps a percentage of revenue. Build and operate transfers require that the private operator construct the water system before then managing and maintaining through a lease-affermage contract. When private operators pay a large share of the initial investment to build the system, they are often allowed to wholly own the system and keep all revenue, although often only for a specified period of time before the system is transferred to government.

One example from our fieldwork involved the local government receiving bids from companies to manage the rural town's piped water system for five years. According to one informant:

> "people in [town] […] used to have these wells they dig and boreholes […]. But later, they brought a company which helped us dig protected wells. That's what we drink and still drink up to now. After [company] putting for us water, it was handed over to private operators that did work amongst us. In the end it was transferred to private operators which controlled the water, then to National Water" (UL10).

This was part of a larger program to encourage public-private partnerships to enhance rural water provision throughout Uganda.

In more recent years, the Ugandan National Water and Sewage Corporation (NWSC) has expanded its management of major urban water systems to smaller piped systems throughout the country. Their organizational structure is such that rural areas are combined into clusters with a NWSC branch that operates each cluster (UNI3). In a sense, the NWSC then manages a large

number of semi-autonomous branches that function as rural utilities. One interview referenced this massive expansion:

> "[NWSC] used to be only in small towns a few years ago, when they used to have 28 total schemes, so those were basically big towns. But as of now we are talking of over 280, close to 300 schemes. So, the difference between rural and urban is really becoming smaller" (UNI3).

Our interviews revealed that many small-scale piped systems that are community managed or owned by sole proprietors fear that they will be forced to hand their system over to NWSC if they are too successful in recovering revenue. This potentially creates adverse incentives for good management, as successful systems risk takeover. In the words of the representative of a company operating in Kenya and Uganda:

> "[towns] have no choice to make but rather go with what's there, so it is either National Water where you have the Umbrella, or you have the NGOs that are sticking up for them" (UF1).

In Kenya, most county seats have an urban utility that provides water to those within the urban areas, and even in rural areas that are proximate to the county seat. However, there are aims to have two utilities per county, one for urban areas and one for rural. Rural water utilities have been established in some counties, including Nakuru and Makueni. There has been some resistance to the incorporation of community-managed water systems into rural utilities, as communities fear losing control of their water source (KNL2). As a result, incorporation usually results from negotiations after a community-managed water system suffers a breakdown that cannot be repaired locally. This creates something of a moral hazard, as newly established rural utilities are only able to incorporate systems that are not sustainable and are not able to incorporate well-functioning systems with sufficient revenue recovery (KNL2).

Funding Pools

Funding pools, as the name suggests, are combinations of funds from different sources that can be utilized by those investing in rural water systems, typically on a competitive basis. The pooling of funds is designed to achieve a number of objectives. Combining funds allows for a coordinated approach to the expansion and improvement of rural water systems, rather than a piecemeal approach with different requirements and priorities among different funders. A pooled fund also reduces the inefficiency of forum shopping, through which those in need of funds have to rework proposals as they are submitted to numerous potential funding sources. In contrast, a pooled fund can have a standard set of criteria for funded projects.

In addition, a funding pool makes it easier to accumulate knowledge of what has worked and what has not, which is harder to do when there are multiple, unconnected funders. For example, a funding pool could develop a technical arm that tracks outcomes systematically and accumulates knowledge that informs future lending, or that provides trainings on best practices to potential borrowers (Oxfam, 2018). Finally, a pooled fund allows donors and governments to better define and enforce requirements through a single source. For example, results-based financing is easier to implement in partnership with a single fund than through coordinating multiple funders (World Bank, 2006).

One of the best known and most active funding pools is the Water Services Trust Fund (WSTF) in Kenya, which was established through the 2016 Water Act. The WSTF funding model has government and donors subsidize loans to service providers who are able to meet certain agreed upon output metrics (Oxfam, 2018). However, given that it is a national funding pool, it has proven hard to recover loans given to smaller, more recently registered community groups, which simply dissolve after non-payment (KNL1). As a result, there has been a significant bias towards funding utilities, which primarily operate in urban areas of Kenya. Yet, the funding pool has an important niche to fill, as most water utilities in Kenya do not qualify for commercial lending, making WSTF their main source of financing (KNL1).

Also in Kenya, the Water Services Maintenance Trust Fund, established in collaboration with FundiFix, Oxford University, and UNICEF in 2016, is a means of pooling water user tariffs, donor funding, and government finances in support of infrastructure maintenance. The large geographic scope of the maintenance services allows for economies of scale and risk pooling. The Fund contracts with maintenance providers – for both preventative and corrective maintenance – and structures payment through performance indicators (a form of Contingent Funding, discussed below).

On a smaller scale, a Turkana Water Fund has also been proposed to provide outcomes-based funding (see below) in Turkana County, Kenya (Oxfam, 2018). In this case, the fund would be financed by government and donors but controlled by the county government. Funds would be used for improving water service delivery or expanding infrastructure. Lending would be conditioned on performance outcomes that are known to be related to long-term sustainability (Oxfam, 2018).

Franchising

A franchising framework refers to a contractual arrangement in which entrepreneurs pay for access to a franchisor's name, processes, practices, and knowledge, typically in the form of a licensing fee plus ongoing royalties. In theory, franchising could allow the expertise developed within the private sector more generally to penetrate the rural water sector, where there are not strong monetary incentives for large firms to sell water to small communities. Instead, these large firms can sell their expertise and support to local firms who are incentivized by the smaller profit margins available in rural water projects in the form of a franchise (World Bank, 2006). A franchising business model in general helps small businesses and entrepreneurs overcome the many barriers to starting a business, including the development of a business method, the establishment of branding, raising initial capital, understanding and complying with regulations, and training qualified staff (Wall *et al.*, 2008).

In urban and peri-urban areas of six African countries, Jibu has created a for-profit franchising model for selling clean drinking water. In particular, they franchise a commercial location that treats and bottles drinking water on site, as well as a micro-franchise for water resellers. The Jibu company has a revocable franchising agreement that holds franchisees to a common, high standard, and provides most of the up-front capital for establishing a new business. For quality control reasons, the company also continues to own and maintain the machinery for water purification. Entrepreneurs who purchase a license in the Jibu franchise receive both initial

intensive training and ongoing training, and significant capital investment in their water businesses.

In Ghana, the Safe Water Network provides technical support to independently owned Safe Water Stations throughout the country. Each Safe Water Station treats local water sources and sells the resulting safe water for a nominal profit. The owners and operators of the stations receive technical and business training, and the franchisor also conducts public campaigns to encourage rural community members to purchase safe water. The franchisor also performs quality checks on the water sold at independent stations, to ensure that the Safe Water Network brand is equated with high quality, safe water.

Another example of a franchise model located in rural areas comes from Kenya, Mama Maji. Within this business model, women become business owners who contract with three to four communities to provide water on a commercial basis. The women, with the help of the franchise, learn to construct proprietary water tanks and to store rainwater safely. The franchisor provides capital, in the form of a loan, and expertise, in the form of a proprietary water storage system, and training in business management to women entrepreneurs. We learned about this project in our interviews, however we were not able to include this unique perspective in our data collection.

In our interviews, we also heard about failed attempts at franchising rural water enterprises in Tanzania. For example, a successful electronic water meter company started but then abandoned an attempted franchising model (TF2). In this case, the company assumed that their electronic water taps – which had been successful at helping community or NGO-managed water systems increase recovery costs – could be sold to private individuals who would have an incentive to expand water systems to new areas and maintain those systems in order to recover their investments long term. However, internal calculations based on existing systems showed that the franchisee would only earn a profit under very specific circumstances, including service to at least 4-5 communities, a minimum of 9 liters of water used per resident per day, a large number of users per tap, and a minimum price per liter. Beyond the limiting circumstances under which the franchisee could expect a positive return on investment, the company encountered a dearth of entrepreneurs with access to enough capital to invest in a business and buy a franchisee license initially. For this and similar reasons, so-called social enterprises that employ a franchise model typically pay more of the up-front capital investment than traditional franchising models, allowing easier entry for entrepreneurs in rural areas and aligning incentives for long term-sustainability.

Microfinancing

Microfinancing refers to financial services, such as loans, that are provided to small businesses or individual entrepreneurs who typically do not qualify for traditional financial services. While utilized across many sectors, within the water sector, microfinancing helps address the lack of capital that hinders entry of small-scale private operators.

The Microfinance for Water Services Project in Kenya was a $1.15 million World Bank project that was implemented by K-Rep Bank, a commercial bank in Kenya. Unlike many microfinance

projects that focus on individuals or small firms, the beneficiaries of microloans within this project were community-based water management groups. Community groups that received loans were meant to use the funds to rehabilitate small-scale water systems or expand their service areas. In an effort to address not just capital shortfalls but also low levels of technical expertise, the Microfinance for Water Services Project in Kenya also subsidized the hiring of consultants for both technical services and management training (GPOBA, 2014). However, during the course of the project, it became clear that community-based management was insufficient to recover loans in many funded communities. As a result, K-Rep Bank added a stipulation that funded projects had to employ a private operator until the loan was repaid (Kleemeier, 2010b). This highlights how one mode of private sector engagement can engender other modalities.

Practices

Participatory Planning

Participatory planning within the water sector is a practice that includes all relevant stakeholders in the planning processes for establishing new water systems and the maintenance and expansion of existing systems. This typically refers most directly to the inclusion of water users in the planning processes through appropriate communication methods. Such participatory planning is necessary for the success of community-managed water systems (Harvey and Reed, 2007) but may also be important in the sustainability of privately operated water systems. Participatory planning can be challenging in rural areas, where low education levels limit the numeracy of many water users. However, collaboration with communities through a long-term commitment can result in appropriate materials and activities that allow for true input from those who are meant to benefit from a particular water system.

One formal tool for participatory planning is Shared Vision Planning (SVP), which combines traditional water resources management tools with structured public participation and collaborative modeling (Palmer *et al.*, 2013). For the public participation component of SVP, interested stakeholders are visualized as a set of concentric circles based on their relative sizes and expertise, with clear paths of communication and trust both within rings and across them. This design is meant to counteract the possibility that special interest groups hijack mechanisms for public input.

In Uganda, an NGO told us that they use participatory planning meetings with rural communities to help them plan for and advocate for the National Water and Sewage Corporation to expand their services into a particular community (UNI3). In Kenya, the Integrity Management Toolkit, developed by Caritas and the Water Integrity Network, guides rural communities through a process of needs assessment and problem identification (KNI1). This allows communities and water users groups to be able to engage with water service providers on a more equal footing and advocate for their community's needs. CESPAD in Kenya is also active in promoting community inclusion throughout the budgeting and planning processes. In particular, they help rural utilities engage communities in making decisions about what types of water infrastructure to invest in and the tradeoffs of different kinds of investments (KLN2). This is especially important when water utilities seek to build centralized piped water in contexts where communities are

accustomed to competing for the allocation of community boreholes (KLN2). Finally, while developed in relation to private sector-led sanitation projects, the NETSSAF Participatory Planning Approach guide (NETSSAF, 2008) could be employed in contexts of expanding water services. The guide covers processes of community-led demand creation, needs assessment, feasible services, concrete planning, and project implementation.

Contingent Funding

Contingent funding – also commonly referred to as results-based or outcomes-based funding or payment by results – is a practice through which funding is allocated based on previously agreed upon metrics of performance (Feeny, 2015; Oxfam, 2018). While contingent funding as a practice is often employed within the framework of a funding pool, funding pools do not have to employ contingent funding and contingent funding can be used in any allocation framework. Contingent funding is one manifestation of a broader set of practices collectively referred to as "output-based aid" (World Bank, 2006).

The logic of contingent funding is to create incentives for good performance by linking payment to observable outcomes. A key component for success is to have everyone – funders and recipients – agree on what good performance would look like and the specific metrics that will be used to measure it. The challenges with this practice are that service providers have to provide upfront capital to deliver the results and then wait for payment. This can be a challenge in resource-constrained areas like many rural communities, effectively excluding small-scale entrepreneurs from entering the sector (Oxfam, 2018). This can be overcome through institutional arrangements, such as the introduction of a "development impact bond" in which an investor gives some initial upfront funding and therefore has an incentive to invest in the capacity of the individual or firm receiving the funding (Oxfam, 2018). Another challenge is the very narrow set of conditions under which the returns to investment would attract commercial financing – as a result, most contingent funding practices will require concessionary financing (McNicholl *et al*., 2019).

Examples of contingent funding in rural water services abound. While the practice could focus on any aspect of rural water services, including payments to water service providers for initial capital expenditures or training and capacity building (Oxfam, 2018), the practice is most often applied to maintenance of rural water systems by local government or private actors.

For example, the Support to Rural Water Supply, Sanitation, and Hygiene in Tanzania is a program funded by the UK's Foreign, Commonwealth and Development Office (formerly, Department For International Development) that uses a performance-based payment scheme. In particular, the program provides funding to local governments to maintain water infrastructure in which payments are made in response to metrics of functionality within their area of responsibility (TNI4).

Similarly, the World Bank's Sustainable Rural Water Supply and Sanitation Program in Tanzania also uses a payment for results approach in which district level metrics – called "disbursement-linked indicators" – condition payments. A new World Bank funded public-private partnership pilot project currently underway in Singida and Dodoma regions, Tanzania –

Accelerating Solar Pumping via Innovative Financing – requires a private operator to install infrastructure and then operate the system for five years under a contingent funding contract. Similarly, in Kenya, the proposed Turkana Water Fund (discussed under Funding Pools) will also utilize contingent funding. The Uptime Consortium is a prominent group of organizations that are using performance-based payment for mechanics in Kenya, Uganda, Central African Republic, and Burkina Faso, typically embedded within a subscription-based maintenance agreement with communities (discussed further below; McNicholl *et al.*, 2019).

Legal Registration and Formal Contracting

While the legal registration of service providers and formal contracting of those legal entities with government or communities are technically distinct practices, they are so closely related that we consider them together here. In fact, formal contracting is difficult if not impossible in the absence of legal registration of private (and other) service providers.

Legal registration refers to the process of recording details about a private entity in a standardized way that allows for the entity to be traceable and legally liable for its actions. The national water regulatory board in Kenya notes the limitations that this introduces: "most community water schemes operate in isolation and are not registered as legal entities. Hence, they are unable to access credit facilities, legally contract support services, acquire assets such as land, seek redress in court or sign agreements as a water service provider" (WASREB, 2019).

Campaigns to legally register community-based water users associations in East Africa have been widespread, but legal registration is also important for private actors engaging in rural water services. A prominent actor in water services provision in Kenya explained to us that the lack of registration among entrepreneurs in the rural areas has been a major problem (KNL1). They noted that money has been invested, especially by international donors, but that without registration and access to legal enforcement, many loans go unpaid. They noted especially the importance of registration when financers are located far from their investments, without the ability to provide direct oversight and monitoring:

> "[if they are not] registered with our regulator, for the financer, any investment that we do in rural Kenya, we will ask ourselves "who's going to manage this?" Unless we ask ourselves that question, then the sustainability will just be there in theory…you cannot invest something in the middle of nowhere" (KNL1).

The liability that follows from legal registration also allows service providers to access additional resources, such as establishing a bank account and accessing commercial financing (Olaerts *et al.*, 2019). In the case of community-based water user associations, an advocate in Uganda convinced a commercial bank to create a special kind of bank account that catered specifically to water committees, with lower thresholds for starting balances and requirements for multiple signatories for any withdrawal (UGN1). Similar financial products would no doubt help small-scale private entrepreneurs manage their funds appropriately, but such products would require legal registration of responsible firms.

Registration allows for the creation of formal and legally enforceable contracts between service providers and communities, a growing practice in rural water services. Delmon (2014) outlines a

toolkit for water authorities and users' groups who wish to create formal contracts with private service providers running small-scale water systems. The toolkit includes a checklist of items for each of the many steps in creating an effective contract and includes sample language for those drawing up such contracts.

The use of formal contracts allows for a clear definition of different actors, an articulation of each actor's obligations and responsibilities, a pre-determined duration of the contract, the provision of mechanisms for adjustment in response to changing needs, and agreed upon metrics for monitoring performance. Such contracts are often framed as protecting governments and water users from unscrupulous private actors by allowing for oversight and accountability (Oxfam, 2018). But such contracts also protect a private operator's exclusive right to service delivery in order to ensure that their investments are not appropriated or undercut by others, including government (McNicholl *et al*. 2019).

Water Treatment

Water treatment refers to processes that improve the quality of water, typically in reference to making water safe for drinking. Drinking water treatment is typically focused on removing microbial or mineral contaminates that are harmful to human health when ingested. In rural East Africa, the biggest risks are from human and animal fecal contamination, or high levels of fluoride and salinity.

The most common means of treating water at the household level is boiling (Geremew and Damtew, 2020). However, boiling water takes significant time and effort, and can be quite expensive for households that use charcoal for cooking. Another widely available method of disinfecting water is for users to add small amounts of liquid or soluble tablet chlorine to water that is accessed through unimproved sources (e.g., rivers, ponds, or shallow wells). However, use of chlorine-based disinfectants is limited by users' dislike of associated tastes and smells (Kgabi *et al.*, 2014), and by the costs and supply chain challenges for getting chlorine treatment into rural communities.

Moving beyond household-level treatment, one model of more centralized treatment is a privately-operated decentralized water kiosk with on-site purification. In its most common form, kiosks are privately operated by entrepreneurs through a franchise model. One prominent example is WaterHealth International, active in India, Ghana, and Nigeria. Their decentralized water treatment kiosks are set up as a public-private partnership between the central WaterHealth firm and a local government or user group. In East Africa, the most prominent example is Jibu, which franchises small kiosks that treat and bottle drinking water on site using company-owned water purification machines. Part of their marketing strategy is to allow customers to see the water purification machine in action within the kiosk, to emphasize the service that is being sold (TF1). Most sites use an ultrafiltration device that is powered by solar energy. However, Jibu has been most successful in urban or peri-urban settings where water users are willing and able to purchase bottled water for their home use. The viability of this model in rural regions of East Africa is believed to be limited (TF1).

Water can also be treated or purified in community-scaled water systems. For example, AguaClara, a for profit company that developed out of a research lab at Cornell University, sells two different types of water treatment systems that remove contaminants and sterilize the water. Water Mission, active in East Africa, uses a patented treatment system called Living Water, that combines filtration and chlorination to purify up to 10,000 gallons of water per day. In the piped water scheme in one of our Uganda field sites, the water is pumped into tanks and then treated with chlorine before being piped into homes and community standpipes (UGL7). However, just like with household chlorine treatment, taste remains a problem. One county official explained: "people who grew up drinking well water, they think water treated with chlorine…there is way they don't like it" (UGL7).

> "Much of the NGO and government sector has been hyper-focused on expanding access to water in rural areas and less focused on water quality and safety. Let's be honest, in the past 20 years all the NGOs were basically already very happy that they were able to provide water, right? And the water has a reasonable quality. But okay, we are not very sure what is happening in the elevated tank. So, the water is not drinking water necessarily" (KF2).

As water treatment expands, one issue will be to address its cost. One NGO that acts as a private operator for rural water systems throughout Africa explained that it is important to help people understand the value of improved water quality. One aspect is to emphasize that money will be saved within the household on medicines that would otherwise need to be purchased to treat diarrhea. He recounted:

> "we had one community that when you drove into the community, there was a little health clinic on the right side. And after a year it was gone. And so, the reason that it was gone is the incidence of diarrhea dropped to the point that they were no longer able to stay there" (TNI6).

Another way to frame the increased costs for treated water is that households will only need to purchase a small amount to be used for drinking and can purchase lower quality water for other household needs (Foster, 2012). One electronic tap firm active in East Africa discussed the idea of having two water options, one treated and the other untreated. The respondent from the firm mentioned that NGOs who work on water quality often provide the means to treat 100% of the water, but that this is wasteful because water for bathing or washing does not need to be treated (KF2). Instead, he proposed a two-tier system in which a small proportion of water is treated using UV light and filtration and then sold at a five-to-ten-fold higher price. However, such a two-tiered system would need to consider the implications of having two sources of water available at different qualities and prices, where the incentive would be to use the cheaper source to meet all needs at the expense of drinking safe water.

<u>Collective Payment</u>

Collective payment as a practice refers to the manner of assessing charges and holding users accountable for payment that pools across individual users. In its purest form, collective payment schemes require that all users or members of a community or user group pay for communal use, or everyone loses access to the service. The logic of the practice is meant to harness communal forms of social pressure and sanctioning to increase tariff recovery.

One example of collective payment in this form comes not from the water sector, but from a small-scale solar energy and solar lighting firm operating in rural Liberia. The firm, LibSolar, refers to their collective payment system as a "community business model" that "harness[es] the most valuable resource in rural areas – tight-knit communities" in order to "maximize repayments through social pressure" (LibSolar, 2020). After a year of operations, LibSolar is providing electricity to approximately 3500 households and reports to be growing, suggesting that their model may be successful in that context. Attributes of the LibSolar model that make it a possible example for crossover into the water sector are the provision of a community-scale service (solar power is provided as a product for the whole community, similar to the way that a water service is provided to rural communities as a whole rather than individuals), the focus on communities rather than individuals allows for economies of scale to the provider, and communities are required to appoint a person to be responsible for payment collection and basic customer service (similar to requirements for communities to provide some sort of oversight or management responsibility in a contracted service provider model).

In the rural water sector, community-managed small water schemes have long relied on collective payment, particularly in relation to repairs. In particular, in many communities, regular access to water is free or very low cost, but when a major repair is needed, all community members are expected to contribute towards the repair (KNL2). However, in at least one case where the private sector adopted this approach formally – Vergnet Hydro's Warranty Schemes in West Africa – communal payment did not work and the scheme ultimately failed (Kleemeier, 2010a; Foster, 2012).

Social Costing

Another payment-related practice is social costing, which provides some water for free or at a subsidized rate. There are two main forms of social costing.

The first form assigns different prices to different types of water users. For example, many communities identify users within the communities who are less able to pay for water for their basic needs and give them free or low-cost access. One example comes from [UF1]'s operation in Uganda:

> "We also had requests, especially from non-government organizations who have identified […] more vulnerable people that they think need to be given lower tariffs as compared to the standard tariffs set for others. How we normally do it with the Susteq product is still we have the option of multiple taps. So, you can program the taps at different tariffs" (UF1).

There are some cases where households that have shown a lack of resources receive water for free (TLU1). For example, in one community in Uganda, we were told that some families, who are known to have limited income, are able to access water at a reduced rate from public standpipes – a practice that is not allowed with domestic connections of the same system (UL7). Similarly, lower rates are sometimes given to organizations that provide public services, such as clinics or schools (TLU6). On the flip side, particular firms that are deemed less necessary, such as car washes, can be charged a higher rate than normal users or even outright prohibited from using the water scheme directly:

> "We don't allow people to use project water for car washing or irrigations. And we are having laws governing the use of this water" (TLU1; TLU2).

A second form of social costing provides progressive or volumized pricing for everyone. Under this type of social costing, all users get some allotment of water for free or very cheap (often referred to as "lifeline tariffs"), typically set at the amount required for basic household needs (Trémolet and Binder, 2009; Oxfam, 2018). Rates then go up for any water use beyond the specified amount, with costs set at the rate needed for commercial viability.

Training and Capacity Building

Trainings for capacity building, which were a common practice under community-based management models, have continued in systems with private operators or other types of engagement of the private sector. The success of private sector engagement in rural water provision often depends on the capacity of local private contractors, such as mechanics and technicians, or community oversight and engagement. As a result, local capacity building of entrepreneurs, skilled professionals, and regular community members may improve the returns to private sector engagement. Training and capacity building can also focus on the private water service providers themselves.

Many training programs focus on instilling or improving technical skills. For example, a key component of the Mama Maji business model in Kenya is technical training for women entrepreneurs. In particular, all franchisees are taught how to build a proprietary water storage system, using locally produced building materials, to be built in each community where they run their water business. Similarly, several subscription maintenance companies operating in East Africa provide technical training to the well mechanics who are contracted to provide regular maintenance, and upon which the business model relies. Some impose strict criteria for continued contracting, ultimately reducing the number of active mechanics, but increasing the quality of the working mechanics and improving the income and livelihoods of those who maintain the highest technical standards (UNI1). Other initiatives focused on improving technical skills are the Ugandan Ministry of Water and Environment's Water Service Institute, which focuses on training government staff and others in the water sector, and the Adventure Project, which trains mechanics in Haiti, India, Uganda, Tanzania and Malawi.

Trainings are also used to strengthen skills around financial management. This is especially important when a community actor or group is responsible for collecting and managing tariffs that are used to employ private operators or technicians. The opportunity to employ private actors then depends on proper management of funds. One example of financial management training is the Water Resource User Association training on governance and integrity by the Water Resources Authority in Kenya. An even more expansive training is the Integrity Management Toolkit (IMT) that was developed by the Water Integrity Network with support from Caritas. The IMT takes an inductive, participatory approach to both identifying major problems with a current water system and brainstorming potential solutions. The program is implemented over the course of nine months in Kenyan communities, and engages community groups, water users, and local government. Similarly, CESPAD in Kenya has trainings to help communities produce a water management plan. All of these financial management trainings

increase the potential for rural communities to have the financial capacity to employ small-scale private contractors, and to demonstrate the financial viability of a system to potential entrepreneurs who could be contracted to take over operations and management. A major component of USAID's Kenya Integrated Water, Sanitation, and Hygiene (KIWASH) project is the professionalization of water service providers, especially utilities and small water enterprises, that will allow them to improve their financial management and more easily access commercial financing (KIWASH, 2018).

Finally, trainings can help build capacity for communities to attract the private sector to meet their water supply needs. Such trainings may aim to make communities more amenable to private sector engagement by explaining the costs associated with dependable and safe water to users who pay for water. Amref, for example, walks communities through a "break-even analysis," which can help those paying for water understand why water is priced the way that it is in a particular community. We heard from many interview respondents that the key is to stress to water users that the water itself is free, but they are paying for the service of having water delivered to them or made safer. Beyond trainings aimed at generating a willingness to pay, trainings may also focus on what the relationship between a private operator and the community should be. For example, the Water Integrity Network, in collaboration with WASREB in Kenya, created easy to understand schematics of six management models between local communities, government, and private actors. The guide helps communities understand which management model requirements are most similar to their context, and thus most likely to succeed sustainably.

Audits

Audits refer to the practice of systematically reviewing and assessing an organization's structure, performance, financial accounts, or other records. Audits can be conducted internally or by an external or otherwise independent actor. In the latter case, audits are a form of regulatory control and oversight. In order to effectively constrain malfeasance, audits must be undertaken by a qualified auditor, repeated with regularity, and linked with consequences for poor outcomes (Hirn, 2013).

External, high quality auditing of small-scale water systems is not yet widespread in rural parts of East Africa. Hirn (2013) notes that audits of small-town schemes run by private operators in Uganda are rarely audited, audits are partial and low quality, and there are rarely consequences related to problems uncovered during audits. Similarly, Nkongo (2009) documents the scarcity of both internal and external audits mangers of rural water supply schemes across Tanzania.

Innovations to improve the auditing of rural water schemes have been put forward by both governments and NGOs. For example, the National Water Supply Directorate of Mali created a unit (STeFi) that was charged with conducting two annual audits of all small-scale water schemes in the country. This unit was privatized in 1998 through a contract with private firms to carry out the auditing and other support and was meant to be financed by fees from the individual service providers (Kleemeier, 2010b). The World Health Organization (WHO) has outlined a comprehensive process for conducting operations and management audits, which help identify problems with an organization's functions, objectives, structure, and practices (Harvey and Reed, 2007).

Another example comes from the Water Integrity Network's Integrity Management Toolkit (Water Integrity Network, 2019). The toolkit includes a module on training community members to conduct audits of water schemes in their communities. The IMT includes a detailed, step-by-step guide for how communities can plan and implement a community audit, including lists of documentation to request from key stakeholders and protocols for sharing information from the audit with the larger community of users (Water Integrity Network, 2019).

System-Wide Assessment Tools

System-wide assessment tools are practices that allow a stakeholder to track the performance of water systems as a whole, both across projects and over time. Such tools recognize that myriad actors are involved in any given water system, the interconnected nature of those actors and the contextual factors that determine success of failure. System-wide assessment tools typically take the form of checklists or groups of indicators. These tools allow for an assessment of the strengths and weakness of a particular system, provide information for planning and decision-making, and allow for a benchmark against which to track progress over time.

One nice example of a system-wide assessment tool is the IRC Building Block Assessment Tool (Huston and Moriarty, 2018). The tool lays out nine distinct building blocks, including policy and legislation, planning, institutions, finance, infrastructure, regulation and accountability, monitoring, water resources management, and learning and adaptation. Within each building block, there are three to five statements about the water system that are scored by an assessor on a scale from one to five. For example, one statement under the monitoring building block is "Service provider performance data are available" and one statement under the learning and adaptation building block is "Institutionalized learning platform (e.g., district stakeholder platform, thematic working group, resource center, coordination platform) exists at district level." Scores are averaged across statements within each block, and the resulting score is mapped onto qualitative interpretations ranging from "very weak" to "very strong." Hailegiorgis *et al.* (2018) use this IRC system-wide assessment tool to understand the quality of existing water systems in two rural districts in Ethiopia. The use of this tool helped to highlight areas of weakness and design interventions to address them while building on existing strengths in the systems.

Other examples include the Sustainable Services Initiative, which has 40 indicators with a color-coded dashboard of summary scores (Tillett *et al.*, 2020), and WaterAid's Sector Strengthening Programme Design Toolkit, which is a series of nine activities designed to identify areas in need of strengthening with respect to sustainability (Casey *et al.*, 2018).

Subscription Maintenance

Subscription maintenance is a practice through which individuals or groups of users pay a fixed fee at regular intervals in exchange for maintenance and repair of water systems. The popularity of subscription maintenance schemes has grown rapidly in the last several years in order to overcome problems of low functionality of rural water points and systems. The logic of subscription maintenance is similar to insurance, in which risk is pooled across many systems (SDSN, 2018). The fact that some communities will pay the fees but not need major repairs

means that other communities can have repairs done that are more expensive than the fees that they have paid into the system. In other words, this model is sustainable, at least in theory, through its economies of scale and risk pooling (REACH, 2016; Lockwood, 2019).

This type of scheme creates strong incentives for the insurer to conduct preventative maintenance and avoid costly repairs. As a result, subscription maintenance is almost always focused very heavily on preventative maintenance, which includes regular inspection and servicing to make repairs before they cause loss of functionality, as opposed to corrective maintenance, which only engages in repairs once there is a breakdown (Lockwood, 2019). Most schemes include some form of remote monitoring, either through paid local staff or with electronic sensors (remote monitoring is discussed at greater length below).

Most of these firms engage independently contracted mechanics to carry out the regular maintenance and repairs. As a result, subscription maintenance firms create and support job creation for local mechanics and technicians. However, they also tend to contract these mechanics based on water point functionality rather than on a per-repair basis. This practice ensures that incentives are aligned for investment in prevention. Absent this payment structure, mechanics have adverse incentives with respect to maintenance: they will purchase the cheapest parts possible and may forgo less costly repairs because they will benefit from larger repairs down the line. As one subscription-based maintenance firm employee told us,

> "Like if you have a funeral service, you need people to die for you to have a business. In this case, [borehole mechanics] need boreholes to break down to be able to keep up and what they would normally do? Let's say there's a spectrum of dishonesty and honesty, right? But if you're somewhere in the middle, what you will do is replace the pump, the one thing that failed, even if you think that there are other things that are ticking time bombs, put it back together, so that you get another call in another three months and you eat again" (UNI1).

Examples of subscription maintenance schemes abound in Africa. One example of a subscription maintenance scheme comes from one of our field sites in Kenya, where a prominent civil society organization provides maintenance by subscription. Other prominent examples include Whave, FundiFix, EverFlow, and Water for Good. Whave and FundiFix were both supported through a USAID-funded learning consortium called the "Sustainable WASH Systems Learning Partnership" (SWS).

Whave is a Uganda-registered firm that serves as a regional service provider in several districts. Whave signs "preventative maintenance and continuous rehabilitation" (PMCRA) agreements with communities, and tasks community leaders with charging fees to users to pay an annual subscription to Whave (Lockwood, 2019). One of Whave's key innovations is to utilize performance-based payment to mechanics – a form of contingent funding, discussed above – that pays for the number of days that a system is functioning rather than paying for specific repairs. This incentivizes individually contracted mechanics to maintain systems as efficiently as possible and to perform lower cost repairs in order to prevent higher cost future repairs.

FundiFix, which operates in several rural districts in Kenya, has a similar subscription maintenance model that contracts with communities or user groups on an annual basis and

employs local technicians to carry out guaranteed maintenance (Katuva *et al*., 2016; REACH, 2016; Lockwood, 2019).

Similarly, International Lifeline Fund's EverFlow subscription maintenance firm, another company in Uganda, provides guaranteed service and functionality in exchange for a subscription by communities. The EverFlow contracts include preventative and routine maintenance, remote monitoring of functionality, and emergency corrective maintenance using a hotline.

Water for Good, which operates in the Central African Republic, uses a "circuit rider model" in which technicians travel on pre-determined routes throughout the service area providing routine preventative and corrective maintenance (Lockwood, 2019). While Water for Good originally used a monthly subscription fee like other subscription maintenance firms, they now use a per-visit fee, regardless of whether and which repairs are made (Lockwood, 2019).

One of the biggest challenges of a subscription maintenance practice is financial viability. In most cases, there is a need for extensive initial capital investment. This is because firms are usually only able to induce communities to enter an agreement after they have experienced a breakdown. The firm then has to fund the initial repair as a form of buy-in after which the community or water system manager will enter into a preventative maintenance contract for all repairs going forward (Olaerts *et al.*, 2019).

However, comparative research on these systems suggests that even once there are large number or communities subscribed and systems are in good working order, user fees (tariffs) are insufficient to cover the full operating costs of the subscription maintenance, much less turn a profit (REACH, 2016; McNicholl *et al*., 2019). One study estimates that only 35% of costs are covered, on average (McNicholl *et al*., 2019), while another suggests one operator would require a 340-423% increase in service fee to get to full cost recovery (SWS, 2019). As a result, ongoing subsidization is likely to be required.

This is likely to explain why "social enterprise" firms such as Whave and Fundifix have been able to survive thus far (Lockwood, 2019), while others have not. In particular, subscription maintenance schemes founded by local NGOs or entrepreneurs – such as the Rural Water Services membership scheme in Kisii, Kenya, the Pump for Life subscription maintenance program in Morogoro, Tanzania, or the South Western Umbrella for Water and Sanitation's subscription model – have tended to fail. Given severe constraints on the ability to pay higher tariffs, closing this financing gap will need to be driven by shifts in the cost of maintenance (Lockwood, 2019; McNicholl *et al*., 2019).

Technical Associations

Technical associations can be formed around any kind of occupation related to water services but have most often been used for private operators engaged in maintenance of water points, especially boreholes. The formation of technical associations is aimed at helping both the private operators themselves and the clients that they serve. In terms of benefits to members, technical associations can offer trainings and certifications, and help connect members to potential clients.

From the perspective of clients – firms, water user groups, communities, or government – an association can help with the identification of qualified technicians and with formalizing the process of contracting work.

One example of a technical association is the Handpump Mechanics Associations formed throughout Uganda with government support beginning in the 1980s. These associations are typically organized by district with a limited membership by sub-district. The handpump mechanics pay an annual membership fee to the association and in return, the association may provide supervision, office space, stationary, tools, bicycles or other transport, and regular trainings (Koestler, 2008). The association may be contracted by local government to undertake preventative or reactive maintenance, or they may be engaged directly by a community water association. One challenge with this model is that there must be a sufficient number of handpumps – or other relevant form of water point – to sustain the private mechanics. The engagement of Handpump Mechanics Associations by many of the subscription maintenance firms within Uganda, such as, Whave and EverFlow, has increased demand for maintenance services and improved the ability of mechanics to earn a livelihood (UNI1).

Another example of a technical association, also from Uganda, is the Association of Private Water Operators (APWO). Unlike most technical associations, this one is for private operators of water systems, rather than the technicians that service them. The APWO lobbies with the government on behalf of private water operators and supports its members through ongoing trainings and information sharing forums (Hirn, 2013).

Community Meetings

Community meetings with service providers are a very commonly employed practice that connects the users of a water system to service providers and relevant government officials. Such meetings allow service providers and government officials to share information with users, as well as allowing users to provide feedback to or ask questions of their service provider.

One example of such community meetings is Water Clinics that are held in Nakuru, Kenya. At these Water Clinics, the CEO of Nakuru Water and Sanitation Services Company (NAWASSCO) and other relevant actors listen to the concerns and questions from water users (KNL2). Another example is water-focused "barazas" in Uganda. Barazas are a general format introduced by the Ugandan government in 2009 to increase community oversight and input of service delivery projects and to create a venue for information sharing (Van Campenhout *et al.*, 2018).

One subscription maintenance firm in Uganda explained that they hold a stakeholder meeting with the community after each year of service. At this meeting,

> "we're showing them statistics…on top we put uptime, because that's what we all set out to do. We all set out to make worrying about breakdowns a problem of the past, right? Then we tell them how we performed against our promises…we promise to do your maintenance regularly and we promise to be there in 24 hours when you call for a problem. So, we put percentage on time maintenance and percentage on time emergency response" (UNI).

These community meetings are meant to be a two-way exchange of information, so information is also shared on the percentage of on-time payments and any delinquent bills.

Publication of Performance Information

Publication of performance information refers to the practice of providing publicly available information about the performance of service providers. The content of performance information can refer to the quantity of service provision, the quality-of-service provision, resource management, financial management, and other dimensions of performance. The provision of such information can also take many forms, but the core commonality is that stakeholders such as the general public, users, and/or oversight bodies have access to clear and accurate information about the performance of service providers.

A prominent example is the annual publication of impact reports in Kenya by the national Water Services Regulatory Board (WASREB). These reports, which are publicly available through WASREB's website, include a rating and relative ranking of all public water utilities within the country. More local and lower technology versions of the same principle of information sharing include the posting of technical or financial performance of a water service provider within a community or sharing such information verbally during community gatherings.

The publication of performance information typically requires established metrics for measuring performance. These can be provided by system-wide assessment tools, discussed above, or more focused sets of indicators. For example, the Good Governance Working Group in Uganda, which was a multi-stakeholder working group within the Ministry of Water and Environment, created a set of 16 common indicators to track the performance of water systems (UNI2). Similar efforts to determine objective measures of performance, whether at the national or local level, are an important precondition for the usefulness and quality of any information shared.

Technologies

Retrospective Monitoring

Technological advancements and the falling prices of such technology allow rural communities and local governments to better monitor the performance of private contractors. For example, a Ugandan government official recounted a common problem with private actors cheating local governments and communities:

> "What happens is that the private sector is taking advantage of the ignorance of the technical people at districts, and also the politicians. And in most cases, they collude with the technical people. So, for instance, when they are procuring, they say we are going to dig the borehole of eighty meters. And because payments are paid per meter, they'll go and dig a borehole of thirty meters. And then in the report, they say the borehole was 80 meters" (UGN1).

However, a technological breakthrough in form of a borehole camera has allowed rural authorities to retrospectively evaluate the quality of work completed by private borehole drillers. The borehole camera is small and can be fed down into a borehole to report both the depth of the hole and presence of water.

Remote Monitoring

Remote monitoring refers to a process through which the functionality, use, and quality of a water point or water system can be observed or assessed without being in physical proximity to it. Remote monitoring allows operators to track use over time, monitor water quality, respond to breakdowns more quickly, or to even predict faults before they occur by comparing performance data over time (UNI1).

One low-tech solution is to have individuals who are near the water point or system take a set of measurements and relay them back to a central operator or technical team. For example, we heard from one subscription maintenance firm about their low-tech method:

> "We pay the caretaker for data every month. Okay, so... the caretaker every morning counts the empty stroke. So they open the padlock and they count how many strokes it takes to get first water. That measurement is really good because even if there's the tiniest leak, this is like a tsunami alert" (UNI1).

The data is recorded on a "borehole inspection form" that is easy enough to use that many different actors are capable of conducting the tests and reporting the results.

Similarly, Whave, another subscription maintenance firm operating in Uganda, uses phone calls to local users or leaders to monitor functionality (Lockwood, 2019) and Skyfox, a spare parts provider in West Africa that uses an electronic ordering platform, uses community-based monitoring systems to detect poor functionality.

mWater has developed an electronic platform that allows human monitors or water users to transmit performance information or service requests more efficiently using electronic forms. Water quality testing can also be carried out in person, with results entered into electronic or paper forms by the technician conducting the testing. To go with its electronic reporting platform, mWater has also developed a portable in-field test kit including two microbiological tests and simple chemical parameter tests (e.g., nitrate, chlorine). The Water Quality Reporter is an open-source example of a testing and reporting program. It allows users and technicians to submit information about water quality (such as chlorine residual testing or a presence–absence microbiological test, which can be measured using simple field test kits) using the simply and widely available technology of Short Message Service (SMS) (Thomas *et al*., 2018).

Another example is M-Maji, a simple mobile phone application that allows water users to submit reports on water point functionality, water quality, and current prices. Water quality data can be obtained through both regular testing and spot checks of water points (presumably using in-field test kits). Additionally, users have the option to file a complaint, which may provide information on a source's changing water quality (Thomas *et al.*, 2018).

Akvo Flow is a smartphone-based, cloud-hosted application designed as a field surveying tool for collecting, evaluating, and displaying geographically referenced data via an online dashboard. Data regarding water point functionality and/or water quality data (see Akvo Caddisfly, below) can be input to the application regardless of internet connection, and then uploaded to the dashboard when connectivity is available. The open source software Open Data Kit can also be used for collecting information about water point operations.

Remote monitoring of functionality is increasingly done without human monitors using *in situ* sensors. For example, Charity Water developed a water point-mounted sensor to monitor functionality from afar. According to their website, "[the] handpump sensor lasts 10 years without a battery change, installs in 10 minutes, is fully tamper-proof and vandal resistant, and uses the Amazon Web Services cloud computing platform to analyze readings in real time" (Charity Water, 2020). The advantages of such a system are to improve the accuracy of key performance indicators, remove human error and misreporting, speed up data transfer, and allow for more frequent or continuous monitoring (Thomson *et al.*, 2012).

Most remote monitoring technologies utilize cellular networks to transmit data and are thus limited to areas with network coverage (SDSN, 2018). Water Mission's TradeWater private operator model in Malawi and Uganda uses the Grundfos LIFELINK system, which has integrated monitoring over mobile network (Armstrong *et al.*, 2013). FundiFix in Kenya has developed and employed the Water-Point Data Transmitter (WDT), which uses simple, durable, and inexpensive components to record the number of pump strokes at a handpump and estimate the flow rate of water dispensed (SDSN, 2018). However, the data is transmitted over mobile network, which has resulted in significant losses of data due to network outages (SDSN, 2018).

For this reason, another remote monitoring company, SweetSense, has developed sensors that can transmit data using satellite instead of mobile networks, allowing expansion into parts of rural Africa that are poorly covered by existing cellular networks. These sensors have been successfully used as part of USAID's Kenya Resilient Arid Lands Partnership for Integrated Development (RAPID).

Technological innovations in remote monitoring of functionality are now pushing beyond simple data collection. FundiFix, in collaboration with UNICEF and the University of Oxford, is developing machine learning applications that allow a "smart handpump" to monitor itself and alert the operator prior to a breakdown occurring (REACH, 2016). Similarly, International Lifeline Fund's EverFlow subscription maintenance firm in Uganda is partnering with Stanford University to develop not just preventative maintenance based on remote monitoring, but predictive indicators to determine which water points are at risk of failure. Based on over a year of data collection by SweetSense sensors in Western Kenya, Wilson *et al.* (2017) report that machine learning-based forecasting based on the sensor data increases uptime functionality from 70% to over 99% and reduces overall maintenance costs for handpumps.

In situ sensors have also been developed to assess water quality. For example, chemical sensors can be used to detect excess fluoride and arsenic (Thomas *et al.*, 2018). The Akvo Caddisfly system builds on the Akvo Flow platform and provides an easy to use and objective measure of both fluoride and saline contamination. Thomas *et al*. (2018) also explain that while microbial sensors that detect fecal contamination are possible in theory, they are not employed in practice because the state of the technology does not allow for long term in situ use of such sensors. However, the UNICEF Rapid Water Quality Testing challenge is focused on spurring the development of microbial sensors that can be widely and easily adopted (UNICEF, 2019).

Electronic Taps and Smart Meters

Electronic taps and smart meters allow a water system operator to measure individual water use by electronically. Smart meters allow an operator to measure water usage from afar and on demand, eliminating the need for human meter readers to visit homes and other water points. However, metered household water points are still quite rare in rural East Africa. As a result, this technology is more commonly used in electronic taps on communal water points, sometimes referred to as water ATMs. These electronic taps are often paired with prepayment systems, whereby water users buy and load credit onto an electronic card or token, which can then be used to purchase water by volume.

Electronic taps are a major growth area in rural water services across Africa, and there are many examples of such systems. eWaterPay, active in Tanzania and The Gambia, uses a near field community (NFC) enabled token, called an eWatercredit tag, that is loaded with credit. The tag is then placed on the reader of a communal electronic tap to dispense water, with credit deducted from the tag based on the number of liters taken.

Similarly, the Grundfos LIFELINK system, used by Water Mission and others, has users prepay for water either digitally or through a water vendor, and credit is loaded onto a "water key" (Armstrong *et al.*, 2013). Data on prepaid tariffs and volumes distributed are transmitted electronically via GSM networks to a centralized database. Grundfos deducts a monthly service contract fee from generated revenue in exchange for maintenance of the unit over time (Armstrong *et al.*, 2013).

Maji Milele is another company active in East Africa that is producing smart meters to be used with prepaid access. In Kenya, Maji Milele offers mobile payment for water credit on communal water taps. Also in Kenya, the Wajir Water and Sewage Company – a rural public utility – has installed water ATMs built by the Dutch company Susteq, in collaboration with Oxfam.

Potential drawbacks to the use of these systems are the upfront capital investment needed, electricity and mobile network connectivity limitations, and ease of use and understanding for water users. However, there are numerous benefits of using prepaid electronic meters on communal water points. First, smart metering significantly reduces non-revenue water, a chronic problem in rural water services. For example, eWaterPay led to an 223% increase in revenue collected in two communities over 6 months (eWaterPay, 2017) and the Wajir Water and Sewage Company increased revenue by 400 percent in one community (Goodrich, 2017). Second, electronic taps allow an operator, community leaders, or government to access relevant information about water usage patterns (e.g., time of day or seasonal) that can help with financial forecasting and targeting new investments. While such information could be collected using traditional meters or human-gathered statistics (e.g., number of buckets sold per day), electronic meters drastically reduce the cost of collecting such data and increase its accuracy (Thomas *et al.*, 2018). Third, electronic taps paired with prepaid credits make social costing or volumized pricing, as well as targeted rationing (when necessary), much easier to implement (KF1). Fourth, because taps with a human operator are only open for certain hours, while electronic taps can be operational 24 hours a day, electronic taps drastically reduce the wait time and increase the

convenience of accessing water (eWaterPay, 2017). One focus group discussant in a community with electronic, prepaid meters explained:

> "people can now access water at the time they want, because when you are having a credit, there is no way you can wait in line. People know that any time you want water, you just go and get it and then you can go to other activities. So basically, we've passed that stage of going to wait in lines for hours, waiting for your turn to get water" (FGD TL4).

Electronic Payment

Electronic payment allows water users to pay for the water they collect using mobile money or other electronic funds transfers. The most common way in which users pay for water electronically is through prepaid electronic taps and meters, as discussed above. However, individually metered water points – to the extent that they exist in rural water services – also allow for electronic payment, as could communal tariff collection processes. Electronic payment requires that there is a relatively cheap and easy to use method of paying a bill or user fee. In the East African context, mobile money is both widespread and commonly used, especially in Kenya with the mPesa system from Safaricom.

Electronic payment makes it much easier for service providers to have accurate and up to date information about revenue raised and outstanding bills. For example, Ugandan umbrellas are able to monitor electronic payments for domestic connections remotely and communicate rates of payment to their local staff (FGD UL7).

Information Dashboards

Dashboards summarize and display relevant information about a water system electronically, including both technical and financial types of information. Like electronic payment, such dashboards are most commonly utilized in conjunction with other technologies, such as electronic taps or remote monitoring technology. For example, eWater developed a platform called eWatercare that reports on total volume dispensed and tariffs paid at each electronic tap, as well as credits purchased and redeemed by each user (eWaterPay, 2017). Because the dashboard can see when water volume drops suddenly, signaling a breakdown, the electronic taps and the eWatercare dashboard work together as a form of remote monitoring. Maji Milele, who distributes Susteq electronic taps, also utilizes their dashboard and alerts system, which provides real time distribution and sales information, as well as alerts about potential malfunction.

While most dashboards are based on electronic data provided by electronic water meters or remote sensors, the tool is not inherently tied to such data. For example, the mWater platform provides a dashboard to summarize data, even if that data is entered manually based on human observations. The mWater portal allows relevant stakeholders to visualize the volume of water use over time or geographic area, information on tariffs collected, and water point functionality and water quality. Another example comes from the Portable Water Quality Field Kit, which includes a mobile phone and charging capabilities, in addition to standard materials for chemical testing, to allow for the quick transmission of water quality results (Thomas *et al*., 2018).

While dashboards promise stakeholders access to pertinent and timely information, the complexity and proprietary nature of many of these platforms may limit their use. In terms of complexity, utilizing the information presented within a dashboard requires an understanding of how to interpret graphs and summary statistics. The dashboards are often considered to be difficult to understand; there is a need for training in how to read and use the information. Additionally, there must also be a demand for the information. The director of an electronic prepaid tap firm told us that, in their experience, there is often reluctance by those with oversight responsibilities to use the dashboard (KF2). He attributed this lack of use to a "cultural" lack of interest, but lack of use typically reflects that the information provided is not clear enough or irrelevant to the decisions of the potential user.

The utility of dashboards may also be limited by the fact that most platforms are proprietary and controlled by individuals and firms removed from the local context. In the T2 field site, for example, district water engineers complained about changes that had been made to the dashboard associated with the company's electronic taps. In particular, relevant information that had previously been provided was no longer visible to the water engineers. The engineer told us,

> "You know, currently the system... I mean, I cannot access the system until I communicate to them. So, they are the ones who have to tell me, for this month we have collected a certain amount, something which is not good. I want to handle my system myself" (TGL1).

<u>Electronic Communication Platforms</u>

Mobile phone technology and internet connectivity have provided new means for water service providers to communicate with their customers. In theory, digital communication platforms can reduce the cost and inconvenience of communication between service providers and users. In terms of cost, a private operator in Uganda noted how expensive community meetings are:

> "the only feedback loop right now we have is quite expensive, because it's holding a stakeholder meeting with the community" (UNI1).

As a result, they are in the process of developing an electronic platform that can allow users to submit questions or feedback to the operator, but also to access the kind of information they would otherwise receive at a community meeting, such as performance indicators and new initiatives.

Existing examples range from the adoption of existing platforms to the development of purpose-built applications and platforms. In terms of repurposing existing platforms, it is quite common for water service providers to create WhatsApp groups with their water users. For example, the local water system manager in a community in Uganda explained that they had set up two WhatsApp groups, one for those working for the umbrella locally and one for water users. Through the latter channel, they give information to the community about outages, rate changes, and other relevant information (FGD UL7). In the same community, local umbrella employees told us that the regional umbrella also uses WhatsApp to communicate with their various branches about the proportion of billed water that has been paid (electronically) in that community:

> "Every collection daily their people to monitor how are we collecting. Which percentage? They always send for us the percentage of the collection. You are twenty percent, you are

> in eighty percent, you people you have not reached your one hundred percent" (FGD UL7).

Purpose built communication platforms are often closely tied to the digital information dashboards discussed above. For example, the mWater suite of software includes applications that allow for the transmission of information between water users and service providers. WASREB in Kenya developed the Maji Voice platform that allows for communication between water users and water service providers using SMS or a website (Thomas *et al*., 2018). It allows users to submit complaints or requests to their water service provider, and allows that service provider to respond to customers, distribute relevant information to users, and track service satisfaction over time and space. Other possibilities for communication platforms include star-rating feedback systems for mechanics and technicians (UNI1) and SMS blasts of technical or financial information from the service provider.

The employment of electronic communication platforms assumes that there is demand for such communication. In terms of reporting problems, one service provider noted that water users are more motivated to report problems such as water breaks or poor functionality when they are paying for a service (UNI1). As a result, we should expect to see increased demand for convenient and low cost means of communication as payment for water services increases in East Africa.

6. Defining Governance in Rural Water Provision

Analyzing governance requires careful attention to what it entails in each setting, considering many dimensions at once instead of simplified metrics. We consider water governance as the set of systems involved in decision-making about water management and water service delivery, with a focus on the implementation *process* of systems. This is in line with UNDP's definition, adopted by USAID, which states that governance is "the exercise of economic, political and administrative authority to manage a country's affairs at all levels". It also outlines governance as the "process and capacity to formulate, implement, and enforce public policies and deliver services" (USAID, 2013).

Regarding governance as a process through which several institutions and actors operate in more or less defined roles and expectations, rather than an analysis of direct outcomes, is in line with most recent research on resources administration, including water services. Evaluating recent contributions in the literature, Lautze *et al*. (2011) propose a new definition of 'water governance' as a set of "processes and institutions by which decisions that affect water are made" (Lautze *et al*., 2011, p.7).

Their definition explicitly sets governance and management apart, as good governance is not necessarily going to lead to better management. Good management is oriented by the principles of achieving increased efficiency, effectiveness, and sustainability. Good governance is connected to how decisions are made concerning the water systems, focusing instead on participation, transparency, and accountability to the citizenry (Lautze *et al*., 2011). Therefore, positive changes in governance do not always lead to improved management; however, good governance is by itself a desirable goal, particularly for cases that require significant community engagement to properly function. Good governance is a necessary but insufficient requirement for good management – it would be hard if not impossible (as time has shown) to achieve sustainable services without good governance.

In this report, we also focus on processes of governance; instead of evaluating the management outcomes, we are concerned with understanding the governance systems in place within East Africa, how their processes function, the factors that are related to the variance in governance, and how some key aspects of governance are attained or not in the presence of other contextual factors. We divide our evaluation into four main goals for water systems, which are discussed as follows: transparency, accountability, trust, and equity. The rationale for choosing these factors rather than the more typical USAID framework of Participation, Inclusion, Transparency, and Accountability (PITA) is discussed in the Introduction.

Transparency

According to USAID's definition, transparency involves creating "an environment where governments and public officials engage in the clear disclosure of rules, plans, processes and actions in a form that is readily accessible to all" (USAID, 2013). This outlines the responsibility that governmental bodies and officials shall have toward the public to promote "accountability by providing the public with information about what the government is doing" (USAID, 2013), but also how other actors besides the government disclose their procedures. Especially given that

governance may be provided by private operators in some cases, including through subcontracting or concessions, efforts for transparency should also be expected from such third parties and the public when applicable.

The components of this definition are each important on their own; for example, existing transparency about rules and laws does not preclude the necessity for transparency regarding planning or implementing phases of a given project. Likewise, providing information in an accessible fashion to the public is how transparency is assured and its benefits, including but not limited to accountability improvement, are more likely realized. This project believes that "consistent availability of information to the public" pertaining to all aspects of projects and systems is required for "public scrutiny and stakeholder engagement". It is important to note that evaluations of transparency need to include the way in which information is simplified and disseminated to the public, for example by translation into different languages and ensuring the most appropriate dissemination methods/channels to ensure access by the target audience.

Advantages coming from increased transparency are demonstrated across the literature, with these efforts being presented as a crucial factor for success in water services provision. Evidence confirms this applies equally to governments and the private sector, as per OECD principles recommending transparency for several aspects of provision by private operators, with focus on financial and institutional transparency (OECD, 2007). On the other hand, issues with transparency have contributed to many problems identified in community managed water provision around Africa (Harvey and Reed, 2007).

Good outcomes in water provision and public evaluation are not sustainable without transparency, which is identified as a common factor of success in rural water provision according to a meta-analysis of 174 cases around the world, including 79 in Sub-Saharan Africa (Hutchings *et al*., 2015). Transparency is also important for payment with direct repercussions to community approval. Technological advancement has created an opportunity for increased monetary transparency with other benefits such as efficiency and security (Koehler *et al.*, 2015).

In this project, transparency is analyzed primarily through evaluating if citizens have reliable and accessible information about the financial status of their water system across all phases of implementation, as well as information on the related decision-making processes. Within the scope of transparency, concerns regarding citizens' participation are focused on when and if they receive information in a timely and understandable manner; specific concerns about their participation in the decision-making process are mostly discussed within the scope of equity. However, there may be some instances in which these two governance concepts overlap, as differential access to information by subgroups could lead to both inequity and a failure in transparency. One example is the possibility that in some cases women might have a lower level of access to information, decreasing transparency toward them and their role as stakeholders.

Accountability

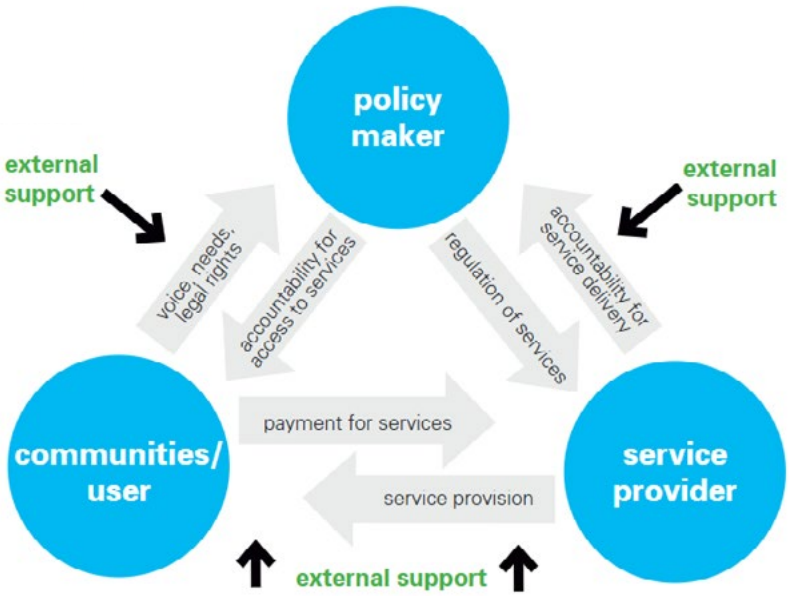
As a two-way street, accountability always requires a back-and-forth relationship between two or more actors, by which their actions can be not only expected but also meaningfully appraised. The definition from Schedler (1999) demonstrates this, as an actor who is considered

accountable to another is obliged to justify their actions and then face consequences in case the conduct is not deemed appropriate based on the previous expectations. As is the case with transparency, it should not be viewed as solely coming from governments to citizens, although this is likely the most crucial instance where accountability is necessary, but also from the public and third parties when engaged in a durable relationship with each other and/or the government.

In our framework, we carefully consider the definitions provided by USAID (2013) and UNDP (2015). From USAID, we emphasize that we consider accountability as "the systems, procedures and mechanisms" ensuring that "public officials and institutions perform their stated duties and uphold their responsibilities to the public, while imposing restraints on their power" (USAID, 2013). Here two main aspects of accountability that we focus on are mentioned: the ability to attribute responsibilities (that is, each actor knows what should be the conduct of other actors) and to sanction inappropriate behavior. Additionally, UNDP (2015) points out that accountability is deeply ingrained into democratic principles, given that governance legitimacy comes from the ability that actors have to set expectations and constraints based on binding commitments.

This is not limited to expectations toward the government, however, as mentioned above; Figure 5, based on UNDP's definition of accountability as a process – in line with our take on governance as a whole – seeks to describe such a framework, showing how governments (or, more broadly, policy makers), the citizenry (communities, users) and private operators have a network of expectations related to each other, through each an accountability net may be derived.

Figure 5: Conceptual model of accountability framework for WASH (from UNDP water Governance Facility/UNICEF, 2015, p. 17)



Additionally, UNDP (2015) highlights a few types of accountability that are relevant for water governance: social accountability, by which norms and informal institutions generate mechanisms to enhance accountability through social interactions and expectations; political accountability through democratizing decision-making processes and holding governments and representatives responsible; administrative accountability, through which users and providers

have standards to refer to and adhere by that can be enforced through already existing structures; financial accountability, devoted to resources management; and importantly accountability toward human rights, with the government role being clearly defined as an obligation to respect, protect and fulfill human rights. These also include concerns with gender inequality and the disproportionate burden that lack of access to water places on women, particularly in rural settings.

Due to its features, accountability contributes significantly to the success of any models in water services provision, as long as there is an emphasis on finding an appropriate fit instead of applying best practices in a one-size-fits-all fashion, according to the UNDP report on accountability for water governance (UNDP, 2015). As community participation through democratic means is necessary, implementation requires a framework adaptable to the local culture to thrive (Gaventa and Barrett, 2010).

There are two different ways for accountability to be exercised: horizontally, when state actors can make demands regarding provisions, with internal oversight and institutional features to foster the evaluation of services; and vertically, when non-state actors are able to pressure state actors to obtain better services (UNDP, 2015). Community participation is paramount to reach accountable governance on a myriad of aspects, including socially, politically, administratively, financially, and respecting human rights (UNDP, 2015; Gaventa and Barrett, 2010; World Bank, n.d.). The ability to communicate decisions through several media, including radio broadcasting, is instrumental to achieve that goal (Nabembezi *et al.*, n.d.).

Technological advancements for payment options help secure accountability on both ends, as users can check if they are being treated fairly by providers, while the technologies can prevent free-riding and other forms of bad behavior from the public at large (Koehler *et al.*, 2015; eWaterPay, 2017; BFA Global, n.d.). Technologies used to maintain the water systems are still not 100% reliable, increasing the need for channels to ensure repairs and other procedures happen in a timely fashion, holding responsible parties accountable whenever that is not the case (Klug *et al.*, 2017). In this way, transparency and accountability are interconnected. The transparency of the system, it's use, income, need for maintenance, etc., allows both users and the providers to keep each other accountable.

Trust

Within the USAID's guidelines, accountability is also seen as instrumental for ensuring the fulfillment of public trust toward governmental interventions and institutions. The overall role of trust is particularly important at the microlevel, as positive public reactions to a given project have been demonstrated as necessary for its success. Institutions that promote public trust, as is the case with establishing water supply trusts in communities around Tanzania, have an important effect on community participation in systems implemented by state actors and private operators alike (German Embassy, 2007).

This project operationalizes the concept of trust separating two dimensions. On one hand, trust comes from offering reliability, mainly regarding service provision and quality (i.e., consistent availability of safe water). On the other hand, public trust develops around the trustworthiness of

agents, in general assurance that they will act in the best interests of the community. Sometimes these two dimensions have significant overlap, as trustworthiness can be increased through reliability and vice-versa. However, dividing them allows a better understanding of how and when public trust is generated or not, as well as the mechanisms that lead to positive or negative outcomes.

Governance can impact and be impacted by public trust in several ways. For example, technological advancements may help increase consumer trust when applied to payment systems, making them trustworthy by charging consumers in a consistent manner (eWaterPay, 2017). Additionally, technology can help in every state of water systems' operation, decreasing the margin of human error. However, evidence suggests these benefits can only be realized if the public is reasonably informed about how technological tools are employed and function; without this educational effort, public trust can even be decreased by making the system opaquer to the community. Here, we can see the connection between transparency and trust. Users are more likely to trust a system when they have more information on the system itself.

Gender dynamics also play a role when trust is considered. Citizens may have certain perceptions about how different the genders behave as operators and board members, potentially impacting their assessment of how reliable or trustworthy the water systems are depending on who is involved and the power they hold. In particular, the participation of women in management boards has been seen as a factor for increasing trust, as women are commonly seen as more reliable in the collection of funds from consumers with a significantly lower risk of embezzlement (German Embassy, 2007). Women are also more likely to be seen as caring for the communities' interests by the communities' members themselves, increasing their baseline trustworthiness.

Equity

As with accountability and trust, the concept of equity needs to be further divided within our scope. Good governance should ensure equity among citizens in terms of providing them access to public goods, like water services – therefore, one aspect of this investigation is concerned with evaluating how well water systems do in their promise to leave no individuals or groups without safe sources of water. However, a second aspect is as important to ensure good governance: to provide equity within the decision-making process, as some groups might have their demands and needs ignored in the absence of institutional measures to allow and promote their influence and participation through all implementation phases of a given system.

Taking access to benefits first, some sources of inequality in access to water have been documented by considerable research. Geographic inequalities, for instance, are prominently featured in the literature, particularly in non-urban environments (Allen *et al.*, 2006; Notter *et al.*, 2012; Koehler *et al.*, 2015). There is also a concern for inequalities caused by disabilities, impairing individuals in their ability to fetch water for themselves; ethnicity, as some groups might be ignored by authorities, deliberately or not, because of their social status; and income-related inequalities, as some systems may charge prices that are too high for some, pushing these citizens to alternative water sources that are not safe.

All these forms of inequality have been shown as hindering progress in efficiency of development programs in general (World Bank, n.d.). In addition to these challenges, institutional and operational difficulties generate starker inequalities in the quality of provision, requiring an approach emphasizing populations mostly in need to obtain extensive coverage (Koehler *et al.*, 2015). Some options have been explored on the ground to address this issue, such as the micro-insurance systems described by Holbro and Young (n.d.) and the "water tenure" concept developed by Hodgson (2016). Finally, introducing tiers for prices based on socioeconomic situations, or a "lifeline" allotment guaranteed to all users, are listed as solutions for lack of access to the benefits motivated by income inequality (Oxfam, 2018).

The one-off nature of some projects contributes to generating inequality as well, according to a report by Oxfam (2018). The main reason comes from how these projects provide communities with infrastructure for a system, but do not build a follow-up environment or institutions to prevent capture by local leaders. So, in some situations the underlying motives for inequality, like favoritism or ethnic tensions, could overtake the project benefits.

Other dimensions to be considered include gender inequalities. On the side of benefits, some works showed how increased access to water sources have affected women positively, not only because women are overwhelmingly more likely to be responsible for water needs in households, but also through reductions in domestic violence (as demonstrated in focus groups in Tanzania). Gender inequalities are also present in decision-making. Some water systems in East Africa have addressed this by securing positions in community management for women.

Governance implications of private sector tools and approaches

Frameworks

<u>Umbrella Organizations</u>

Transparency: Each umbrella organization is organized differently. Some implemented the integration of community level representatives, having direct implications for transparency. The umbrella organization we studied in Tanzania was structured such that representatives from each community were included on the board. This allowed a direct linkage between water users and those with access to information about the performance of the umbrella (TL4). In contrast, umbrellas in Uganda tended to replace rather than integrate community-level water boards, reducing transparency with respect to community members. In one of our Uganda field sites, previous members of the no longer active community management board explained that they used to hold meetings to inform the community about what was happening with the water system. However, since the umbrella had taken over and they were no longer involved in the system, information spread was much more limited and there was an "information gap." Those who were able to access the WhatsApp group would try to share information with others, but

> "we just chat locally, if you don't meet me then you miss out on the information" (FGD UL7).

An employee in the same discussion noted that the local staff are supposed to call general community meetings to share information, but they had not done so recently due to lack of funding (FGD UL7).

Accountability: The accountability implications of umbrellas will depend on the degree of top-down pressure. If a regulatory body has the will and capacity to provide oversight, then the aggregation of water points into a smaller number of umbrellas will make it much more feasible for regulators to monitor. However, if the main accountability pressures are bottom up, based on community members providing oversight, then aggregation of management and operations to an umbrella will reduce accountability by increasing the distance between the service provider and the users.

Trust: Well-functioning umbrella organizations have the potential to increase trust in the water system's reliability because of the increased capacity of technical staff relative to local maintenance staff and because of better access to spare parts. In Uganda, we were told that the piped water system that was taken over by the umbrella from a previous sole proprietor had resulted in increased trust because of maintenance issues:

> "I think today the clients trust the Umbrella more than the private operator. The private operator was not clear in his situations. When there is a breakdown, he took time to fix it. There should have been a mortar failing here, it would take almost three months or three weeks to fix. But now with Umbrella, if there is a breakdown of a mortar, within one week they will work hard and make sure water is supplied to the community" (FGD UL7).

On the other hand, some water users may have less trust in the management of finances within umbrellas compared to community member's handling of revenue (TN12).

Equity: Regional equity may be expected from establishing an umbrella organization. Some localities suffer from lack of access to the numerous tools discussed here for reasons including town size, remoteness, cultural differences, etc. An umbrella can potentially ensure all community-based systems under their jurisdiction are able to participate in decision-making processes and share benefits from governance of water provision. This is even more so the case when localities share water sources but have different systems or vice-versa, given that some disputes may prove disruptive for service providers. However, efforts for equity within localities, not between them, could suffer occasionally in cases where the umbrella has too much power while representing majority groups, effectively shutting minorities out of the decision-making process. Institutional design is key to prevent these side effects and to ensure the expected benefits.

<u>Rural Utilities</u>

Transparency: Because utilities are publicly owned, regulators can require the collection and sharing of performance information. For example, in Kenya, WASREB publishes comparable performance indicators for all public utilities annually, and ranks their performance against each other, allowing users and other stakeholders to understand not just what their service provider is doing, but what it is doing relative to other similar organizations. This type of relative information is very important in mobilizing user demands for improved performance (Gottlieb, 2016).

Accountability: As outlined above, because utilities are publicly owned, governments are better able to hold them accountable through formal means. For example, rural water utilities in Kenya

operate under licenses issued by WASREB but are also accountable to local (county) governments under the 2016 Water Act (WASREB, 2019).

Trust: In Uganda, water users tend to trust utilities operating under the National Water and Sewage Corporation (NWSC) more than regional umbrellas or private operators because of their national profile and their deep expertise and experience (UNI3). In addition, NWSC has

> "very good performance contracts for the staff and very good incentives for them to perform, to give their best quality of service" (UNI3).

Because of this improved service and reliability, NWSC and the rural branch offices under its management have a very good reputation.

Equity: Rural utilities may increase equity in access if regulations compel them to expand into underserved areas that would not be served under a fully privatized system. For example, the 2016 Kenya Water Act requires that county governments establish a rural water service provider, typically in the form of a utility, in areas where water services are not commercially viable (WASREB, 2019).

Funding Pools

Transparency: Centralized lending or granting from a funding pool increases transparency by directly funding investments in technologies that improve transparency, such as remote sensing or electronic taps (Oxfam, 2018). Funding pools also increase transparency around the standards for accessing funds and service performance, as most will employ a common set of performance indicators and assessment tools. Finally, when funding pools are structured contingent on outcomes, they can induce greater transparency through the publication of the outcome metrics collected for determining payment.

Accountability: Funding pools can increase accountability of service providers by reducing forum shopping among poor performers. When funding sources are fragmented and uncoordinated, poor performing service providers may be able to receive funding from a new source even after failing to meet their obligations to a past funder. Funding pools can induce accountability of the governments that control them by linking fund replenishment to outcome and performance metrics (KNI6).

Trust: In those community water supply systems in which the funding pools are managed by a representative of the community designated by popular choice, trust increases among the system users.

Equity: Funding pools can increase equity by creating and enforcing incentives for equitable and inclusive water access (Oxfam, 2018). As a centralized funding source, they can also ensure that the allocation of resources align with government or community needs assessments and development priorities.

Franchising

Transparency: By establishing business relationships, franchisors can confirm the linkage mechanisms with each franchisee to create a culture of transparency among stakeholders in the water system. Franchisors gain complete visibility into the work of their franchisees, allowing them to make better decisions for the operation of the system and provide efficient service to users (Wall and Ive, 2010). Transparency within the system operations that a franchisor offers to the franchisee can be easily replicated in the franchisee's relationships with the users of the water system. The multilateral transparency of the franchised water system allows those responsible for receiving information to collect it from all the actors in the system, building a culture of efficiency in stating the system's water needs (Wall and Ive, 2010).

Accountability: Franchisors can hold individual franchisee entrepreneurs accountable through their contractual relationship. Franchising may also improve the ability for government to hold service providers accountable by creating an intermediary between government and a huge number of small water service providers: the government holds the franchisor responsible for service delivery outcomes, and the franchisor, in turn, holds the franchisees responsible for the quality of their service (Wall and Ive, 2010).

Trust: Franchising can increase customers' trust in the reliability and quality of water provided if the franchisor has a brand reputation, the internal means to monitor franchisee performance, and provide support and expertise to improve performance.

Equity: Franchises can increase equity in community water systems by implementing guidelines in which the franchisor requires franchisees to ensure that all community members have an equal opportunity to receive service and participate in decision making.

Microfinancing

Transparency: Our research did not find any specific links to transparency based on microfinancing besides those connected to other aspects of governance. The literature does not report how microfinance potentially affects the transparency of a water supply system.

Accountability: Within a community water system, the use of microfinance brings rigor to the local market. It helps improve system operations by creating more specific and localized accountability among microfinance stakeholders, including service providers and recipients (Mehta, 2008).

Trust: According to Mengueze *et al*. (2014), microfinance increases bilateral trust between those responsible for the water supply system and users. The latter establish relationships of trust with those individuals or entities that support them in processes of difficulty or need. Service providers increase their trust if users comply with their responsibilities of use, payment, and reimbursement to the water supply system.

Equity: Microfinancing increases equity among (potential) water service providers by opening the water sector to small-scale entrepreneurs who lack the necessary upfront capital and who are

unlikely to qualify for traditional financing. By expanding the group of potential water service providers, microfinancing may also increase equity in water access by funding the types of private actors who are active in more difficult to reach areas.

Practices

Participatory Planning

Transparency: Participatory planning can increase transparency by giving water users and community members a better understanding of both the inputs to decision-making and the process through which final decisions will be made (Menzel *et al.*, 2013).

Accountability: Participatory planning may increase the accountability of water service providers by making it clear to water users who the decision makers are.

Trust: In theory, participatory planning increases users' trust in a water system and its management, as they have early access to information and the planning process. However, some research has shown that a positive association between participatory planning and trust may be due to higher trust, generating more inclusive planning rather than the other way around, and that merely increasing the quantity of participation can even erode trust (Menzel *et al.*, 2013). As a result, participatory planning processes should focus on improving the quality of participatory engagement over the quantity of community input.

Equity: Participatory planning, if not well structured, can reduce equity of input by giving special interest groups a platform through which to influence outcomes (Palmer *et al.*, 2013).

Contingent Funding

Transparency: Contingent funding presents a unique set of difficulties for increasing transparency. As funding is conditioned to results or other goals set by the donors, distributing information concerning these expectations to users and operators is necessary. Conversely, operators should have the appropriate channels to be transparent themselves, both to the users and to donors.

Accountability: Contingent funding is explicitly designed to increase the accountability of service providers by aligning incentives for continued performance. Compared to up-front funding that is awarded based on plans and proposals, contingent funding ties payout to service performance indicators. This creates leverage over service providers, using their profit motivation to incentivize long-term performance.

Trust: Trust can be reinforced with contingent funding as a continuing relationship is established, as both sides learn to meet expectations and rearrange agreements upon reevaluations or as conditions change. However, the sensitivity of the system rests on its contingency and the expectations that come from it – occasional disputes might erode trust if one or both sides believe relevant milestones are not achieved, for example. This might require an

impartial body overseeing agreements, which may be difficult when the government is one of the parties.

Equity: Contingent funding can increase equity by making it possible for service providers to expand service to disadvantaged groups, if funders agree to subsidize the difference between tariffs collected and the actual full cost of service (World Bank, 2006). However, contingent funding may reduce equity among service providers, as smaller entrepreneurs cannot absorb the risk of payment contingent on future performance (Oxfam, 2018). This latter challenge can be ameliorated through upfront capital expenditure "development impact bonds." Alternatively, contingent funders can engage a (private) investor who agrees to pay upfront costs for a water service provider, who then has financial incentives to invest in the capacity of the water service provider (Oxfam, 2018).

Legal Registration and Formal Contracting

Transparency: Legal registration and formal contracting can increase transparency by building reporting requirements into the registration and contracting processes. For example, the 2016 Water Act of Kenya requires that all individuals, community organizations, firms, and public companies that are engaged in water service provision must be registered as a legal entity, and as part of the licensing process, each water service provider agrees to report on "credible data and performances" (WASREB, 2019). Formal contracts can assign clear obligations and responsibilities to each party, thereby increasing transparency around responsibility for the different components of a particular water scheme (see Delmon, 2014 for an example).

Accountability: Legal registration and formal contracting should increase the accountability of water service providers because it facilitates government oversight and clarifies who is responsible for particular infrastructure (Oxfam, 2018). Registration and formal contracting also give water users legal avenues for recourse. For example, the Water Services Regulatory Board (2019) notes that without legal registration, "There are no control systems to protect the rights of the customers, as it excludes those groups from government financial and/or technical support mechanisms. This poses a serious threat to the sustainability of the community water schemes."

Trust: Formal contracts can increase a water service provider's trust that the government will not appropriate their business, as it gives the service provider legal recourse. In addition, a formal contract with clear monopoly rights can increase a service provider's trust that his or her investment will not be undercut by other service providers (McNicholl *et al.*, 2019).

Equity: Legal registration and formal contracting ensure guidelines and procedures for all stakeholders in a water system that ensure that they will be included effectively and equitably in receiving benefits and making decisions. On the other hand, those supply water systems that lack formal registration may experience greater difficulties in accessing the services and benefits offered by governmental and non-governmental entities, creating inequity issues among water supply systems.

Water Treatment

Transparency: Our research did not find any specific links to transparency based on water treatments besides those connected to other aspects of governance. The literature does not report how water treatment potentially affects the transparency of a water supply system.

Accountability: Our research did not find any specific links to accountability based on water treatments besides those connected to other aspects of governance. The literature does not report how water treatment potentially affects the accountability of a water supply system.

Trust: Some water users will have increased trust in the water system if water is properly treated. In one community in Uganda, water users explained that for those who can afford to pay, they prefer the piped water over the nearby spring because they feel that the piped water is safer because it is treated (FGD UL7). However, living experiences may counter this trust: for example, an elder in one rural Tanzanian community protested efforts to increase demand for treated water available via a prepaid electronic tap by noting that he drunk from the local stream water his entire life, as had his father and grandfather before him (TF2). This example underscores the importance of not overstating the dangers of untreated water – or the benefits of treated water – as large discrepancies between dangers or promises from the service provider and the lived experience of community members will undermine trust in the service provider (Michel, 2016). However, if communities observe for themselves a falling rate of illness after using treated water, trust could improve in the service provider. Finally, unusual tastes or smells that result from water treatment could produce rumors that the service provider (or government) is "poisoning" the water source.

Equity: Water treatment can increase equity within the water supply system by providing water without contamination or health-related risks to all users. Compliance with this governance element depends on following previously approved water treatment protocols, while service providers must operationalize the system in a standardized manner for all water distribution points.

Collective Payment

Transparency: Collective payment can increase transparency by reducing the number of financial transfers made to a water supply system. In water systems where service fees are collected through a designated person, transparency can be highly compromised. A collective payment opens the possibility for an easy and precise monitoring process for the money coming from each user group or community.

Accountability: Collective payment is designed to increase the accountability of users to pay for services by leveraging social and communal networks. In particular, it uses preexisting means of social control to enforce payment, by tying the community's water access to overall rates of payment.

Trust: Because of increased accountability, collective payment arrangements may increase water service providers' trust that water tariffs will be recovered.

Equity: Collective payment may compromise equity among users by setting unreasonable rates at each user's income and water consumption levels. In a collective payment scheme, equity can be guaranteed by establishing a stratified collective payment; each user's contribution to the collective payment will be determined through standardized guidelines using individual consumption levels.

Social Costing

Transparency: Social costing may help with transparency, but it poses more challenges. Given the structure of payments, based on charging higher rates to some users (likely companies and other organizations that do not provide public services directly) for subsidization, other efforts for transparency need to be increased to ensure the public knows what factors determine different rates and if they are being properly charged. Additionally, information regarding compliance is essential to ensure public perceptions on the fairness of cost structure.

Accountability: Similar to transparency, social cost structures present additional challenges for accountability. Enforcement of the rules pertaining to the cost structure is paramount, but also constant monitoring to prevent favoritism and other undesirable practices associated with bad implementation of both types of social costing.

Trust: Users are more likely to trust arrangements that implement social costing if they are on board with the rationale for differential treatments, particularly with users who are not the direct beneficiaries. Opaqueness regarding motivations will erode trust among users even if they are not being harmed by the cost structure decided for a given location.

Equity: Social costing increases equity of access by ensuring that everyone has access to enough water to cover their basic needs, regardless of socioeconomic status (Trémolet and Binder, 2009; Oxfam, 2018).

Training and Capacity Building

Transparency: Some challenges in transparency are directly connected to lack of capacity, especially at the local level. Without enough trained people, a given district is unable to properly evaluate if and when appropriate information about the water systems is being delivered to users and other stakeholders, let alone evaluate the information to find potential misdeeds. Thus, transparency requires at least some capacitated personnel related to information processing and publication.

Accountability: Rural districts are often held accountable to water schemes' shortcomings by the users, but such accountability can be non-existent in the absence of well-trained professionals.

Trust: Technical skills trainings for operation and maintenance can increase users' trust in the reliability of the water system, and financial management trainings and capacity building can increase users' trust that tariffs are being managed appropriately.

Equity: There are no main connections between capacity building and equity besides the effects it has on the other governance aspects; however, equity in decision-making requires that capacity building happens in an equitable way, ensuring diversity in training.

Audits

Transparency: Audits, especially those carried out by an external and independent party, can increase the transparency of service providers' finances and operations, if results are made available to regulatory organizations, government, and/or water users.

Accountability: Audits can increase the accountability of service providers if they are implemented on a regular basis by independent, qualified staff and there are predetermined and enforceable consequences (Hirn, 2013).

Trust: Regular audits can increase trust in a service provider by ensuring its customers that there is a mechanism for performance oversight.

Equity: Audits are necessary to ensure equity is being pursued and/or achieved, particularly regarding how benefits are distributed. Auditing procedures are also an opportunity to improve equity at the decision-making level if they are properly communicated to stakeholders.

System-Wide Assessment Tools

Transparency: System-wide assessment tools can increase transparency by making clearer the mode of assessment and the nature of the metrics that are important. However, system-wide assessment tools make transparency easier, but do not guarantee it, as the outcomes of the assessment may not be made available to stakeholders.

Accountability: System-wide assessment tools can increase accountability by predefining the criteria for determining success and failure, and by treating a water system holistically. If performance is not measured in a consistent and agreed upon manner, then *post hoc* accountability is much harder. System-wide assessment tools can improve accountability by giving service providers, stakeholders, and those charged with oversight a common and comprehensive set of indicators to measure and track performance over time. System-wide assessment tools can also increase accountability by including indicators of the strength and effectiveness of regulatory frameworks (Hailegiorgis *et al.*, 2018).

Trust: Most of the effects of system-wide assessment tools on trust come from its connection to transparency and accountability. If those are successfully increased, it should follow that stakeholders can trust the system more. However, if these tools fail, the impact on trustworthiness can be significant, as assessments can determine sensitive decisions regarding funding or operation, leading to users' discomfort with the system as a whole.

Equity: System-wide assessment tools can increase equity by building indicators of inclusivity and participation into the assessment scheme. For example, Hailegiorgis *et al.* (2018) employ a

system-wide assessment tool in their evaluation of small-scale water systems in Ethiopia that includes indicators of equitable and inclusive planning.

Subscription Maintenance

Transparency: Efforts for transparency require some level of stability of information flow, which subscription maintenance may elicit for users if providers are also mandated to share information on proceedings and other relevant aspects of their operation.

Accountability: Subscription maintenance increases the accountability of the water service provider by making clear the provider's obligations and standards. During their interview, [an NGO's] representative mentioned that their model of subscription addresses this directly, as they built a scheme in which mechanics get paid monthly and get evaluated, therefore incentivized to provide comprehensive maintenance to avoid doing repeated calls (UNI1).

Trust: Subscription maintenance may increase users' trust in the reliability of the water system, as service providers have increased incentives to monitor performance and conduct preventative maintenance. However, trust in the service provider is also necessary for users to be willing to prepay for maintenance. Users must trust that the subscription funds will be handled correctly and that the service provider will indeed follow through on their promises (SWS, 2019).

Equity: This research found few links to equity based on subscription maintenance besides those connected to other aspects of governance.

Technical Associations

Transparency: The potential benefit of technical associations for transparency is to reduce the number of steps between stakeholders and information, as well as increasing the reliability of such information. Bookkeeping and other forms of logs are helpful and easier to maintain when technicians are constituted into companies or other forms of collective organizations.

Accountability: Technical associations can increase the accountability of service providers by serving as a "focal point of contact" when issues arise (UNI1).

Trust: If technical associations can increase the quality of service among its members – such as improving the technical skills of hand pump mechanics – then water users should have increased trust in the capacity of affiliated private actors, and, in turn, the reliability of the water system.

Equity: One of the possibilities coming from the establishment of technical associations is to standardize practices and prices, allowing for better planning on expenditures even for remote locations.

Community Meetings

Transparency: Community meetings in which technical and financial information is shared with the community increases transparency in a straightforward manner. However, it is

imperative that information is shared in a way that is interpretable and usable by members of the community.

Accountability: Community meetings can increase accountability if community members are able to give feedback to service providers and government, and to question the past or current actions of service providers and government officials.

Trust: The act of asking questions, receiving usable information, and interacting directly face-to-face can increase community members' and users' trust in service providers. Anticipating that future meetings will be held, in which service providers must answer questions from users, may increase users' trust that funds are being managed properly and maintenance is being proactively done.

Equity: Community meetings can increase equity if they are open to all community members or users. However, marginalized members of communities may be excluded from such meetings or feel disempowered to actively engage. The most pernicious outcome could be when service providers assume that holding such meetings is increasing equity, while in fact it is only further marginalizing excluded groups.

Publication of Performance Information

Transparency: Making performance information – either financial or technical – available to the public increases transparency in terms of the performance of water service providers.

Accountability: Because transparency is increased through the publication of performance information, accountability is made easier. Without such information, it is much more difficult for users or regulators to sanction poor performance or reward good performance. However, it may be necessary to provide comparable or relative performance information across contexts to increase accountability. As shown by Gottlieb (2016), bottom-up accountability is likely to require information about both one's own level of service and the levels of service provided by other comparable units.

Trust: The publication of performance information can increase users' trust in the intentions and capacity of their water service provider if that provider's performance is highly rated.

Equity: This research did not find any links to equity from publication of performance information besides those connected to other aspects of governance.

Technologies

Retrospective Monitoring

Transparency: Retrospective monitoring increases transparency for the monitor in terms of the quality of work completed. Such information can be shared with other stakeholders to further increase transparency around performance.

Accountability: Retrospective monitoring is crucial for users or regulatory bodies to be able to hold private operators accountable for the quality of their work. Without direct observation of work quality, such bodies would be dependent on future breakdowns to assess performance, but such breakdowns could have many potential causes, making it difficult to assign responsibility for poor performance.

Trust: The capability to directly monitor work performed by private actors can increase users' trust that contracted work will be completed at a high standard.

Equity: Retrospective monitoring makes it possible to ensure that water suppliers maintain the operating conditions that ensure water service to all community members from the beginning of the project. Also, retrospective monitoring offers the possibility of building schemes that encourage public participation in the water supply system decisions. Finally, retrospective monitoring allows decision-makers to identify gaps between different stages of the project to make relevant changes that improve system operations.

Remote Monitoring

Transparency: Remote monitoring can reduce the costs of observing water system functionality, thereby increasing transparency.

Accountability: Remote monitoring allows increased accountability when used to collect information and respond to the needs of system users. By monitoring remotely, other entities external to the system also can visualize the information of the system, improving the response levels to system problems. Remote monitoring provides a mechanism for continuous accountability of service providers and those responsible for the governance of the system.

Trust: Remote monitoring may increase users' trust in the reliability of the water services, if such monitoring results in reduced downtime (Koehler *et al.*, 2015; Thomas *et al.*, 2018).

Equity: Remote monitoring could increase geographic equity with respect to maintenance by making it easier and more cost effective for service providers to monitor water systems in very remote or difficult to reach areas.

Electronic Taps and Smart Meters

Transparency: Electronic taps increase transparency about water disbursed and tariffs collected because this information is automatically collected and stored as a "digital audit trail" (Goodrich, 2017).

Accountability: Electronic taps increase the accountability of individuals who are receiving money. For example, water vendors, who sell credits for the electronic taps in many schemes, can be held accountable for all funds because all credit transfers are recorded digitally and can be compared to bank deposits and digitally recorded volume distributions.

Trust: Electronic taps increase a service provider's trust that users will pay for all water that they have used. A focus group participant in a Tanzanian community with electronic taps noted this improved efficiency in tariff collection:

> "So I can say this system is good because no water is being wasted as before. Back then there were a lot of conflicts, people used to force the tap attendants to fill their bucket until the water pours down, and they were saying 'that is just water, you're acting like we are buying fuel'. So, when an accountant goes there to read the meter s/he might find the readings are too high compared to the money obtained. So that is the big different we experience after this system started" (FGD TL4).

Electronic taps also increase users' trust that they are being charged the official tariff and that other users are paying the same fee.

Equity: Electronic taps have numerous equity implications. First, electronic taps ensure that there is no favoritism in access to water, compared to tap attendees who may favor their own networks in terms of access and pricing. Second, electronic taps make it easier – and therefore more likely – to employ social costing, lifeline rates, and volumized pricing. Third, electronic taps increase gender equity through their profound effects on married women. In particular, the fact that electronic taps allow for 24-hour access, unlike attended taps, impact gender equity. In all focus group discussions across two communities with electronic taps, water users and management committees all discussed the beneficial effects of the taps on marital disputes. This was attributed to the fact that women could fetch water much more quickly than before, when they had to wait on long queues during the few hours that a tap was attended, leading to fewer disputes with their husbands. This was cited in multiple focus groups discussions in Tanzania:

> "Also in families, there were so many marriage conflicts. For instance, woman might go to fetch water, while looking for water, she might use much time there and other things might happen there. So, marriages are now fine because of this project because water is accessed in nearby source" (TLU2).
>
> Another man said, "I think back then it was a real problem, some marriages were in trouble, because you can find women goes to find water and get back at 10PM, but these days there is no such a thing, and that's a big change, problems with marriages are no longer here." (TLU4).

<u>Electronic Payment</u>

Transparency: Electronic payment systems tend to increase financial transparency. From the user's perspective, this means that they can receive and pay their bill without going through an intermediary. For example, in one Uganda locality, each water user with a domestic connection has a unique account number that they use to pay their bill electronically. A user explained that prior to electronic payment, money would be collected manually by the service provider and there were sometimes concerns about whether it would be applied to one's bill or not. After electronic payment was introduced, however, customers were able to immediately see that their account had been credited (FGD UL7).

Accountability: Similar to electronic taps, other forms of electronic payment also increase accountability through the creation of a digital audit trail (Goodrich, 2017).

Trust: Electronic payments can increase trust for the service provider that funds are being collected and recorded accurately.

Equity: Electronic payment may decrease equity by making it harder for poorer and less tech-savvy users to pay their bills, and/or for those who do not have reliable access to phones (e.g., if a phone is owned by head of household but someone else is responsible for payments).

Information Dashboards

Transparency: Dashboards that allow stakeholders to monitor and analyze the performance of other tools have an obvious impact on transparency by reducing costs of sharing and divulging information. However, the gains require that information is presented in a legible way, including but not limited to considerations about how people are technically able to interpret it, if the information is relevant to actors involved, how readily available and actionable the information is, etc.

Accountability: Communication improvements are the main avenue for accountability gains in using information dashboards. Users can inform providers about their needs with objective data; depending on the characteristics of the system, feedback offered in a timely manner reduces the chances providers are unaware of issues and can either solve them more easily or be held accountable for failures in addressing them.

Trust: If the dashboards provide relevant and legible information to stakeholders, such as the volume of water dispensed periodically or potential mechanic malfunctions, they tend to increase trust in the systems they provide information about. However, this trust is only realized to the extent there is interest in the communities to use the information dashboards as a tool for their own understanding of how the system works, and how confident they are the information portrayed is true.

Equity: When the information is easy to access for users, its availability by itself can increase equity as potential inequalities are more easily perceived and addressed.

Electronic Communication Platforms

Transparency: Electronic communications platforms can increase transparency by lowering the costs of sharing or consuming information.

Accountability: Electronic communication platforms can increase accountability by giving users a means through which to communicate their needs and other feedback to the service provider. Without such information, it is more difficult for a service provider to be held accountable by their customers.

Trust: Electronic communication platforms can increase or decrease the user's trust in the water supply system. The effect depends on how service providers use virtual communication platforms, especially when they disseminate information that is not a schematic view of the

reality of water distribution systems. Users generally increase their confidence when they have access to understandable, real, and continuous information (Scherer *et al*., 2016).

Equity: Although users can access information more easily, in the context of sub-Saharan Africa, electronic information platforms can exclude certain groups who do not have the resources to acquire the technologies that the platforms support. This sociodemographic characteristic could make the platforms generate inequity in disseminating information about the water supply system. For service providers, electronic information platforms are a competitive advantage. Those service providers that have this technology have a greater chance of being selected to provide service to a community, generating inequity in competitiveness for service contracts.

7. Contextual Factors

Numerous contextual considerations will affect the feasibility and success of rural water provision. In this section, we discuss project-level, cultural, demographic, geographic, institutional, economic, and political factors that shape rural water provision. While we sometimes discuss the effects of these factors on the general success of rural water provision, we focus in particular on barriers to private sector engagement and governance challenges.

Project-level

The **scale of a rural water project or its water service provider** can affect the business viability of water provision and its governance. In terms of business viability, small-scale projects can be very hard to sustain due to very small profit margins. As a result, small-scale projects need to be clustered to generate sufficient revenue for sustainable provision. Similar economies of scale also apply to governance, as the costs of institutions for oversight and communication, as well as sourcing spare parts and qualified technicians, are too high if applied to single, small-scaled systems. An example of this comes from [an NGO] representative in Uganda, when they described how in that country it is comparatively more difficult to create governance clusters that allow for advantages in economies of scale:

> "We do not have any intermediate area of provinces like Tanzania or Kenya, I think. So that's a bit the issue of decentralization in Uganda. You have a national level and then you have 120 districts and then below the district, you have sub counties. So a district has probably 5, 6, 7 sub counties. So the idea is to create a water board at sub county level that would, that would, that creates a little bit of more economics for scale. So you would attract better qualified service providers" (UNI16).

The **type of service provider** is also likely to shape the success of a project or scheme. For example, small private entrepreneurs may need a financial return sooner, over a shorter time horizon, than do larger financers. In addition, some water service providers, such as social enterprises or non-governmental organizations, may never need a return and seek instead to simply break even or minimize the degree of subsidization. Whether a private service provider is an "insider" – from the community being served – or not may also shape outcomes. On the one hand, an insider may have a longer time horizon and non-commercial reasons for community investment and high-quality service. However, an insider may have a harder time than an outsider in resisting pushback against water tariffs. This tradeoff is apparent in discussions about the relative satisfaction between the National Water and Sewage Corporation management of the piped water scheme in one of our Ugandan field sites compared to prior management by a private operator. One respondent told us that water users would prefer private operators over NWSC because of "closeness to the people…National Water is very distant from the people" (UGL6). However, another told us that there is less favoritism and ability to avoid paying now that the system is under NWSC. Members of the water board said that the private operator was "more patient with people and payments" than NWSC, which "doesn't have patience for people, they can't understand that the people will pay later or won't run away from home" (UL10).

Demographic

The demographic characteristics of a service area are also likely to shape the viability of commercial water provision. In particular, the overall **population size and the population density** will determine water demand and hence potential revenue collection, an important determinant of commercial viability (Oxfam, 2018). In addition, these factors also shape the marginal costs of maintenance and operations.

Hydraulic

The geography and hydrology of a service area also have implications for the commercial viability of rural water services. First, the **water source** used for a particular scheme dramatically affects the costs of provision. Gravity-fed systems are much cheaper than systems that must pump water from deep underground, especially where water pumps are diesel-powered. Connecting pumps to the electricity grid or solar panels has the potential to reduce pumping costs considerably, but gravity-fed systems are always less expensive and thus more commercially viable.

The overall **water availability, and the presence and convenience of alternative water sources**, also shapes the viability of commercial water provision (Olaerts *et al*., 2019). For example, while the arid and semi-arid regions of Kenya face many challenges for water provision, the commercial sale of water is common and accepted because there are very few alternative water sources. Another example came from the Tanzanian field site around the electronic water tap project. The success of the electronic tap system was much better in one community than the other, primarily because there was readily available stream water in one community, reducing demand for commercial water. Overall water scarcity and the frequency of droughts also shape the viability of water businesses.

Cultural

Cultural beliefs and practices are also important for shaping the success of rural water services. One issue that was frequently expressed in all three countries of study was **resistance to treating water as a commodity**. In particular, many water users believe that water is given from God and communally owned, or a basic human right, and can therefore not be treated like other goods. Water service providers and others in the water sector often emphasize that one is paying for the service of delivering or treating the water, and not the water itself. One [international NGO] employee in Tanzania explained it this way:

> "I've heard people say water should be free and it's a God given, right? [In response, we say] well, fine water is free. You can go pick it up from a ditch, but that water, you drink that water and it's going to make you sick. And we've gone through all the explanation of why, you know, we need safe water. There is a cost associated with making water safe and, and that costs needs to be covered" (TNI6).

A second issue, which is perhaps universal, is the **difficulty of sustaining citizen interest and action**. This is partially because of the well-understood barriers to collective action and incentives for free riding, but it is also because costly action is difficult to motivate in the

absence of a problem. In particular, so long as water of a reasonable quality is available for a reasonable cost, water users do not want to put much effort into monitoring performance of the water service provider. This inability to spur citizen action except when there is a problem severely limits water service approaches that rely on bottom-up accountability and oversight.

Another cultural factor that shapes the success of rural water services is **the importance of ownership**. Communities that have a sense of ownership over the water systems are repeatedly presented in both individual interviews and focus groups as significantly likelier to experience success. This affects all levels of governance, as noticed by many stakeholders:

> "I think it's to make them own the own system, that can access it for their village and see every day what they are collecting all they are buying" (TGL2).
>
> "…because people like the project, it turns out the community became guards of the project" (TLU2).
>
> "if the community is the owner of the water source, then they trust… who is managing their water source. So, we collect funds, we ask them to pay for money before we do a measure […], they make some small contributions" (TGL1).

The degree of **comfort and experience with technology** also affects the ability to employ new technologies to improve service and governance, such as electronic payment or electronic communication platforms. For example, mobile money is much more widely used and accessible for Kenyans than Tanzanians or Ugandans (World Bank, N.D.). The penetration of mobile phones and the mobile money platform mPesa into rural areas makes the adoption of electronic technologies for water services much more feasible.

Economic

Several economic factors influence the potential for commercial water services in rural areas. First, **overall levels of economic development** are crucial, with wealthier countries and regions better able to sustain commercial water businesses (Koestler, 2008). This is because a stronger economy is better able to support entrepreneurship, and because water users are better able to afford to pay for water. More robust economic activities also generate increased demand for water: for example, commercial agriculture or luxury services such as car washes. Across the three countries considered here, Kenya has a larger and more diverse economy than Tanzania or Uganda (World Bank, 2021).

Second, the **depth and strength of the private sector** will also shape the potential for private sector engagement with water. In general, the private sector is more viable in stronger economies, linking this factor to the one above (International Finance Corporation, 2019). But the size and strength of the private sector is also path dependent and based on historical differences in the nature of the economy. In addition to having a larger economy, Kenya also has a long history of capitalist economic structures and global integration. Uganda has a similar capitalist history but has been less economically integrated with the global economy than Kenya. Finally, Tanzania had a long socialist period after independence through 1986, and this is still evident in the limited nature of the private sector today (Msami and Wangwe, 2016). Past

experiences in service delivery by the private sector also have implications for engagement today. For example, Uganda made a large-scale effort to set up public-private partnerships (PPPs) for small-town water services, with support from the World Bank. However, most of these partnerships failed to expand water services and most were not renewed after the initial contract. These past failures reduce enthusiasm for private sector engagement in water services today, for both government and private firms.

A related but distinct economic factor is the nature of the **relationship between private sector businesses and government**. In particular, when government officials have backgrounds in the private sector, they are more likely to understand the policies and institutions that can facilitate the successful engagement of the private sector in service provision. In Kenya, many government actors have extensive experience in the private sector. This is clearly related to the size and strength of the private sector in Kenya, which makes this type of experience possible. In contrast, the weaker private sectors in Uganda and Tanzania mean that government actors and policy makers do not understand the needs and behaviors of private sector actors. This lack of experience has real implications for the success of private sector engagement with water service. For example, in Uganda, a respondent attributed the failure of many public-private partnerships to the fact that businesses and government are so isolated from each other in the country, explaining,

> "I realized at the time that we had the PPP arrangement in Uganda, I think both parties were not ready for this. I think mentally both parties were not, it was first of its kind. The private sector had their way of thinking, in a very technical way, 'I need money out of these.' And the public sector also had their own thinking, '[the] private [sector] is cheap, they only think of money.' And you find that no one from public had ever been in a private company. So, they had a very different understanding, they couldn't really work together" (UNI2).

Another important economic factor is the degree **of integration and coordination within the water sector**. This is typically driven by the strength and experience of key coordinating institutions. For example, while all three countries have civil society organizations that are aimed at water sector coordination and integration, their success varies across countries. For example, the Kenyan Water and Sanitation Civil Society Network (KEWASNET) hosts regular gatherings for sharing information and resources and is valued by its members as a source of expertise. In contrast, the Uganda Water and Sanitation Network (UWASNET), which was modeled after KEWASNET in Kenya, seems to act more as a broker or gatekeeper between donor funding and implementing members than an institution that independently adds value for its members. As a result, the water sector in Uganda is much more competitive and fragmented, with many implementers unaware of the programs run by others, and providers are thus unable to learn collectively about successes and failures in the sector. In addition, this lack of coordination has resulted in a proliferation of similar technologies that are different enough that they do not result in economies of scale. One manifestation of this is related to trainings: the Ministry of Water and Environment has tried to do widespread training on how to use electronic water taps and water meters, but it is difficult to train on so many distinct platforms.

A final economic factor is the **ability to couple rural water provision with other sectors**. Because much of the research suggests that rural water services will not be profitable based on

current water demands (Oxfam, 2018), water provision will only be commercially viable in many rural areas if demand for water can be increased through its use in economically productive ways. One respondent in Tanzania explained:

> "I think there's room for private capital to move into water. But, I think the trick in that space is – I think this is also worked in the energy – is what comes after the water. I think you have to tie the service into something else. So, for example, if you're able to tie electricity provision with, let's say, mobile phone services or hospitals or…a small kiosk where you get your cold drinks and your cold beer, then you're able to excite enough, you know, the critical mass to sort of get on board. And I think the trick in water is to do that, too, to make sure that water provision is coupled with something else…So, should anyone think of going into that space, I would certainly recommend sorting of find the two wins, to see if you can tie them together and if there is a way to commercialize that" (TNI2).

Though a subject of this research, one possibility is to explore ways to use multiple-use water systems for improved commercial viability, particularly with regard to agriculture. It has already been mentioned that larger economic activities, including commercial agriculture, generate increased demand (and hence payment) for water services. Such a coupling need not apply only to large-scale agricultural enterprises. As the main income generating activity in many rural communities, small-scale agricultural practices are often a major user of local water sources and community water access points may serve dual purposes for domestic and irrigation uses. Further information on this potential sector integration was not gathered through this research; however, the authors have made editorial comments on this point in the attached authors' note.

Institutional

Institutional and legal frameworks also influence the success of private sector engagement in rural water services. First, countries vary in the degree to which the **commercialization of water services is institutionalized**. In Kenya, both the 2002 and 2016 Water Acts called for water services to be commercially operated. These guidelines are crucial for providing legal recourse for both water service providers and users, to make contracts enforceable. The more willing a government is to promote private operators (Valfrey-Visser *et al.*, 2006), provide legislation, policies, and build a regulatory environment (Adank *et al* 2011; van der Byl and Carter 2018), the more success a country will have in commercialization of their water provision. Beyond legal frameworks, historical legacies also affect the institutionalization of commercial operations. For example, a history of users paying for water is an important determinant of commercial success. While only 26% of rural Tanzanians have paid for water in the past, this number is 31% in Kenya and 37% in Uganda (Foster, 2012).

Second, the **strength and independence of oversight bodies** are also important. This is especially apparent in Uganda, where sustained efforts to introduce an independent regulatory authority have repeatedly failed: "they would need it to establish an independent regulator, which they have not done for many years, with a lot of arm twisting to try to get them to do that." (UNI7). Currently, the only oversight is provided by a body within the Ministry of Water and Environment, which means that it does not operate independently and will have a hard time holding the Ministry accountable. This lack of a strong, independent regulatory authority

hampered the experimentation with public-private partnerships in small towns throughout the country, and also limits the ability to provide oversight for the National Water and Sewage Corporation (NWSC) as they expand services throughout the country. In fact, one respondent in Uganda explained that the NWSC has more resources and a more professional staff than even the Ministry of Water and Environment, further limiting the Ministry's ability to provide oversight (UGN1). In contrast, Kenya has a very strong and independent regulatory body in the Water Services Regulatory Board (WASREB), which produces guidelines and performance metrics of water service providers.

Third, the degree of political and fiscal decentralization affects rural water services in several ways. Of the three countries considered here, Kenya is by far the most decentralized. While Uganda is decentralized on paper, in practice decision making and resource allocation is highly centralized under a dominant party and leader. Tanzania had decentralized considerably, putting district and village-level management of rural water and other services under the President's Office of Regional Administration and Local Government, but recently recentralized water provision under the Ministry of Water and newly formed Rural Water Supply and Sanitation Agency. In theory, decentralization is meant to bring decision making closer to the people being served and improve services as a result. However, in some ways decentralization could complicate rural water services. For example, in Kenya, many familiar with the water sector bemoaned the inefficiencies that resulted from decentralization, with multiple levels of government now having to coordinate their actions. This allows for different levels to blame the others for shortcomings, or to falsely claim credit for progress.

Political

There are three means through which politicians can undermine the potential for private engagement in rural water services. First, **political patronage and clientelism** may interfere with the functioning of private operators and the institutions meant to regulate them. For example, private contracts may be awarded to political loyalists or to shore up political support in other ways, rather than based on merit and capacity. Political manipulation in the allocation and enforcement of private contracts is likely to severely undermine the quality of water services. Similarly, appointments to oversight bodies may be awarded as patronage, again undermining both capacity and autonomy.

Second, political actors may **undermine the commercial viability** of private sector engagement. In all three countries, we heard that politicians undermine water businesses by promising rural residents that they will provide them with free or lower cost water. The World Bank (2006) has noted that commercial water services will only be viable if private actors can be guaranteed that elected officials will not legislate prices that are lower than those needed for viability to increase their vote share. We observed just such a risk firsthand at a regional water authority office in Tanzania, where a local official threatened a private operator in our presence that they would soon mandate lower prices for water in the areas that the private operator was working. The operator has since pulled out of some communities that area. Another way in which political actors can undermine private engagement is by bailing out failed enterprises. The primary reason that private operators are expected to improve services is that the fear of losses induces good

performance. If private operators are not exposed to the risk of bad investments, then there will be no incentive for performance (World Bank, 2006).

Third, the **risk of political appropriation** can deter engagement by private actors. Just as political bailouts undermine good performance by protecting from losses, appropriation of successful enterprises undermines good performance by reducing expected gains (World Bank, 2006). Where there is such a risk of appropriation, either private actors will not enter the sector, or they will have disincentives to grow their business or generate profits for fear of attracting government attention. We saw this happen in Uganda, where the National Water and Sewage Corporation (NWSC), a state-owned company, or the regional umbrellas have taken over water systems in small towns after they were made profitable by private operators (Brower, 2014). One respondent described a concrete example of this:

> "There was a private operator…who kept on expanding the water [system]. But then as he kept on expanding, then the [regional] Umbrella unfortunately took over management" (UNI8).
>
> This respondent then connected such takeovers to reduced incentives for performance among other operators, saying, "So, if in most cases this happens, then people tend to start to notice the trend, then they tend to relax, because I know if I put up very good management, then the Umbrella will take over, or National Water will take over" (UNI8).

We saw similar dynamics in Tanzania. For example, efforts to engage the private sector in another service sector – electricity – has been unsuccessful and has had a chilling effect on enthusiasm for private sector engagement in water. In particular, some electricity service provision was privatized in the past, and after an entrepreneur had invested significantly in the services, it was appropriated by the government. These precedents hamper enthusiasm for engagement in the water sector, for fear that something similar would transpire. Another example is the government takeover of a successful, community-owned umbrella organization previously described in this report. According to local interviews and focus groups, the CBO was functioning well. However, with changes in pollical party and government restructuring, the CBO was taken over by RUWASA and is now being managed without the integration and autonomy of the local communities.

8. Governance Dimensions of Private Sector Engagement in Rural Water Provision

Governance challenges and opportunities

In this section, we bring together a brief synthesis of our findings across country contexts. With three different countries, we found both similarities and differences across the four elements of governance. We also seek to provide some food for thought as to how to improve these areas of governance.

Transparency

In all three countries, we see the importance of transparency in water governance. The users want to be able to clearly see what is happening with their water system, where their money is going. However, how this information is communicated is differed not per country necessarily but by water provider. Information was provided via printed reports, text messaging, and through the preferred method of presenting at community meetings. The importance of transparency cannot be understated. We found that transparency in the system, especially when users were well aware of how their money was being spent (i.e., repairs, maintenance, etc.), was more likely to increase a user's willingness to pay for water and the trust in the water provider. Transparency can be increased by providing users with useable and understandable information. While technology can be helpful in increasing the amount and accuracy of the information, it will not increase transparency unless the information is made accessible and clear to the users. Additionally, transparency has a positive interaction with other aspects of governance, particularly trust and accountability – as transparency increases, so do the others.

Accountability

Accountability was an essential component of building trust amongst the users and with the system. Users stated that having sanctions was a good way to ensure that everyone using the water system was equitably paying their part. In Tanzania and Uganda, sanctions came in the form of taking away the ability to fetch water. Although imposing sanctions or restrictions may seem to have concerns regarding do no harm, we note that it was users themselves who supported this measure. In Uganda, if the community defaulted as a whole, service providers were allowed to stop water services by disconnecting the boreholes. A way to increase accountability was again incorporating the community to increase their sense of ownership. This was demonstrated in all contexts. The more a community was involved in the system, the more accountability there was between the users and the providers. When community members are involved, they know what to expect from the provider and can make demands for maintenance, system expansion, or other needs. In Tanzania, we saw that when community members were trained to provide maintenance and did so in a timely and efficient manner, this not only helped in accountability, it also increased trust in the system. Another way to increase accountability was the use of meters. In all countries, we learned that users and service providers felt that meters helped to accurately account for water used and would provide accurate information for bills and payments. There were several instances where users felt that the providers would bill them for more water than they used. In this case, a meter was an essential tool to help keep the

provider accountable. The opposite is also true; meters would tell how much a user owed and would thus provide more accountability to the user.

Trust

In all three contexts, trust was mostly focused on trustworthiness and reliability of the system rather than on the quality of the water itself. Users felt confident that the water they were receiving from the taps was of good quality. However, when it came to trusting the management of the system, there were certainly some issues. For example, with hand pumps, there has to be trust in the attendant of the pump. This presented challenges for the community as users of the system could not account for water that was wasted or given away without payment. Community members expressed that even though some pump attendants were trustworthy, there was always an element of overall distrust in the honesty and integrity of the person. Aside from trust in the individual actors, trust in the water provider was also deemed as essential. In all three contexts, water providers mentioned the need for trust from the community. In Uganda, one NGO mentioned that gaining user trust could be an arduous process if the community had had previous bad experiences with other providers. This could impact willingness to pay and/or drive them to seek water from other potentially unsafe sources. Improving trust in the system could be accomplished through a variety of both technical and relationship building approaches. First, the use of constant monitoring can help to alert the water provider quickly to any issues with the system. This will increase trust in the provider when the users see a quick and appropriate response reducing time without water in the community. Likewise, technologies to help monitor the dispensing of water and money collected can also help to increase trust in the fairness of the system and what is being charged. Finally, the provider can engage with the users in the community at different times by investigating client satisfaction and hosting feedback sessions to address any concerns.

As a final note on trust, we found that ownership came up several times as a means to increase trust in the system. In all three countries, users felt that they would trust a system more if they felt a sense of ownership in it. For example, in Tanzania, users felt more trust in a system where they contributed financially or physically to the building of the water system. In Uganda, there was a sense that rural areas could feel this ownership more than urban or peri-urban areas due to the denser social networks and the types of providers that would service those areas (private firms vs. government).

Equity

There were two main ways the respondents spoke about equity: ensuring water is accessible for all people and ensuring equity in decision making mainly through highlighting women's participation on community water boards. In all three countries, nearly all respondents mentioned the importance of ensuring the most vulnerable had access to clean, safe water. The providers would allow for vulnerable people in the community to access water for free or at least a significantly subsidized rate. The Kenyan communities reported that chiefs and committees would make decisions to allow special needs to be covered for free, such as disabled users. Community managed system users mentioned they were aware of who those people were within the community, and they felt a responsibility to ensure their access to water when needed. In

Uganda, a government official mentioned the need to make water access points accessible for the differently abled. Tying in the concepts of transparency, trust, and accountability, users felt it was important to make sure that no one in the community was benefiting from the system more than others. An example was given in Uganda where users felt that certain communities, households, or individuals would benefit more from the system if they were politically affiliated or somehow associated with the managers of the system. Similarly, one community in Kenya reported the cattle owners as benefitting more and also having significant influence in how the system was being managed. Having transparency in how decisions are made, accountability and trust with system managers can ensure equitable water access in the community.

When asked about including underrepresented groups in decision making, women were the only group being included. However, the inclusion of women did not necessarily equate to equitable decision making. Women were said to not speak up in meetings or engage in leadership. Their inclusion is necessary, but their engagement must go beyond just meeting quotas.

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Appendices

Appendix 1. Note From the Authors

To Whom It May Concern:

In the course of undertaking work for GROWS, several interesting and important questions and considerations arose that were not directly related to the research interests and overall objectives of the project. These questions are of particular interest to us as researchers in our respective fields of expertise – political science (Dr. Robinson) and community leadership and development (Dr. Rodriguez). While we did not deem it appropriate to include our thoughts on these topics within the main report deliverable from Ohio State University, we want to discuss some of them here as potential motivations for future work. These questions may be of interest to various USAID offices, in Washington, D.C. or different country Missions.

Gender and Water

While in Tanzania, we heard about changes that occurred in household dynamics when water was brought to the community. When talking to users in a mixed gender focus group, we learned that men felt that bringing water to the community improved household relations. They specifically mentioned that it lowered household disputes because the women did not take as much time to fetch water and the household chores were completed in more "appropriate timing". Women in the same focus groups made a few affirmative head nods but did not speak directly about this particular dynamic. This is an interesting point of view and one that was only mentioned in two focus groups in Tanzania.

There were other instances when comments were made about the changes that increased water access brought to women that warrant further exploration. Women mentioned that they were glad that clean and safe water was more available to them. However, they also mentioned that the time they took in fetching water was also time that they valued to engage with other women or to be out of the household. Women's time, how it is spent and what is valued, is often not considered when developing water projects. The assumption is that women will appreciate the water being closer to their homes. While this is in fact true, it also means that they might be losing valuable social time.

Finally, one of the things that we did not ask nor directly learn about was about compensations in women's time – what did they do with the time "saved" from not having to spend hours fetching water? There have been many studies that have found that women's time saved from fetching water often goes back into productive activities in the home. It would be interesting to see what other dynamics change in the lives of women when water is brought to communities.

Household Decision Making

In Tanzania and Uganda, we learned more about how difficult it could be to pay even the least amount for water. One of the underlying questions we had from our data collection is: if households are expected to pay for water when they weren't paying before, where are the

concessions being made to be able to afford the water now? In other words, where is that money coming from and how is it affecting the overall financial health of the household?

Other questions arose when it came to deciding how to use the paid water. The users knew that the water they were paying for was intended first and foremost for human consumption. However, they also acknowledged the need to give water to their animals and/or use it to water their home gardens or other agricultural plots. Households had various water needs, not just for drinking. This presented challenges for the community when they were told that the water was only for drinking, but they also had other important needs to meet as well.

This is an interesting dynamic to consider since here we can see the close connection between water and agricultural production, which could contribute to household food security/insecurity or economic gains/losses for the family. The household is having to make many decisions when it comes to paying for water and there are some dynamics that still need to be explored.

Partnering with Other Sectors

A concept that was brought up during several key informant interviews was the idea of connecting water with other sectors, in particular agriculture. As mentioned above, water is necessary for agricultural production. However, if water provision to arid areas also partnered with agricultural sectors, it could further improve people's livelihoods in various ways. The need to pay for water could potentially be offset with the economic gain from increased agricultural production. If the governments of Tanzania, Uganda, and Kenya were interested to grow more agricultural products for consumption, they could also invest in agricultural infrastructure that would include investing in water. We believe this is an idea worth further investigation.

Decentralization of Water

The decentralization of water provision has often been championed as a way to increase citizens' voice in policy making, improve equitable allocation of resources, and enhance social accountability in public service delivery. However, several potential political issues were identified during a discussion with an associate at the World Bank in Kenya. With decentralization, responsibilities and accountability are diffused. This can lead to scapegoating, in which local level and national level water actors blame the other for underperformance. Also, the creation of additional utilities, boards, and government oversight (the proliferation of veto players) has allowed for increased corruption and rent seeking because each actor can effectively hold the others hostage until they receive concessions. There are unintended consequences that arise from decentralization that can in fact make it more difficult for the water sector.

While this is certainly not an exhaustive list of the many follow-on questions generated through interviews and focus group discussions in Kenya, Tanzania and Uganda, it represents issues we feel are significant and warrant further investigation.

Dr. Amanda L. Robinson and Dr. Mary T. Rodriguez

Appendix 2. Detailed Methodology

Interviews

Table 1 contains information about the 57 interviews with 82 individuals that were conducted for this report, which also include interviews conducted for each of the six case studies discussed below. The interviewer code and date are used to reference interviews throughout the report.

Table 1. Interviews

Interview Code	Country	Type	Date	No. of Participants
AF1	N/A	Firm	9/16/19	1
KA1	Kenya	Academic	2/21/20	1
KF1	Kenya	Firm	2/25/20	3
KF2	Kenya	Firm	2/28/20	1
KGL1	Kenya	Gov (local)	12/19/20	1
KNI1	Kenya	NGO (intl)	2/26/20	1
KNI2	Kenya	NGO (intl)	2/26/20	1
KNI3	Kenya	NGO (intl)	2/27/20	3
KNI4	Kenya	Donor (bilateral)	2/28/20	2
KNI5	Kenya	Donor (multilateral)	2/28/20	2
KNI6	Kenya	NGO (intl)	9/23/20	3
KNL1	Kenya	CSO (local)	2/24/20	1
KNL2	Kenya	NGO (local)	2/24/20	4
KNL3	Kenya	NGO (local)	2/25/20	1
KNL4	Kenya	NGO (local)	2/27/20	1
KNL5	Kenya	NGO (local)	12/10/20	1
KNL6	Kenya	NGO (local)	12/15/20	1
KNL7	Kenya	NGO (local)	12/16/20	1
KII1	Kenya	CSO (local)	5/02/21	1
KII2	Kenya	NGO (local)	5/30/21	1
KII3	Kenya	NGO (local)	5/31/21	1
KII4	Kenya	NGO (local)	5/31/21	1
KII5	Kenya	NGO (local)	6/02/21	1
TF1	Tanzania	Firm	7/11/19	1
TF2	Tanzania	Firm	7/22/19	1
TF3	Tanzania	Firm	7/26/19	1
TGL1	Tanzania	Gov (local)	7/18/19	1
TGL2	Tanzania	Gov (local)	7/19/19	1
TGL3	Tanzania	Gov (local)	7/22/19	1
TNI1	Tanzania	NGO (intl)	7/20/19	1
TNI2	Tanzania	Donor (multilateral)	7/26/19	1
TNI3	Tanzania	Donor (bilateral)	7/29/19	3
TNI4	Tanzania	Donor (bilateral)	7/29/19	1
TNI5	Tanzania	Donor (bilateral)	7/29/19	5

TNI6	Tanzania	NGO (intl)	7/30/19	1
UA1	Uganda	Academic	3/2/20	1
UC1	Uganda	Consultant	3/3/20	1
UF1	Uganda	Firm	3/6/20	1
UGL1	Uganda	Gov (local)	3/10/20	1
UGL2	Uganda	Gov (local)	3/10/20	1
UGL3	Uganda	Gov (local)	3/10/20	1
UGL4	Uganda	Gov (local)	3/11/20	2
UGL5	Uganda	Gov (local)	3/12/20	3
UGL6	Uganda	Gov (local)	9/28/20	1
UGL7	Uganda	Gov (local)	9/28/20	1
UGL8	Uganda	Gov (local)	9/29/20	1
UGL9	Uganda	Gov (local)	9/29/20	1
UGN1	Uganda	Gov (natl)	3/4/20	1
UNI1	Uganda	NGO (intl)	3/3/20	1
UNI2	Uganda	NGO (intl)	3/3/20	1
UNI3	Uganda	NGO (intl)	3/4/20	1
UNI4	Uganda	NGO (intl)	3/4/20	1
UNI5	Uganda	NGO (intl)	3/4/20	3
UNI6	Uganda	NGO (intl)	3/5/20	1
UNI7	Uganda	NGO (intl)	3/5/20	3
UNI8	Uganda	NGO (intl)	3/25/20	1
UNL1	Uganda	NGO (local)	3/6/20	2

Case studies

Table 2 lists the tools and approaches considered in this research that are present in each case study. Detailed descriptions of the individual tools and approaches are provided in Section 5. Where Table 2 does not identify a case study associated with a particular tool or approach, analysis of that element has been drawn from the desktop review and interviews.

The K1 field site focused on a maintenance insurance scheme provided by a civil society organization in one of Kenya's arid counties. The insurance scheme is subsidized by the civil society organization that operates as the provider, but participating communities pay an annual subscription to insure against repairs to their water system.

The K2 field site is part of a pipeline system divided into 14 water distribution points known as "Kiosk". Each Kiosk has a water board constituted and freely chosen by the system's users. In each town, the kiosk is responsible for managing a section of the whole distribution system. Users pay a flat rate per month for water service, although the frequency in the service distribution depends on the time of year. In the dry season, users must explore other water sources, including nearby water bodies, and purchase from private individuals or organizations.

T1 is focused on an umbrella organization in Tanzania that is organized as a trust. The trust was created and comprised of individual communities and their water leadership structures to govern a set of gravity fed piped water systems installed by an international NGO. The organization

Electronic Payment						
Information Dashboards						
Communication Platforms						

Focus group discussions

Table 3 provides details of the dates, locations, and composition of the 19 focus group discussions held across the six case studies.

Table 3. Focus group discussions (FGDs)

FGD Code	Country	Type	Gender Makeup	Project	Date
KL12	Kenya	Leaders	Mixed Group	K1	12/17/20
KL13	Kenya	Leaders	Mixed Group	K1	12/19/20
KU14	Kenya	Users	Mixed Group	K1	12/19/20
KU15	Kenya	Users	Mixed Group	K1	12/20/20
KM16	Kenya	Users	Mixed Group	K2	5/25/21
KM17	Kenya	Leaders	Women Only	K2	5/25/21
KM18	Kenya	Leaders	Mixed Group	K2	5/25/21
KM19	Kenya	Users	Mixed Group	K2	5/28/21
TLU1	Tanzania	Leaders and Users	Mixed Group	T1	7/16/19
TLU2	Tanzania	Leaders and Users	Mixed Group	T1	7/17/19
TLU3	Tanzania	Leaders and Users	Mixed Group	T1	7/18/19
TL4	Tanzania	Leaders	Mixed Group	T2	7/23/19
TU5	Tanzania	Users	Mixed Group	T2	7/23/19
TLU6	Tanzania	Leaders and Users	Mixed Group	T2	7/24/19
UL7	Uganda	Leaders	Mixed Group	U1	3/10/20
UU8	Uganda	Users	Women Only	U1	3/11/20
UU9	Uganda	Users	Mixed Group	U1	3/12/20
UL10	Uganda	Leaders	Mixed Group	U2	10/1/20
UL11	Uganda	Users	Mixed Group	U2	10/2/20

Appendix 3. GROWS Focus Group Discussion Guide

Thank you for agreeing to be a part of this discussion today. Our goal is to understand how you and other people in your community access water for daily needs.

Let's start by discussing the different ways that people in this community access water, both now and in the past.

1. What are the different ways that people in your community access water?
2. Do people access water for different purposes through different means? If so, why?
3. What factors determine the decision about where/how to access water (e.g., cost, convenience, etc.)?

Now, we want to ask you specifically about your experiences with [specific project].

4. Can you describe how this system works?
    a. Who are the actors?
    b. What is the user experience like?
    c. What is the cost?
    d. Is it convenient?
5. How many of you have direct experience accessing water through this project? [show of hands]
6. What are the benefits of accessing water through this project compared to alternatives now and in the past?
7. What are the downsides of accessing water through this project compared to alternatives now and in the past?

Accountability

8. In the community's view, who is ultimately responsible for this system?
9. Has the community or users encountered any problems in using this system?
    a. If so, how were those problems communicated to the service provider?
        i. Did it seem that the service provider responded to information about the problem from users?
    b. If so, how were those problems communicated to the government?
        i. Did it seem that the government responded to information about the problem from users?
10. Do you think that everyone pays for the full amount of water that they are using?
11. Have you heard about any tools or methods used for making sure that people do not cheat the system (contracts, fines, removal of privileges)?
    a. If so, who enforces these systems?
    b. If so, are these methods effective in making sure that no one cheats the system?
    c. Does it seem like some people are able to get around the rules?

Transparency

12. How do users access information about how the system is working at the community level?
    a. What is the role of different actors: government, village committees, residents, private sector?
13. Do users feel that they are well informed about the system?
    a. Is the information shared in way that is easy for users to understand and use?
14. In thinking about information shared from the service provider or government to the users, what types of information are they most likely to share?
    a. Are they more likely to share information about technical components than financial ones?
15. How has technology been used to share information, if at all?
    a. Is this type of information easier to understand than information provided without the help of technology?
16. Is mobile payment used in this system?

Trust

17. How reliable is the technology used in this system, if applicable?
18. How secure is the technology used in this system, if applicable?
19. How trustworthy does the community find the private service provider?
20. How trustworthy does the community find the government oversight of the project?
21. Who would need to be involved for the community to have greater trust in the system?
22. Has this community experienced anything in the past that affects the degree to which this project is trusted?
    a. Probe for past projects by the government, private sector, or NGO.
23. Are there certain members of the community who are more trusting or less trusting of this system?
    a. What kinds of factors affect how much someone trusts the system?

Equity
[Issues around inclusion for minority and vulnerable groups, including women, ethnic minorities, disabled, extremely poor, elderly, etc.]

24. Which type of people in this community do you think benefit the most from this [specific project] water access?
25. Which type of people in this community have the most influence in how this system works?
26. Are there specific requirements in this project for including people who might otherwise not be included?
    a. What are the requirements?
    b. What is the community's perception of this requirement?
    c. Does this requirement actually lead to greater inclusion, or just look like it does?
27. How do you think that the visible inclusion of different segments of society would affect the community's perception of the project?

a. Would including women in decision making, for example, improve or harm perceptions of the project?

28. Do you think that management and government are equally responsive to feedback from all users?

Appendix 4. GROWS Semi-Structured Interview Guide

Respondent Background

1. Please describe your current professional position.
2. Describe your experience in water and other service provision.

Background on Water Access

1. Can you describe the different means through which regular people access water?
    a. What are the benefits and drawbacks of each source of water?
    b. What proportion (roughly) of the population (in this area) accesses water through each of these means?

You were selected to be interviewed based on your knowledge of [specific project]. With that project in mind, I would like to ask you some specific questions about how it functions/functioned.

Accountability

1. What kinds of problems have arisen with this project?
2. How are such problems with the system are handled?
3. How is feedback for providers and/or the government oversight body obtained from users?
4. How is feedback incorporated into practices and policies, if applicable?
5. Perception of how feedback is received and used by providers
6. User perception of willingness and ability to pay for water
7. Perception of providers on whether or not there is full water coverage and full payment by water users in the system
8. Any experience with mechanisms used to enforce accountability, e.g. contracts, fines, removal of privileges – do such mechanisms work in practice? Does the regulatory environment support accountability, e.g. what support is available for development and enforcement of service contracts?
9. To what extent is accountability a function of personal relationships? What is the role of government and community structures (e.g. village council) in enforcement?

Transparency

1. Types of information that is likely to be shared, types that are likely to be kept opaque – is transparency a function of the kind of information (e.g. financial versus technical)
2. Descriptions of the means by which information is shared with users and different stakeholders (government, village committees, residents, private sector, etc)
3. Perceptions of the accessibility and usability of shared information
4. Use of digital technologies to improve transparency – types, frequency of use, effectiveness, expense, perception of value
5. Use / role of mobile banking in transparency – any experience around this?

Trust

1. Comments on trust from non-users related to: reliability and security of technology associated with the water systems; cost of water from the system; providers, etc.
2. Requests for how much users/non-users would trust various statements from providers and why. If they do not trust the statement, what would they assume was true instead? Who would they trust instead?
3. Stories on what past experiences may influence how trusting people are of current providers and how they think providers could become more trustworthy (where "provider" could be local government, private service provider, NGO or other).
4. Any stories or experience with private service provision in rural contexts – electricity, agriculture, health or WASH. Are communities more likely to trust private providers in one context but not another? Are there specific characteristics of private service providers that make them more likely to be trusted?
5. Are there any socioeconomic and/or sociocultural norms that influence trust of private service providers and willingness to engage with service providers?

Equity

1. Visibility of vulnerable / minority groups in decision making processes (including but not limited to minority ethnic groups, women, disabled, extremely poor, elderly) – mentioned in policy and also done in practice
2. Any experiences with user feedback or project success being related to gender status or other minority group status.
3. Perceptions on how management would react to varying feedback from diverse sources (disaggregated by COWSOs, providers, government)
4. The effects of existing incentives and requirements for equity and how this can be improved

Appendix 5. GROWS Verbal Consent: Focus Group Discussion

Hi, thank you very much for agreeing to take some time to discuss with me about the role of private service provision in community water access in [Kenya/Tanzania/Uganda]. This study is being conducted by The Ohio State University which is in USA. Our goal is to better understand any challenges to collaborations between private service providers and community water management groups.

This discussion is expected to last for about one hour and a half or so and all the information that will be collected will be kept confidential and anonymous. To ensure that all information collected is accurate, our discussions will be recorded using an audio recorder. However, to ensure protection of your privacy and confidentiality your name or any other identifying information will not be included in the recordings. All the audio recordings will be destroyed after the recordings have been transcribed. Your de-identified information may be used or shared with other researchers without your additional informed consent. While we ask other group participants to keep the discussion in the group confidential, we cannot guarantee this. Please keep this in mind when choosing what to share in the group setting.

Your participation in this discussion is voluntary as such you are free to stop participating whenever you feel like stopping. You are also free to decline to answer any questions you do not wish to answer. By participating in the study, you will not be provided with any incentives, but neither will your failure to participate or terminate the interview lead to any repercussions from the research team or OSU. As such, there are no risks or benefits to participating in this interview. By agreeing to participate in this discussion, you agree that you have been informed of your rights as a research participant and are participating of your own free will.
Thank you, we can now start.

Appendix 6. GROWS Verbal Consent: Interview

Hi, Thank you very much for agreeing to take some time to discuss with me about the role of private service provision in community water access in [Kenya/Tanzania/Uganda]. This study is being conducted by The Ohio State University which is in USA. Our goal is to better understand any challenges to collaborations between private service providers and community water management groups.

This interview expected to last for about one hour or so and all the information that will be collected will be kept confidential and anonymous. To ensure that all information collected is accurate, our discussions will be recorded using an audio recorder. However, to ensure protection of your privacy and confidentiality your name or any other identifying information will not be included in the recordings. All the audio recordings will be destroyed after the recordings have been transcribed. Your de-identified information may be used or shared with other researchers without your additional informed consent.

Your participation in this interview is voluntary as such you are free to stop participating whenever you feel like stopping. You are also free to decline to answer any questions you do not wish to answer. By participating in the study, you will not be provided with any incentives neither will your failure to participate or terminate the interview lead to any repercussions from the research team or OSU. As such, there are no risks or benefits to participating in this interview. By agreeing to answer the following questions you agree that you have been informed of your rights as a research participant and are participating of your own free will.
Thank you, we can now start.

Tanzania Quantitative Findings

Governance Research on Water Systems

Endline Survey Report

Produced by

Global Partners for Development

for

The Global Environment & Technology Foundation

&

The Global Water Institute

at

The Ohio State University

November 2021

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APPENDICES:

This report provides an analysis of governance indicators at water systems in 27 rural villages in Singida, Tanzania. The evaluation is commissioned by the Governance Research of Water Systems (GROWS) program studying the governance of water systems in Kenya, Tanzania, and Uganda. A partnership for this evaluation exists between The Global Environment and Technology Foundation (GETF), Ohio State University's Global Water Institute (GWI), and Global Partners for Development (GPFD), with assistance from the local and federal governments of the United Republic of Tanzania. This report uses survey data gathered in May 2019, November/December 2020, and June 2021 through targeted key informant and water user interviews. Analyses include a before and after evaluation from baseline to endline, a comparison of changes at midline and endline, as well as a cross-sectional evaluation at endline. Results show correlational patterns among user demographics, water system features, and governance indicators as well as changes over time on indicators of accountability, transparency, trust, and equity. Main takeaways from the evaluation include the importance of in-person mass communication and transparency of information from service providers to water users as well as the fact that simple system functionality is key to user satisfaction.

I. Introduction

This field evaluation is intended to enable a better understanding of the governance impact around new innovations in public sector engagement methods. This report is a component of Activity 2: Field Evaluation by Global Partners for Development (GPFD) for the Governance Research of Water Systems (GROWS) program led by the Global Environment and Technology Foundation (GETF).

Landscape of WASH Governance

Access to potable water and hygiene facilities remains a key public health issue around the globe. An estimated 785 million people lack access to clean water, and 701 million people lack access to improved sanitation facilities[1]. Inadequate access to proper water, sanitation and hygiene (WASH[2]) is linked to health problems including diarrhea, hepatitis A, cholera, typhoid, dysentery, intestinal helminthes, malaria, and trachoma. Meta-analyses of WASH projects have consistently reported positive effects, particularly in reducing childhood rates of diarrhea.

In addition to health risks, vulnerable populations are also burdened by the severe economic and social costs associated with lack of access to water. In 2011, the World Health Organization attributed global economic losses of USD$260 billion to

[1] Centers for Disease Control & Prevention. <https://www.cdc.gov/healthywater/global/wash_statistics.html>.

[2] Defined by the WHO as the provision of safe water for drinking, washing and domestic activities and the safe removal of waste (toilets and waste disposal) in addition to promoting activities to promote protective behavioral practices amongst populations exposed to unsafe water and inadequate sanitation facilities

the reduced productivity of disease-affected populations and the opportunity costs of time spent collecting water. The Global Water Strategy[3] notes that without sustainable supplies of water, many countries will suffer from increased poverty and disease, food and energy insecurity, economic dislocations, and cross-border and regional tensions.

Women are disproportionately burdened by a lack of reliable, safe water[4]: women almost always bear responsibility for its collection; maternal mortality due to water-related disease and infection is extremely high; women are usually responsible for caring for family members afflicted with water-related illness; girls are often pulled out of school once they reach puberty due to a lack of menstrual hygiene facilities; and women and girls often face sexual assault and other forms of violence when fetching water, particularly over long distances. Ensuring reliable, affordable and sustainable provision of safe water greatly reduces all of these life-changing issues[5].

Rates of clean water access have not improved at the pace required to meet the Sustainable Development Goals[6]. This trend can be attributed to investment that does not match the demand due to population growth and a rate of infrastructure failure that has hovered at 30-40% for the past 20 years[7], especially in rural, economically marginalized communities in Sub-Saharan Africa. An estimated 60% of Tanzania's population has access to basic drinking water services[8] (defined as access to improved drinking water within 30 minutes round-trip). In rural areas, the percentage is even lower than the national average at 45%.[9]

Inadequate governance contributes greatly to these challenges. Sub-Saharan nations often do not have the necessary monitoring procedures[10] in place to track

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[3] U.S. Government. 2017, *Global Water Strategy*, Available from: <https://www.usaid.gov/sites/default/files/documents/1865/Global_Water_Strategy_2017_final_508v2.pdf>.
[4] WaterAid. 2011, *Off-track, off-target: Why investment in water, sanitation and hygiene is not reaching those who need it most.*
[5] See, for example: International Business & Technical Consultants, Inc. 2013, *Performance evaluation for the integrated water, sanitation and hygiene (iWASH) program: Final report*, produced for USAID/Tanzania.
[6] Dickinson, N., F. Knipschild, P. Magara, and G. Kwizera. 2017, *Harnessing water point data to improve drinking water services*, WASHNote, July 2017, Available from: <https://www.ircwash.org/sites/default/files/harnessing_ waterpoint_data_to_improve_drinking_waterservices_-_white_paper.pdf>.
[7] Rural Water Supply Network. 2014, *Water Point Mapping: Indicators, pump functionality, accuracy of GPS, using and sharing data*, Synthesis of discussion and activities May and June 2014, Available from: <http://www.rural-water-supply.net/_ressources/documents/default/1-588-2-1406117553.pdf>.
[8] WHO/UNICEF Joint Monitoring Programme for Water Supply, Sanitation and Hygiene (JMP). 2020, *Household Data – United Republic of Tanzania 2020 – Service Levels,* Available At: https://washdata.org/data/household#!/dashboard/new
[9]Lifewater. October 23, 2019, *The Tanzania Water Crisis: Facts, Progress, and How to Help,* Available At: <*https*://washdata.org/data/household#!/dashboard/new>
[10] Fierro, A., E. Nelaj, E. Mwendamseke, and L. Traini. 2015, 'Rural water supply management: An empirical study on COWSO strategy implementation, private sector participation and monitoring systems', *Second International Conference on "Advancement of geography for the people, natural resources and development"*,

infrastructure operational status or resource sustainability, nor do they have or provide sufficient funding and guidance to local government authorities to ensure long-term operability. The community management model[11], championed as the solution for rural water services and community "buy-in" since the end of the 20th century, frequently places an unmanageable burden on communities who do not have the technical, financial or management capacity to ensure system sustainability. These models most often operate with little policy or guidance[12]. All too frequently, they result in corruption of water user fees that should be spent on water system maintenance, repairs and capital improvements.

In many sub-Saharan African nations, policymakers are increasingly looking towards the private sector to deliver rural water services[13]. However, a lack of accountability and transparency mechanisms within rural communities and inadequate oversight on the part of local government authorities discourage the nascent private water sector from engaging in rural water service provision. When cost recovery is not assured, service providers have little incentive to ensure reliable services. This completes an environment in which rural communities are solely responsible for their own water systems, the systems fail, remain in disrepair, and clean water access targets are not met.

However, there is optimism[14] for transforming the rural water sector: markets do exist for high quality water services in rural areas[15], if each actor is held accountable for their role. There is a great opportunity to improve local-level governance around rural and peri-urban water services by encouraging growth in accountability mechanisms among service providers. At the same time, water can be used as a vehicle to strengthen the governance relationships between local, regional and national governments and communities.

Tanzania, Available from: <http://www.academia.edu/24377886/RURAL_WATER_SUPPLY_MANAGEMENT_AN_EMPIRICAL_STUDY_ON_COWSO_STRATEGY_IMPLEMENTATION_PRIVATE_SECTOR_PARTICIPATION_AND_MONITORING_SYSTEMS>.

[11] Klug, T., K. F. Shields, R. Cronk, E. Kelly, N. Behnke, K. Lee, and J. Bartram. 2017, 'Water system hardware and management rehabilitation: Qualitative evidence from Ghana, Kenya, and Zambia', in *International Journal of Hygiene and Environmental Health*, **220**(3):531-538, doi: 10.1016/j.ijheh.2017.02.009.

[12] Nkongo, D. 2009, *Management and regulation for sustainable water supply schemes in rural communities*, WaterAid Tanzania, Available from: <https://pdfs.semanticscholar.org/571b/25965b58c79bb63cedf6933aa0f6182fb530.pdf>.

[13] Foster, T. 2012, *Private sector provision of rural water services: A desk study for Water For People*.

[14] Kleemeier, E., and J. Narkevic. 2010, *Private operator models for community water supply: A global review of private operator experiences in rural areas*, Water and Sanitation Program (WSP) Rural Water Supply Series, Field Note February 2010, Available from: <http://www.wsp.org/sites/wsp.org/files/publications/Private_OperatorModelsforCommunity_WaterSupply.pdf>.

[15] Sy, J., and R. Warner, with J. Jamieson. *Tapping the markets: Opportunities for domestic investments in water and sanitation for the poor*, Directions in Development, Washington, D.C.: World Bank, doi: 10.1596/978-1-4648-0134-1. License: Creative Commons Attribution CC BY 3.0, Available from: <https://openknowledge.worldbank.org/bitstream/handle/10986/16538/9781464801341.pdf?sequence=1&isAllowed=y>.

II. GROWS Program Overall

The goal of the GROWS program is to identify and disseminate information on innovative governance models and tools that can help accelerate the elimination of extreme poverty in sub-Saharan Africa. The research program is jointly cost-shared and implemented by GETF, the Global Water Institute (GWI) at The Ohio State University, and GPFD.

This quantitative research seeks to answer the following research questions:

i. What factors impact governance of water systems and what are some ways that communities can hold water service providers accountable? For example, what is the correlation between governmental, operational or service agreements and sustainable water supplies?
ii. What governance structures or market-derived tools could enable service providers to hold rural communities accountable for payments?

Note: The research questions were altered after the initial proposal due to an out of our control decision by the Tanzanian government to shift away from implementation of private operators at the treatment sites. These changes will be discussed more in subsequent sections.

In this research, we use the term, 'governance', to reference the set of systems that are involved in decision-making about water management and water service delivery[16]. The goal of GROWS research is to identify and disseminate innovative governance models, tools, and conditions that help accelerate good governance practices in East Africa and ultimately contribute to water security and the elimination of extreme poverty.

"Governance, as defined by the United Nations Development Programme, refers to the exercise of economic, political and administrative authority to manage a country's affairs at all levels. It involves the process and capacity to formulate, implement and enforce public policies and deliver services."[17]

Answering the two research questions above contributes directly towards "Development Objective 2: Foster greater accountability of institutions and leaders to citizens and the law" and "Development Objective 4: Improve development outcomes through the integration of democracy, human rights and governance

[16] UNDP Water Governance Facility/UNICEF. 2015, *WASH and Accountability: Explaining the Concept*, Accountability for Sustainability Partnership: UNDP Water Governance Facility at SIWI and UNICEF. Stockholm and New York. Available from <http://www.watergovernance.org/>.
[17] United Nations Development Programme, 'Governance for sustainable human development: A UNDP policy document', UNDP, <http://mirror.undp.org/magnet/policy/glossary.htm>, accessed 15 January 2019.

principles and practices across USAID's development portfolio" of the *USAID Strategy on Democracy, Human Rights and Governance*[18]. This research will also contribute towards "Strategic Objective 4: Governance" in the *Global Water Strategy*.

To answer the two research questions, a three-pronged approach was executed:

1) *Activity 1:* A *Landscape Analysis* to review existing evidence and knowledge around local-level governance models for water services and the current role of private sector providers;
2) *Activity 2: Field Evaluation* of local governance mechanisms and private sector engagement around new water services projects in Kenya, Tanzania and/or Uganda; and
3) *Activity 3: Recommendations* and a blueprint for wider implementation.

This report is a deliverable of *Activity 2: Field Evaluation*.

Field Evaluation Team

Activity 2 required personnel with varied experiences and competencies, strong relationships between U.S.-based and Africa-based teams, and partnerships between the public and private sectors, civil society and academia. Each team member either has staff in-country or collaborates very closely with locally-based organizations in study countries to ensure meaningful engagement with rural communities and government authorities at multiple levels.

Program Design & Implementation Managers (Global Environment & Technology Foundation and The Ohio State University): Plan approval; Report approval; MEL results dissemination. The Global Environment and Technology Foundation (GETF), which serves as the USWP's secretariat, has more than 30 years' experience in developing public-private partnerships to implement programs in support of USAID priorities in Africa. This project capitalizes on GETF's prior and existing projects in East Africa and its domain knowledge. GETF currently manages two Global Development Alliance partnerships for USAID and Coca Cola – the Water and Development Alliance and Project Last Mile. The Ohio State University's Global Water Institute (GWI) served as lead institution for the research team, led the landscape analysis, and directed the field monitoring and evaluation work. GWI is currently executing innovative sustainable systems projects in Tanzania in collaboration with the Government of Tanzania, USAID and The Coca-Cola Foundation.

GPFD Principal Investigator (Director of Programs & Evaluation): Plan development; Data collection and report planning; Staff training; Staff oversight; Report editing and approval. GPFD led the field evaluation efforts. GPFD has been practicing community-driven development in east Africa for nearly 30 years and brings extensive expertise in the design and application of robust, cost-effective

[18] U.S. Government. 2013, Available from: <https://pdf.usaid.gov/pdf_docs/pdacx557.pdf>.

research, monitoring, and evaluation systems.

In-Country Manager (Monitoring & Evaluation Manager, GPFD Tanzania): Staff training; staff oversight; Data collection and reporting management

Enumerator(s) (GPFD): Data collection

III. Description of Report: Governance of Water Systems in Singida, Tanzania

As part of *GROWS Activity 2*, this report provides data on indicators of accountability, transparency, trust, and equity before and after the implementation of a new system of water governance in Tanzania. It also includes a cross-sectional evaluation to show the influence of various factors on governance indicators at endline. All data were collected in Singida, Tanzania.

GPFD planned to conduct a difference-in-difference and propensity-score matching mixed-methods evaluation to measure the impact of new private operators at half of the water sites in the study. The study was meant to include a control group and both quantitative surveys and qualitative focus groups. This was the goal before, during, and after the baseline surveys were completed in 2019. However, in the time period between the baseline and endline surveys, the Tanzanian government passed new legislation and implemented a new governance mechanism for water systems nationwide.

The legislation established a new federal agency called the Rural Water and Sanitation Agency (RUWASA). The Community Owned Water Supply Organizations (COWSOs) that previously oversaw water systems were changed to Community-Based Water Supply Organizations (CBWSOs).

With this new emphasis on management by RUWASA, private ownership of water systems was no longer politically supported by the national government and the intended evaluation of systems run by private operators was no longer possible. In response, the research pivoted to evaluate the impact of the shift from local oversight alone to additional federal supervision through RUWASA oversight at the District and Regional levels.

At baseline, prior to the 2019 law, communities managed their water systems through COWSOs or through water committees within village leadership. These water committees managed all finances through village bank accounts and reporting systems aligned with village, ward, and district reporting.

The 2019 law was enacted to ensure additional oversight by multiple levels of government and hold the newly established CBWSOs accountable by RUWASA and

village leadership. The law put into place many requirements for how CBWSOs govern water systems. For example:

- All CBWSOs are responsible for submitting hard-copy monthly and quarterly reports to the RUWASA District Water Manager (DWM) and the District RUWASA representative including financial details
- All maintenance issues must be reported to RUWASA, not to private organizations, and RUWASA technicians are responsible for evaluating problems and completing repairs, moving responsibility for water system maintenance and success further into the public sector.
- All CBWSOs are required to have a bank account that is accessible and reviewed by RUWASA. Previously, village leadership was responsible for managing the maintenance and accounts of water systems within the village.
- CBWSO members are nominated in village meetings facilitated by the Village Chair and Village Executive Officer (VEO). Required CBWSO positions include Chairman, Secretary, Accountant, Technician, and general committee members. Committee member positions must include an individual representing the VEO, a general village representative, and a representative for village health systems including any dispensaries or health centers. At least one representative in the CBWSO must be a woman.
- RUWASA is responsible for providing a full-time accountant and technician per CBWSO. Salaries for these staff are intended to come from CBWSO revenue from water sales.[19]

These changes in governance structure are evaluated in this report, and while no causation can be assumed given the lack of an experimental statistical model, this report provides interesting correlations and reveals many significant changes from baseline to endline.

In addition to the baseline and endline surveys, a midline survey was also conducted in November/December 2020 using the same validated survey that was used at baseline. The midline survey was initially planned as the endline, but an extension was provided for the GROWS program allowing time for a more robust endline to be held during the same time of year as the baseline. This extension ensured the ability to provide longer term results and to control for seasonality more fully. This narrative focuses on changes between the baseline and endline with a section to identify any changes that might be due to seasonality or other contextual factors from midline to endline. This highlight reveals how results can shift over time and

[19] These are meant to be full time positions with a salary that comes from the CBWSO. At the time of the endline surveys, the CBWSOs reported that they pay what they are able to based on the revenue from the water source. At least one site reported that the selected accountant had left because the pay was not sufficient.

along with weather changes, emphasizing the importance of continued research. The full results from the midline evaluation can be found in Appendix 1.

This report provides primary data, lessons learned, insight into best practices and potential governance models, and recommendations that can be shared throughout the development community, including with USAID, other U.S. government agencies, NGOs, country line ministries, and donors. The work identifies opportunities for scaling these learnings to other geographies, starting with Global Water Strategy countries, to multiply the impact of the initial investment and USAID's other programming.

Research Methodology

This impact evaluation provides insights on four main governance outcomes: 1) accountability; 2) transparency; 3) trust; and 4) equity. The evaluation is set up to inform what factors correlate with improved governance outcomes.

There are two methodologies present in this report. This study utilized a before and after, pre-post methodology to identify changes that occurred in the set of water systems surveyed at baseline, midline, and endline. The data include responses from more than 900 individuals from the same number of households. In addition, cross-sectional data show correlations between various conditions and governance outcomes.

In winter of 2018, GPFD developed a Monitoring and Evaluation (M&E) Plan for the GROWS field evaluation, which can be found in Appendix 2. This Plan was intended to standardize GROWS data collection, analysis, and reporting such that data collection was efficient, data analysis was robust, and data reporting had accuracy, validity, and integrity.

The M&E Plan laid out monitoring and evaluation indicators to further define impact on the four main outcomes. Equity indicators were disaggregated by gender of respondent and whether or not the respondent reported themselves to have a disability that affected their ability to fetch water. All indicators were separated into quantitative and qualitative categories, and it is mainly the quantitative indicators that are included in this report. Quantitative indicators provide numerical data through multiple-choice survey responses and the analysis of any available official documents. Qualitative focus groups were not held due to COVID-19 restrictions, but qualitative responses within the quantitative surveys are reported where applicable throughout this report.

GPFD developed survey tools for this impact evaluation, including a survey for village leadership (Village Executive Officers and Village Chairpersons), COWSOs (at baseline) and CBWSOs (at midline and endline), and water system users.

The surveys were validated by Tanzanian GPFD staff living in Singida and Arusha.

GPFD's staff trained enumerators in best practices for administering the questionnaires and used input from trusted local sources to make any necessary cultural and language-based adjustments to the survey. Using local enumerators was considered essential to making the questionnaire relevant to local conditions, overcoming language barriers, creating a comfortable environment for respondents, and respecting cultural norms. The questionnaire was translated from its original form and administered in Swahili.

Respondents were informed that their answers would be kept confidential and that their answers would not affect the likelihood of project implementation in their community. Enumerators were asked to note anything that might affect the quality of the data recorded such as respondent confusion or discrepancies between information reported and information found in records.

Data was collected via hand-held tablets. Software from Mobenzi, an online platform that can be populated without an internet network, was used. The baseline survey took place in April 2019 and gathered responses from 27 individuals in village leadership, 27 COWSO members, and 903 water system users.

The same conditions were held for an endline survey in June 2021. For the endline survey, 53 village leaders, 24 CBWSO members, and 1,625 water users were surveyed. A midline survey was also held in November/December 2020, surveying 27 village leaders, 16 CBWSO members, and 1550 water users. Additional demographic details can be found in Appendix 3.

Users were surveyed at the water point, and all possible COVID-19 precautions were taken throughout. A full site list is below:

Site #	District	Ward	Village
1	Singida DC	Ikhanoda	Mjughuda
2	Singida DC	Ilongero	Ilongero
3	Singida DC	Mtinko	Mpambaa
4	Singida DC	Msisi	Msisi
5	Singida DC	Maghojoa	Ghata & Mwachambia
6	Singida DC	Mgori	Mgori, Sughana & Nkhora
7	Singida DC	Ughandi	Laghanida
8	Singida DC	Ughandi	Ughandi 'A'
9	Singida DC	Ngimu	Ngimu
10	Singida DC	Merya	Mwarufyu & Mvae
11	Singida DC	Msange	Msange
12	Singida DC	Msange	Msange
13	Singida DC	Maghojoa	Mipilo & Maghojoa

14	Singida DC	Itaja	Itaja
15	Singida DC	Ngimu	Pohama
16	Singida DC	Kijota	Kijota & Mtinko
17	Singida DC	Ikhanoda	Ikhanoda & Msimihi
18	Singida DC	Mwasauya	Mdilu & Mwasauya
19	Singida DC	Makuro	Matumbo & Mikuyu

The full surveys can be found in Appendix 4.

Empirical Approach

As mentioned above, analysis of the evaluation data was completed in two stages. First, a pre-post regression analysis was conducted to estimate the impact of the intervention on GROWS's targeted outcomes. Then, an exploratory regression analysis was done for several dependent and independent variables.

The pre-post analysis involved creating a dummy binary variable to represent the baseline (0) and endline (1). Given the objective of the study to estimate the effect of outcomes at the end of the intervention (endline), the baseline used a reference group. The newly created variable was used as the independent variable and outcomes as the dependent variables. For ease of interpretation, a linear probability regression model was selected in determining the relationship between the dependent and independent variables.

$$Y_i = \alpha + \beta T_i + \gamma t_i \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where α = the constant variable

β = specific effect during the endline

Y_i = Program Outcome

Because cofounders in the form of socio-demographic characteristics could potentially affect the achievement of outcomes, the influence of these cofounders was controlled in a multivariate regression model. Impact estimates for this model was derived as:

$$Y_i = \alpha + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \beta_k X_{ki} + \cdots \gamma t_i \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Where α = the constant variable

β = specific effect during the end line

X_i = cofounding variables included in the model
Y_i = Program Outcome

The analysis included a bootstrapping command (by 1,000 replications) into the multivariate regression model in response to smaller sample sizes for the village and water committee key informant surveys. This technique created extrapolated impact estimates with the assumption that the sample size was increased to 1,000 but the variance in the original dataset remained same. Findings were presented in tables as regression coefficient, standard error, confidence interval and p-value (see Appendix 1).

The second stage of analysis was used to decipher correlations between specific indicators of governance and perceived effectiveness and trustworthiness in the eyes of water users. This exploratory regression analysis included regressing several independent variables by dependent ones to assess significance of association. This was a univariate model and used a linear probability model.

All analyses were conducted in STATA 13.0. Both systems are password-protected and are not shared outside the team. There was no paper-based data collection or analysis. Statistical significance was considered when p-values were less than or equal to 0.01 in this report.

IV. Indicators of Success

This report focuses on four main governance outcome categories: accountability, transparency, equity, and trust. Unfortunately, qualitative focus groups were not held due to COVID-19, so it is recommended that continued research be done to gather the qualitative outcomes listed here. All quantitative and qualitative outcomes are further defined below.

Accountability Indicators
The United States Agency for International Development (USAID) defines accountability as "the systems, procedures and mechanisms that ensure that public officials and institutions perform their stated duties and uphold their responsibilities to the public while imposing restraints on their power and authority and providing for redress or sanction when these duties and responsibilities are not met."[20] UNICEF states that "accountable actors…provide and demand better water governance —for better services. Supporting accountability within the service delivery framework is about improving the quality of relationships between

[20] United States Agency for International Development, 'USAID Strategy on Democracy, Human Rights and Governance', USAID, Washington, D.C., June 2013, p. 19, <https://www.usaid.gov/sites/default/files/documents/1866/USAID-DRG_fina-_6-24-31.pdf>, accessed 15 January 2019.

stakeholders. Accountable States, service providers and users assume responsibility and answer for their actions—all key elements for breaking institutional inertia and making the institutional arrangements and systems for service delivery work for all."[21]

As it relates to GROWS research, indicators of high accountability will show that providers consistently demonstrate a commitment to providing reliable, safe water sources. In order to ensure this, there must be internal and external structures in place that promote accountability among providers and between providers and users. This study will measure the mechanisms in place to ensure accountability as well as the degree to which users perceive that water system providers are accountable to them. This analysis measures levels of community engagement and the extent to which providers are responsive to user feedback. Measures of accountability also include the accountability of users in their payments for water use.

We use 'accountability' to mean social, political and financial mechanisms that instill responsibility for the respective roles of different stakeholders in rural water services. Such mechanisms include: public expenditure tracking, two-way communications channels, public access to information, professional standards for service delivery, and monitoring and reporting[22].

Quantitative indicators for this outcome include:

1. Number of times per year feedback is requested through official channels
2. Number of recorded feedback communications from water user to provider
3. Number of recorded feedback communications from water committee and user to village government
4. Percentage of users who provided feedback
5. Percentage of users aware of opportunities to provide feedback
6. Number of times in the past six months that actions were taken in response to user feedback
7. Number of user complaints about a service in the previous six months that included information about who is responsible for those actions
8. Percentage of complaints reported to have been addressed
9. Number of times accountability is mentioned in written employee policies

System Functionality

10. Average percentage of users who paid total amount owed for water in full
11. Percentage of community members who consistently use the water service

[21] UNDP Water Governance Facility/UNICEF, WASH and Accountability: Explaining the Concept, Accountability for Sustainability Partnership, Stockholm and New York: UNDP Water Governance Facility at SIWI and UNICEF, 2015, http://www.watergovernance.org/, accessed 28 August 2019., accessed 28 August 2019.

[22] Ibid.

12. Average number of days system was available to consumers in the last month
13. Average number of days between system problem and resolution in last six months
14. Average number of times water quality is tested per year and percentage of sites that report results to users

Qualitative indicators for this outcome include:

15. Description of how problems with the system are handled
16. Descriptions of the means by which feedback is obtained from users
17. Perception of how feedback is received and used by providers
18. User perception of willingness and ability to pay for water
19. Perception of providers on whether or not there is full water coverage and full payment by water users in the system

Transparency Indicators

USAID describes proper transparency as creating "an environment where governments and public officials engage in the clear disclosure of rules, plans, processes and actions in a form that is readily accessible to all. Transparency promotes accountability by providing the public with information about what the government is doing".[23]

For the purposes of GROWS research, transparency is further defined as the consistent availability of information to the public regarding all financial, political, and managerial transactions related to water systems so that these actions are open to public scrutiny and stakeholder engagement. This study measures the mechanisms in place to ensure transparency and perceived levels of provider openness among users.

Quantitative indicators for this outcome include:

1. Number of official communication structures that promote two-way communication between users and providers
2. Number of mass communications from providers to users in the previous six months
3. Number of mass communications that included information about how money is spent

Qualitative indicators for this outcome include:

1. Descriptions of the means by which information is shared with users
2. Perceptions of the accessibility and usability of shared information

Equity Indicators

[23] Ibid, p. 38.

The World Bank states that equity means "that individuals should have equal opportunities to pursue a life of their choosing and be spared from extreme deprivation in outcomes".[24]

This study defines equity as equality of opportunity as well as equality of outcomes associated with not only use of the water system but also level of participation in the governance of that system.

Quantitative indicators for this outcome include:

1. Number of times equity is mentioned in written employee policies
2. Percentage of women who felt that the system served their daily needs
3. Degree to which feedback participation of women mirrors the participation of men
4. Degree to which participation of disadvantaged or minority groups mirrors the percentage of this group in the total population
5. Percentage of respondents with a disability who felt the system served their basic needs

Qualitative indicators for this outcome include:

6. Perceptions on how management would react to varying feedback from diverse sources (disaggregated by COWSOs, providers, government)
7. The effects of existing incentives and requirements for equity and how this can be improved

Trust Indicators

The Organisation for Economic Co-operation and Development explains that "trust is important for the success of a wide range of public policies that depend on behavioural responses from the public. Trust is necessary to increase the confidence of investors and consumers. Trust is essential for key economic activities, most notably finance. Trust in institutions is important for the success of many government policies, programmes and regulations that depend on cooperation and compliance of citizens".[25]

This study further defines trust as confidence in the reliability of water service providers to fully maintain systems and to be motivated by the best interest of the end user in mind. Trust is defined as confidence in the reliability and perceived security of technology associated with the water systems. Indicators related to

[24] World Bank Group, 'World Development Report: Equity and development', World Bank, Washington, D.C., 2006, p. 2, <http://documents.worldbank.org/curated/en/435331468127174418/pdf/322040World0Development0Report02006.pdf>, accessed 16 January 2019.
[25] Organisation for Economic Cooperation and Development, 'Trust in Government', OECD, Paris, 2018, <http://www.oecd.org/gov/trust-in-government.htm>, accessed 15 January 2019.

willingness to pay are included because perceptions of fairness, process legitimacy and credibility matter in people's willingness to pay for a good or service.[26]

Quantitative indicators for this outcome include:

1. Percentage of users who feel that their concerns are consistently addressed
2. Percentage of users who trust that the technology associated with the water systems is secure and reliable
3. Percentage of users who think the cost of water from the system is fair
4. Percentage of users who think that their payments for water are used appropriately
5. Percentage of users who expect the system to be working one year from now
6. Percentage of users who believe that water service providers care about them

Qualitative indicators for this outcome include:

1. Comments on trust from non-users related to: reliability and security of technology associated with the water systems; cost of water from the system; providers, etc.
2. Requests for how much users/non-users would trust various statements from providers and why. If they do not trust the statement, what would they assume was true instead?
3. Stories on what past experiences may influence how trusting people are of current providers and how they think providers could become more trustworthy

This report shares data collected for the quantitative indicators and includes some qualitative data related to these indicators based on additional information shared by informants during surveys.

V. Findings

Demographics of respondents and findings for the before and after study as well as the cross-sectional study are provided in this section. For the purposes of this report, 'service providers' refers to up to three water system governing bodies – the village leadership, the water committee, and RUWASA. In addition, in this report the term 'water committees' refers to both COWSOs at baseline and CBWSOs at endline.

[26] The World Bank Group, 'World Development Report: Governance and the law', ch. 6, World Bank, Washington, D.C., 2017, p. 171, <https://openknowledge.worldbank.org/bitstream/handle/10986/25880/9781464809507_Ch06.pdf?sequence=43&isAllowed=y>, accessed 16 January 2019.

Demographics

The demographic breakdown of the individuals surveyed at endline and baseline are as follows:

Water System Users	Endline	Baseline
Total User Respondents	1,625	899
Total Men	824	461
Total Women	801	438
Total Heads of Household	1,022	576
Total Responsible for Water Collection	1,096	616
Total Disabled	88	14
# Respondents 0-17	44	0
# Respondents 18-24	87	54
# Respondents 25-35	325	208
# Respondents 36 - 50	585	382
# Respondents 51 - 65	424	217
# Respondents 65+	160	38

Village Leadership	Endline	Baseline
Village Respondents	53	27
Men	50	24
Women	3	3
Executive Officers	25	7
Chairperson	24	19
Secretary	4	0
Committee Member	0	1
Age 25 – 35	6	4
Age 36 – 50	29	8
Age 51-65	18	12
Age 65+	0	3

Water Committee Members	Endline	Baseline
Respondents	24	22
Men	18	18
Women	6	4
Chairperson	17	9
Secretary	6	8
Treasurer	1	2

Age 25 – 35	4	2
Age 36 – 50	4	13
Age 51 – 65	15	5
Age 65+	0	0

The enumerators reported that the increase in respondents at endline is related to water user trust at endline. They stated that it took much more time to convince water users to complete the surveys at baseline; however, at midline and endline everyone was familiar with the process, so enumerators were able to collect more responses per day. Full details of respondent demographics by site are available in Appendix 3.

Before and After Evaluation Results – Baseline to Endline

Primary indicator results are presented for endline data, and a chart is included for each indicator to show more detail in the change from baseline to endline. Details on results broken down further by site can be found in Appendix 5.

A note on the impact of COVID-19 on results: Until summer of 2021, the Tanzanian government did not acknowledge COVID-19 or require any changes in the activities of its citizens or government officials. While there were no official changes, local and regional leaders may have needed to adjust their priorities away from water system support based on demands on health centers and other effects of COVID-19.

Accountability

Quantitative indicators for this outcome at baseline and endline were analyzed, and the changes over time are provided below. The Accountability outcome category is divided in the subcategories of 'feedback' and 'system functionality'.

Feedback

1. Number of times per year user feedback requested through official channels

46

Endline	Total CBWSO	8
	Total Village	38
	Total Overall	46
Baseline	Total COWSO	3
	Total Village	13
	Total Overall	16
Change - Village Leadership		25** (0.33)
Change - Water Committee		5** (0.20)

Note: **p<0.01; Data from Village Leadership and Water Committee surveys

According to the Village Leadership and Water Committee surveys, there was a 33 and 20 percentage point reported increase, respectively, in the number of times per year feedback from users was requested through official channels under the CBWSO system versus the COWSO system.

2. Number of recorded feedback communications from water user to provider in previous 6 months

389

Total Endline	389
Total Baseline	10,365
Total Change	-9,976**

Note: **p<0.01; Data from Water Committee Survey

However, the number of recorded feedback communications from user to provider fell significantly by 454 percentage points. This decrease could be due to a variety of factors. The majority of feedback is collected either at village meetings or verbally at the water site. It could be that at baseline there were many more community meetings focused on the water source and therefore many more opportunities for feedback compared to endline, when the water source may not have been as much of a priority. It also could be that CBWSOs were still honing their systems for recording feedback at endline. In addition, at baseline, COWSOs were part of the village system already, potentially making it easier for processes such as setting up meetings to take place. CBWSOs function outside of the village system, so it may not be as streamlined for CBWSOs to collect feedback through village meetings.

For example, village meetings are called specifically to discuss village issues - e.g. problems with the water source, problems with village businesses, harvest periods, etc., so when village leadership was managing the water sites, it may have been more organic to collect feedback at the village meetings rather than having the CBWSO come to village leadership to request a meeting to collect feedback. CBWSOs are meant to have a village leadership representative, but enumerators also heard a few anecdotal stories about conflict between village leadership and newly registered CBWSOs, so this may make ensuring meetings with water users at the village level difficult.

3. Number of recorded feedback communications from CBWSO and users to village government

4,079

Total Endline	4,079
Total Baseline	10,938
Total Change	-6,859

Note: Data from Village Leadership Survey

Though the number of recorded feedback communications to village government fell, there was not a significant difference from baseline to endline, and the potential explanations are similar to indicator #2.

4. Percentage of users who provided feedback

34.2%

	Endline		Baseline		Change
Feedback to Village	348	21.4%	320	35.6%	-14.2%** (-0.14)
Feedback to CBWSO/COWSO	240	14.8%	161	17.9%	-3.1% (-0.03)
No feedback provided	1,069	65.8%	438	48.7%	17.1%** (-0.17)

Note: There was some overlap between those who provided feedback to village leadership and those who provided feedback to a water committee; Data from User Survey; **p<0.01.

There was a 14 and 3 percentage point decrease in the percentage of users who provided feedback to the village leadership and the water committees, respectively, from baseline to endline. The change in feedback to the village was significant at the p<0.01 level, while the change in feedback to the water committee was not significant. It is possible that the addition of RUWASA's oversight reduced the village's relevance in receiving feedback from users. Enumerators were not able to survey RUWASA leadership for this report.

5. Percentage of users aware of opportunities to provide feedback

93%

	Endline	Baseline	Change
Aware of Water Committee Feedback Request	93.0%	96.9%	-3.9%
Aware of Village Feedback Request	91.3%	97.0%	-5.7%

Note: 179 users listed "NA" at endline for CBWSO, bringing the total number of users to 1,446; Data from User Survey.

Changes in user awareness of opportunities to provide feedback were not significant. However, it seems that there is some disconnect between the number of reported opportunities for feedback and the number of users aware of opportunities that are willing to engage in them. While users are aware of opportunities to provide feedback, they are not taking advantage of them at the same rate.

6. Number of times in the past six months that actions were taken in response to user feedback

36

Endline	36
Baseline	9
Change	27

Note: Data from Water Committee Survey.

There was no statistically significant change in the number of times in the past six months that actions were taken in response to user feedback. However, the trend is for the CBWSO to report more actions taken in response to user feedback than COWSOs. Actions taken by CBWSOs included installing additional distribution points and ensuring water sources were closer to community members.

7. Number of user complaints about a service in the previous six months

315

Endline	1,625
Baseline	900
Change	725**

Note: Data from User Survey; **p<0.01

Changes in the number of user complaints filed changed significantly between baseline and endline with 0.44 complaints per user at baseline and 0.57 per user at endline. Changes in the number of complaints could reveal a greater level of user concern, but it could also reveal an increase in user confidence in reporting complaints over time or changes in other contextual factors. At endline, there was a 17 percentage point increase in users responding that they did not file complaints because they were happy with the system, a 12 percentage point increase in saying they were too busy to file a complaint, a 16 percentage point decrease in saying it was too difficult to file a complaint, a 7 percentage point increase in saying they did not know how to file a complaint, and an 8 percentage point decrease in believing that their complaint might not make a difference (p<0.01).

Qualitative responses from users included that individuals did not complain because it is the responsibility of the water committee, there was nothing to complain about, there was lack of awareness of being able to complain, and an understanding that they should wait for the next village meeting to speak up.

Qualitative responses from village respondents included that some of the technical breakdowns are beyond the ability of the village water technician to address, people have to wait for RUWASA to respond on all water complaints, and the local government is informed and is awaiting funds to address the situation.

8. Percentage of complaints reported to have been addressed

45.6%

Endline	45.6%
Baseline	41.1%
Change	4.4%

Note: Data from Water Committee Survey

There was a slight increase in the number of complaints reported to have been addressed by the water committee from baseline to endline, but this change was not statistically significant. Initially, the M&E Plan required the percentage of official records on actions taken by providers that included information about who was responsible for these actions, but enumerators were not given access to official records.

Qualitatively, village respondents shared that they used feedback to correct water challenges, to change the time when water systems operate to fit the needs of citizens, to give education on water usage, and submit complaints to RUWASA.

9. Number of times accountability is mentioned in written employee policies

Enumerators were not given access to written employee policies, so data on this indicator are not available.

System Functionality

10. Average percentage of users who paid total amount owed for water in full

64%

Endline	64%
Baseline	62%
Change	2%

Note: Data from Water Committee Survey

This indicator was not statistically significant, and there was very little change from baseline to endline, suggesting that the governance changes did not impact whether or not users were willing and/or able to pay for water in full.

11. Percentage of community members who consistently use the water service

Enumerators were not able to identify this information at baseline or endline due to lack of access to records from village leadership.

12. Average number of days system was available to consumers in the last month

21.25

Endline	21.25
Baseline	18.73
Change	2.52

Note: Data from Water Committee Survey

CBWSO members reported that systems were operational and available to consumers for more days at endline than baseline, but this change was not significant (significance may be difficult to show for water committee and village surveys given their relatively small sample sizes). Users reported significantly fewer days of system operation at endline compared to baseline by 15 percentage points ($p<0.01$). Given the enumerators' lack of access to records for triangulation, the data may be best used as a representation of the different perceptions of various system actors.

Endline	14.20
Baseline	20.91
Change	-6.71

Note: data from Water User Surveys

One note is that systems that were not functional at endline were unavailable for the entire month and had zero operational days according to the Water Committee Survey. Those that were functional were reported to be available every day. There were seven nonoperational sites, and CBWSOs for the rest of the sites reported 30 days of operation even though users reported that breakdowns at operational sites did occur.

13. Average number of days between system problem and resolution in last six months

5.6

Endline	5.6
Baseline	65.77
Change	-60.17

Note: All results are for the six months before the Water Committee Survey

While the water committee data did not show a significant result, the user data showed a significant reduction in the number of days between system problem and resolution by 12 percentage points ($p<0.01$). While there seems to be disparity in the total number of days that water systems were operational between users and CBWSOs, there is agreement between users and CBWSO members that the number of days it takes to repair system problems is shrinking and improving over time.

14. Average number of times water quality is tested per year and percentage of sites that report results to users

1.25 & 62.5%

Endline	1.25	62.5%
Baseline	1.18	86.4%
Change	0.07	-23.9%

Note: Data from Water Committee Survey

The average number of times water quality was tested per year and the percentage of sites that reported results to users did not change significantly from baseline to endline based on water committee member surveys.

User surveys showed a significant decrease in communication of water quality results by 8 percentage points ($p<0.001$). The largest decrease was seen in the reduction of large public forums to announce the results. Other forms of communication about water quality, such as phone contact or in-person reports at the water source, actually rose according to the user survey. User surveys also reported that the amount of time it took to learn about water quality results fell by 50 percentage points from baseline to endline ($p<0.01$).

Transparency

Quantitative indicators for this outcome were analyzed at baseline and endline. The endline indicator results and the changes over time are provided below.

1. Number of official communication structures that promote two-way communication between users and providers

29

User Survey Data

Endline				**Baseline**			
Phone/ SMS/ Whatsapp	**Email/ Social Media**	**In-Person Opportunities**	**Other**	**Phone, SMS, Whatsapp**	**Email/Social Media**	**In-Person Opportunities**	**Other**
6** (0.07)	0	20* (-0.19)	3	0	0	22	0

Note: **p<0.01; *p<0.05

Village Leadership Data

Endline				**Baseline**			
Phone/ SMS/ Whatsapp	**Email/ Social Media**	**In-Person Opportunities**	**Other**	**Phone, SMS, Whatsapp**	**Email/Social Media**	**In-Person Opportunities**	**Other**
6	1	24* (-0.26)	6	0	0	27	0

Note: *p<0.05

The number of official (sanctioned by village government) communication structures in place by type is shown above. There was a significant increase in the number of phone, SMS, and Whatsapp communications (seven percentage points) and decrease in the number of in-person opportunities (19 percentage points) according to users. Village leadership surveys also showed a significant decrease in the number of in-person opportunities (26 percentage points). “Other” responses all referred to situations where respondents chose “not applicable”.

2. Number of mass communications from providers to users

23

Endline	23
Baseline	31
Change	-8

Note: Data from Water Committee Survey

The number of total mass communications from providers to users was reduced from baseline to endline, but this was not statistically significant.

3. Number of mass communications that included information about how money is spent

16

Endline	16
Baseline	25
Change	-9

Note: Data from Water Committee Survey

The number of communications that included how money was being spent was reduced from baseline to endline, but this was not statistically significant.

Equity

Quantitative indicators for this outcome include:

1. Number of times equity is mentioned in written employee policies

Enumerators were not provided access to written employee policies.

2. Percentage of women who felt that the system served their daily needs

63.3%

	Endline	**Baseline**	**Change**
Yes	507	339	168
No	294	100	194

Note: Data from User Survey

Of the 801 women who responded to the endline survey, 507 or 63.3% responded that the system served their daily needs. This is compared to 64.9% of the total population who responded that the system served their daily needs. This was not a significant difference from baseline to endline.

Some of the reasons given by female respondents for the system failing to meet their daily needs included that the diesel system needed repairs, that the water was only available in limited areas, that the tank was improperly installed, and that there was not enough water for community needs.

3. Degree to which feedback participation of women mirrors the participation of men

22.1% of Women Provide Feedback to Village
12.9% of Women Provide Feedback to CBWSO

	Endline	Endline %	Baseline	Baseline %	Change	Change %
Women Who Provided Feedback to Village	177	22.1%	142	32.3%	35	-10.2%**
Women Who Provided Feedback to Water Committee	103	12.9%	66	15.0%	37	-2.1%
Respondents Who Provided Feedback - Village	348	21.4%	320	35.6%	28	-14.2%**
Respondents Who Provided Feedback – Water Committee	240	14.8%	161	17.9%	79	-3.1%

Note: Data from User Survey; **p<0.01

Of the 801 women surveyed at endline, 177 of them (22.1%) reported providing feedback to the village leadership, and 103 of them (12.9%) reported providing feedback to the CBWSO. This is a reduction of 10.2% and 2.1%, respectively, from baseline to endline. This was a statistically significant change in feedback provided to the village. Compared to the total population, women were more likely to provide feedback to the village but less likely to provide feedback to the CBWSO at endline.

4. Degree to which participation of disadvantaged or minority groups mirrors the percentage of this group in the total population

	Endline	Endline %	Baseline	Baseline %	Change	Change %
Respondents Reporting Disability	88	5.4%	14	1.6%	74	3.8%
Individuals with Disability Who Provided Feedback to Village	44	50%	5	35.7%	39	14.3%
Individuals with Disability Who Provided Feedback to Water Committee	13	14.8%	3	21.4%	10	-6.6%
Respondents Who Provided Feedback - Village	348	21.4%	320	35.6%	28	-14.2
Respondents Who Provided Feedback – Water Committee	240	14.8%	161	17.9%	79	-3.1

Note: Data from User Survey; Having a disability that affects water collection is self-reported

Of the 88 water users who reported that they had a disability that affected their ability to collect water, 44 reported providing feedback to the village and 13 reported providing feedback to the CBWSO at endline versus five and three, respectively at baseline. The percentage of individuals with a self-reported disability provided feedback and the same rate as total respondents to the CBWSO but at a higher rate to the village leadership at endline. These changes were not statistically significant, but this may be due to the small sample size at baseline.

5. Percentage of respondents with a disability who felt the system served their basic needs

84.1%

	Endline	Endline %	Baseline	Baseline %	Change	Change %
Yes	74	84.1%	9	64.3%	65	19.8%
No	14	15.9%	5	35.7%	9	-19.8%

Note: Data from User Survey

Of the 88 individuals who identified themselves as disabled, 84.1% of them reported that the system served their basic needs at endline, which was a significant increase of five percentage points from baseline ($p<0.001$). However, it is important to note that there were far fewer individuals who identified themselves as disabled at baseline, so they may not provide a full representation of the perceptions of those with disabilities at baseline. It is unclear why there was a marked increase in the number of individuals who identified as having a disability at endline.

Trust

Quantitative indicators for this outcome include:

1. Percentage of users who feel that their concerns are consistently addressed

16.7% for Village
13% for CBWSO

	Endline		Baseline		Change	
	Village	**CBWSO**	**Village**	**COWSO**	**Village**	**Water Committee**
% Always	16.7%	13.0%	8.4%	5.4%	8.3%**	4.6%
% Rarely/Never	17.8%	8.7%	18.9%	12.1%	-1.1%	-3.4%

Note: Data from User Survey; **p<0.01

Of 1,625 total users at endline, 16.7% believe their concerns are consistently addressed by the village. This is a significant increase from baseline to endline. Of this same number of surveyed users, 13.0% believe their concerns are consistently addressed by the CBWSO, which is an increase from baseline that was not statistically significant.

Qualitatively, for those who believed their concerns were addressed rarely or never, they shared the following:

a. We do not see any efforts concerning the water issue.
b. They don't value water users concerns
c. The CBWSO has been formulated but it does not work yet (three people stated this)

2. Percentage of users who trust that the technology associated with the water systems is secure and reliable

49.1%

	Endline (boreholes)	Endline (all)	Baseline (boreholes)	Baseline (all)	Change (boreholes)	Change (all)
Yes	73.0%	49.1%	75.9%	63.7%	-2.9%	-14.6%**
No	0.5%	7.0%	1.5%	8.7%	-1.0%	-1.7%
Unsure	25.4%	33.0%	17.6%	23.0%	7.8%	10.0%
N/A	1.1%	10.9%	5.0%	4.7%	-3.9%	6.2%

Note: Data from User Survey; **p<0.01

There was a significant reduction in trust in technology from baseline to endline that corresponded with a non-significant increase in users who were unsure if they trusted the technology or not. There were four GROWS sites that received solar or diesel-powered boreholes (Msange, Ngimu, Mvae, and Mdilu). For the four sites that received solar or diesel-powered boreholes, overall trust was higher at baseline and endline, but there was still a general trend in the same direction. Otherwise, there were no large changes in infrastructure technology from baseline to endline.

3. Percentage of users who think the cost of water from the system is fair

62.5%

	Endline	Baseline	Change
Yes	62.5%	67.1%	-4.6%
No	13.3%	16.1%	-2.8%
N/A	24.2%	16.8%	7.5%

Note: Data from User Survey

Of total users at endline, nearly two-thirds of them reported that they believed the cost of water to be fair, which was a decrease (but not a statistically significant one) from baseline to endline. At the majority of sites, the cost remained the same (50TSH/20L); however, at Maghojoa and Matumbo, water was free at baseline and then cost 50 TSH/20L, and at Mpambaa the cost of water was 100 TSH/20L at baseline and free at endline.

4. Percentage of users who think that their payments for water are used appropriately

43.1%

	Endline	Baseline	Change
Yes	43.1%	1.7%	41.5%**
No	25.4%	2.2%	23.1%
Unsure	31.5%	96.1%	-64.6%

Note: Data from User Survey; p<0.01

The percentage of total users who thought that payments for water were being used appropriately by providers rose from baseline to endline. The vast majority of people at baseline reported that they were "unsure", so there was actually an increase in the percentage of people saying both "yes" and "no" to this question at endline, though the overall trend was significantly positive.

5. Percentage of users who expect the system to be working one year from now

68.1%

	Endline	Baseline	Change
Yes	68.1%	72.7%	-4.6%*
No	31.9%	27.3%	4.6%

Note: Data from User Survey; *p<0.05

There was a four percentage point decrease in the percentage of people who believed that the system will be functional next year from baseline to endline.

The number of users who expect the system to be working one year from now was correlated with other indicators of trust, including trust in technology (12.4 percentage points; p<0.01).

6. Percentage of users who believe that water service providers care about them

67.1%

	Endline	**Baseline**	**Change**
Yes	67.1%	77.8%	-10.6%**
No	9.7%	6.6%	3.2%
Unsure	23.1%	15.7%	7.5%

Note: Data from User Survey; **p<0.01

The percentage of users who reported that they believed service providers cared about them fell significantly from baseline to endline. Of users who reported that service providers do not care, some shared insight into why they believed this:

Endline	**Baseline**
They do not solve many problems	There is no communication
They do not provide sufficient maintenance	They do not provide service on time
Water is not consistently available	Unfair pricing
They have not resolved water problems (e.g. salty water)	Water service is delayed
The CBWSO does not provide water on time	They do not provide water in our area/ There is no permanent water source
Another water source has not been provided	They do not address system breakdowns
The price is too high	Long distance to water
The water system is too far away	Poor organization
Insufficient site visits and follow ups	They are not available at their work place
There is no water provided	

Many of the reported issues relate to problems with water availability and distance to water, so it is important to remember that the first test of water system governance is simple availability and access.

Midline to Endline Comparison

There were several differences between results at midline and endline. This is a highlight of some of the differences in results as well as some of the areas that remained the same regardless of seasonality. Midline results are not ideal given that

they were taken in November and December instead of at the same time as the baseline in late Spring/early Summer. The endline survey captured results more accurately because there was greater control for seasonal factors, including water availability due to data collection taking place in early June.

In November/December 2020, it was rainy season in Singida, while in May/June of 2019 and 2021, it was dry. Rainy season may cause families to resort to rain catchment systems or seasonal ponds, etc. instead of paying to use larger water systems. The midline was conducted during crop planting time while the baseline and endline surveys were conducted during harvest.

Full results can be found in Appendix 1.

Demographics

Water System Users	Endline	Midline
Total User Respondents	1,625	1,550
Total Men	824	658
Total Women	801	892
Total Heads of Household	1,022	956
Total Responsible for Water Collection	1,096	1,308
Total Disabled	88	44
# Respondents 0-17	44	12
# Respondents 18-24	87	257
# Respondents 25-35	325	519
# Respondents 36 - 50	585	560
# Respondents 51 - 65	424	187
# Respondents 65+	160	15

Village Leadership	Endline	Midline
Village Respondents	53	27
Men	50	26
Women	3	1
Executive Officers	25	13
Chairperson	24	14
Secretary	4	0
Committee Member	0	0
Age 25 – 35	6	2
Age 36 – 50	29	15
Age 51-65	18	10
Age 65+	0	0

Water Committee Members	Endline	Midline
Respondents	24	16
Men	18	12
Women	6	4
Chairperson	17	10
Secretary	6	6
Treasurer	1	0
Age 18 – 24	0	1
Age 25 – 35	4	4
Age 36 – 50	4	2
Age 51 – 65	15	9
Age 65+	0	0

Contrasting Results from Midline to Endline

The following indicators revealed different results at baseline and endline. Data is from the user surveys unless otherwise noted.

The number of respondents stating that they received **water from other sources** was negative at midline (-17 percentage points) and positive at endline (5 percentage points) compared to baseline, and both of these results were significant ($p<0.01$). This is the opposite of what we would expect from seasonality given that there would be more individuals seeking water from other sources (rain water catchment for example) during rainy season. This result could instead be related to the fact that compared to baseline, water sources were **operational** more often at midline (2.62 percentage points) and less often at endline (-6.73 percentage points) ($p<0.01$).

Feedback requested by Village Leadership rose from baseline to endline (28 percentage points; $p<0.01$), though it had fallen at midline (-4 percentage points; not significant). Requests for feedback from CBWSOs were higher at endline by 18 percentage points ($p<0.01$) but were lower than baseline at midline by one percentage point (not significant). **Anonymous** feedback rose by 2 percentage points at midline but rose significantly at endline by 45 percentage points ($p<0.01$).

The number of **complaints** filed in the past six months was no different than baseline at midline but higher at endline (11 percentage points; $p<0.05$). This may be due to fewer water systems reported operational at endline versus midline.

Actions taken based on receipt of feedback by village government was much higher at midline (29 percentage points; p<0.01) and only slightly higher at endline (1 percentage point; not significant). **Concerns being addressed** by the water committee fell to an increase of 0.8 percentage points (not significant) at endline versus an increase of 1.53 percentage points (p<0.01) at midline. This lack of action could be attributed to new CBWSOs that are still being trained being identified between midline and endline as well as potential growing pains for the RUWASA response system when water systems need attention.

Ability to pay was better at endline with inability to pay in full in the past two weeks falling by 38 percentage points at endline (p<0.01) and falling by only 14 percentage points at midline (not significant). This may be due to individuals budgeting more fully for payment for water a few years after the system is installed and having funds to pay at harvest time versus crop planting time.

Perception of **water quality** fell at endline (-8 percentage points; p<0.01) when it had risen at midline (13 percentage points; p<0.01). Enumerators shared that an increase in perception of water quality during rainy season may be due to the belief that more rain leads to higher water tables and that rain is the purest form that water can take.

Belief that the system would be **operational next year** rose at midline (22 percentage points; p<0.01) but fell at endline (-4 percentage points; p<0.05). This may be due to the closeness of the "new year" in January, and people potentially answered with a focus on the calendar year versus a year from when the question was being asked. Belief that the water system served all daily needs changed from an increase at midline (21 percentage points; p<0.01) to a decrease at endline (-14 percentage points; p<0.01). This is likely tied to the increase in system breakdowns between midline and endline.

Similarly, the impression that service **providers care** about users rose at midline (8 percentage points; p<0.01) but fell at endline (-4 percentage points; p<0.01).

Similar Results from Midline to Endline

One result that stayed largely the same at midline and endline is **payment** for water in cash at time of service, which fell from baseline to midline by seven percentage points and fell from baseline to endline by three percentage points (p<0.01) but was still the most widely used form of payment.

Feedback provided to village leadership and water committees also fell from baseline for both surveys.

Mass communication from water providers to users was largely similar between midline and endline results, including communications on water quality.

There was little change in user beliefs that **water technology** is secure and reliable and in the use of **water restrictions** between midline and endline.

The results from midline and endline suggest that water source operationality is the key factor, overriding factors of rainy/dry or planting/harvesting seasons.

Cross-Sectional Evaluation Results

The next step of the analysis sought to shine light on what could be driving some of the changes revealed in the before and after findings. Since qualitative focus groups were not possible, these correlations may provide some insight into the mechanisms behind the changes described above as well as fodder for further study.

Using endline data, 324 different regressions were run to identify correlations in various survey responses.

Independent variables included:

- Respondent gender
- Type of user (head of household and/or individual who collects water)
- Respondent age
- Respondent disability that affects retrieval of water
- Composite indicator of household poverty, which included the following variables:
    - Source of drinking water
    - Source of water for other use (i.e. for cooking and handwashing)
    - Type of toilet facility used
    - Toilet facility shared with other households or not
    - Type of cookstove used
    - Separate room for kitchen or not
    - Electricity in the home or not
    - Livestock or poultry owned
- Water source (improved or unimproved)
- Number of days water source was operational
- System breakdown in the last six months
- Days taken for repairs in times of system breakdown
- Cost of 20 liters of water
- Payment in case at time of service
- Feedback requested by village leadership
- Anonymous feedback requested
- Feedback requested by CBWSO
- Number of mass communication messages sent from village government in last six months
- Mass communication about water system finances
- Number of times mass communication messages were sent from CBWSO to users
- Water quality communications received by users

Dependent variables included:

- User belief that they pay a reasonable price for water
- Water payment frequency
- Feedback provided (by all actors)
- Feedback use
- Complaints filed
- Concerns addressed by the government
- Concerns addressed by CBWSO
- Security and reliability of water technology as reported by users
- User perception of water quality
- User perception of the cost of water
- User belief that system funds are used appropriately
- User belief that the system will be operational next year
- Users belief that the system is maintained well
- User perception that the system meets their daily needs
- User access to the water system
- User belief that service providers care about them
- Service provider use of water restrictions

Through this regression analysis, many trends were identified. All correlations discussed in this section were statistically significant at less than the 1 percent level ($p<0.01$) and most are significant at the 0.1 percent level ($p<0.001$). The full results can be found in Appendix 1.

Demographic Correlations

Some trends highlighted correlations between demographics of the individual being surveyed and their likelihood to answer in a specific way.

For example, being the **head of household** (more specifically, the person who oversaw the household finances), gave water users a 10-percentage-point increase in responding that they provided feedback and a 4-percentage-point increase in responding that they believe that feedback was used by service providers to make decisions ($p<0.001$). They also had a 5-percentage-point increase in believing that their concerns were addressed by the CBWSO, a 13-percentage-point increase in believing that the system funds were used appropriately, a 12-percentage-point increase in believing the system was maintained well, and an 8-percentage-point increase in believing that the system served their daily needs ($p<0.001$).

Being the individual who fetches water or the individual who manages the household finances often falls along gender lines in East Africa. However, **gender** on its own did not reveal a strong correlation to any of the governance indicators analyzed.

Age also correlated with answering in a certain way, and increased **age** generally correlated with decreased satisfaction. For example, for every increase of one year in age, respondents had a 42-percentage-point decrease in responding that they believed that service providers cared for them ($p<0.001$). Being older also correlated with a 13-percentage-point decrease in believing that their concerns were addressed by the government or the CWBSO ($p<0.001$) and a 30-percentage-point decrease in belief that the cost of water was fair ($p<0.001$). However, increase in age correlated with an increase in payment for water frequently (32 percentage points; $p<0.001$) and provision of feedback to water service providers (22 percentage points; $p<0.001$).

Compared to the general population, having a **disability** led to an increase of 5 and 4 percentage points in the belief that the system served their daily needs and that they had full water access, respectively ($p<0.001$). Having a disability also correlated with an increase of 8 percentage points in provision of feedback to water operators ($p<0.001$).

Being a household experiencing **poverty** was correlated with believing that the cost of water was unreasonable (17 percentage points; $p<0.001$). It was also correlated with lower provision of feedback (19 percentage points; $p<0.001$). Households experiencing poverty were also correlated with not believing that feedback was used, not filing complaint, and not believing that their concerns were addressed by the CBWSO. Across the board, they were correlated with reduced trust in the service providers and had a 30-percentage-point decrease in believing the system would be operational next year and an 18-percentage-point decrease in believing that the service providers cared about them ($p<0.001$).

Governance Correlations

The results of this analysis provided evidence that some features of governance correlated with respondents answering in a specific way.

For example, the existence of any form of **mass communication** from village government in the last six months had sweeping impacts on user satisfaction. This could include public meetings (most common), text or Whatsapp messages, paper notices, etc.

Most of the mass communications recorded are still made through the village meeting structure. Mobile service is still not reliable in the majority of the villages surveyed making any sort of SMS or Whatsapp communication difficult. Additional technology for communication (e.g. social media, Whatsapp, email, etc.) requires purchasing data bundles which have increased in price in Tanzania and may be out of the reach of the average water user.

Receiving messages in the last six months correlated with responses showing that users believed the water price was reasonable (41 percentage points), provided feedback (19 percentage points), believed their feedback was used (13 percentage points), believed their concerns were addressed by service providers (23 percentage points for government), and believed water technology to be secure and reliable (64 percentage points) ($p<0.001$).

Users who received mass communication from the village government also had greater trust in the system. Receiving any mass communication from the village government in the last six months was correlated with an increase in belief that the system would be operational next year (41 percentage points), that the system served their daily needs (31 percentage points), and that service providers cared about them (52 percentage points) ($p<001$).

The number of times users received mass communication from the CBWSO also correlated with increased trust, feedback, water payment, and service provider accountability. For example, receiving one more mass communication resulted in an increase of 51 percentage points in believing that the system was maintained, 42 percentage points in believing that the system would be operational next year, and 65 percentage points in responding that they understand water technology.

If users received mass communication about the way system finances were managed and/or how funds were used, users increased their reported belief that water was prices reasonably (27 percentage points), that their feedback was used (18 percentage points), and that their concerns were addressed by service providers (23-26 percentage points) ($p<0.001$). There was also a correlation between sharing information about system funds with users responding that the system met their daily needs (47 percentage points) and that they had high levels of water access (43 percentage points).

Communications about water quality also revealed correlations to greater satisfaction by users with an increase in users reporting the belief that the price of water was reasonable (27 percentage points) $p<0.001$).

Requesting **feedback** correlated with specific answers to survey questions as well.

Village leadership requesting feedback correlated with users accepting the price of water as reasonable (22 percentage points; $p<0.001$). It also correlated with users believing water technology is secure and reliable (51 percentage points), having water access (21 percentage points), saying that the water quality was high (35 percentage points), and stating that the system served their daily needs (17 percentage points) ($p<0.001$). However, results show that the village requesting feedback had a negative correlation of 18 percentage points for concerns being addressed by the CBWSO. Correlation with the government addressing concerns was also negative, but this was not significant at the 0.01 percent level. This may

reveal that the more village interaction there is, the less CBWSOs hear of concerns or it could suggest that CBWSO inaction may lead to villages seeing the need to request information from users.

CBWSOs requesting feedback correlated with users paying more often, providing more feedback, believing water technology is secure and reliable, and believing the water quality was high. However, CBWSOs requesting feedback resulted in a negative correlation with user belief that feedback was used (-10 percentage points), that concerns were addressed by the government (-16 percentage points) and the CBWSO (-14 percentage points), that the cost of water was fair (-39 percentage points), and that service providers cared about them (-48 percentage points) ($p<0.001$).

The above may suggest that requesting feedback is not enough to inspire trust but that feedback must be used and actions must be taken on the feedback in a public way for positive governance outcomes to be realized. On the contrary, requesting feedback when it is unlikely that changes can be made may cause more resentment amongst users, which may represent one of the reasons why service providers could be hesitant to engage in it. Sometimes, users may not understand the reasons why suggestions cannot be implemented, so a two-way communication flow is key to improving user satisfaction.

Additionally, feedback being **anonymous** had similarly negative correlations to user belief that concerns were addressed (-17 percentage points). It also had a negative 54-percentage-point correlation with user belief that service providers cared about them and a -36-percentage-point correlation with user belief that the system would be operational next year ($p<0.001$). These effects were largely similar between respondents from communities with large borehole systems and with smaller non-borehole systems. This may suggest that feedback provides more satisfaction to users when it can be done in person or with the user's name attached. This may also be due to the fact that when feedback is given anonymously, there is less opportunity to respond and therefore more potential for users to be unaware of how the feedback will be used.

System Functionality Correlations

Predictably, system functionality had a strong correlation with user satisfaction. The more days that were **operational**, the more users responded that price was reasonable (10 percentage points), believed water technology is secure and reliable (15 percentage points), believed water quality was high (6 percentage points), believed the system would be operational next year (10 percentage points), and believed that the system served their daily needs (7 percentage points) ($p<0.001$).

Conversely, when the system had a **breakdown** in the last six months, belief that the price was reasonable fell by 19 percentage points ($p<0.001$), belief that the system would be operational next year fell by 27 percentage points, belief that the

system successfully served user's daily needs fell by 30 percentage points, and belief that service providers care fell by 31 percentage points (p<0.001).

Interestingly, the longer systems took to **repair** at sites that had system breakdowns, the more users were to pay more frequently (6 percentage points) and to believe that service providers used funds appropriately (6 percentage points) (p<0.001). The longer it took for the work to be done, the more people understood and believed in the water technology as well (11 percentage points) (p<0.001). This could be due to the fact that through the process of repairing the systems, users learn from lived experience why funds in the water system's account are important toward ensuring the longevity of the system. A lengthy repair may also signify a more problematic issue with the system, which creates an opportunity for users to learn more about how the system's technology works.

Payment

Amount of payment per 20 liters of water ranged from zero to 100 Tanzanian Shillings. Users who had **higher priced water** actually paid more frequently (64 percentage points), provided more feedback (52 percentage points), and showed an increase in responding that they believed that the system served their daily needs (47 percentage points) than those with water costs that were lower (p<0.001). However, with every shilling increase in payment for water there was a reduction in respondent belief that the cost of water was fair (-46 percentage points) (p<0.001). While water that is priced at a consistently higher rate may cause equity issues, it may also encourage participation on the part of users given their greater investment in the system's success. It is likely that systems with higher prices, however, might drive away those who cannot pay, so those living in deeper poverty would not use the system and thus would not have been included in the surveys at the water point. One way to amend this concern would be to tier the payment structure in order to ensure groups with the inability to pay were not marginalized. As mentioned above, poverty correlates with lower levels of participation, so non-users in communities with higher water rates should be targeted for input on this finding.

Users who paid **cash at time of service** instead of cash in advance or cash after service paid less frequently (17 percentage points). However, paying cash at time of service was positively correlated with provision of feedback (13 percentage points), belief that their feedback was used (9 percentage points), belief that their concerns were addressed by service providers (7-8 percentage points), belief that the water technology was secure and reliable (38 percentage points), belief that water quality was high (29 percentage points), belief that the cost of water was fair (8 percentage points), belief that the system would be operational next year (25 percentage points), approval of the way the system was maintained (9 percentage points), belief that the system served daily needs (34 percentage points), access to water (38 percentage points), and belief that service providers cared about them (13 percentage points). A note about this indicator is that all sites currently have a cash payment at time of service system when the systems are operational and do not

have any other payment technology in place. Therefore, respondents who answered that they pay after time of service may do so because they are either unable or unwilling to pay at time of service.

VI. Limitations

Data limitations may include some selection bias because respondents were surveyed at the water site, and this may reduce the likelihood of gathering data from people who are unavailable or unable/unwilling to use the water source. Non-users were meant to be included in qualitative focus groups, but those groups were cancelled due to COVID-19. These focus groups were replaced with key informant interviews that took place via phone, and the data for these phone interviews are described in a separate report.

Other data limitations include the sensitive nature of some questions surrounding governance, especially when related to government oversight and transparency. In order to 'do no harm' throughout the evaluation, some conclusions were reached through indirect questioning. There are no known conflicts among different groups living in the villages we surveyed. There were many contributing factors that may minimize the ability to attribute significant changes to a specific governing policy due to the fact that the data are tied to complex and ever-changing political and social realities. GPFD's team was tasked with making note of any confounding variables within the communities that may have contributed to changes in survey responses on a large scale.

Qualitative focus groups and other in-person opportunities to have more in-depth conversations were also not possible due to researchers' COVID-19 concerns. In addition, enumerators were not provided with village-level documents to triangulate survey responses as planned, which may have been due in part to lack of access to government buildings due to COVID-19. However, it should be noted that until summer of 2021, the Tanzanian government did not acknowledge COVID-19 or require any changes in the activities of its citizens or government officials. While there were no official changes, local and regional leaders may have needed to adjust their priorities away from water system support based on demands on health centers and other effects of the COVID-19 pandemic.

Assumptions derived from the data in this report are limited by the lack of a control group, which indicates that no causation can be inferred. Significance of results for village government and water committee surveys was also limited by a small sample size, though user surveys had a large enough sample size to show significance for many indicators.

While there are essential differences in the governance of the COWSO system

versus the CBWSO system, sites in this study varied in their completion of the requirements of CBWSOs, so more research would be beneficial to further elaborate and confirm the findings.

A final limitation is that enumerators did not survey RUWASA leadership at endline, so further research that includes RUWASA's participation is suggested.

VII. Conclusion

As part of *GROWS Activity 2*, this report provides data on indicators of accountability, transparency, trust, and equity before and after the implementation of a new system of water governance in Tanzania. It also includes a cross-sectional evaluation to show the influence of various factors on governance indicators at endline. All data were collected in 27 rural villages in Singida, Tanzania.

While the limitations of this study may prevent the ability to identify causality, there are clear correlational patterns and circumstantial evidence that contribute to the body of research on water system governance. Some of the most significant findings from this report are summarized below.

- Being the head of household, being younger, having a disability, and being wealthier corresponded with reporting more positively to questions on system governance and user participation.

- Mass communication from water providers was strongly correlated with increased trust, transparency, and accountability indicators. Village leadership and CBWSOs requesting feedback correlated with mixed results on governance indicators, and results suggest that requesting feedback may have neutral or negative consequences if feedback is not acted upon in a public way.

- System functionality had a strong correlation with positive user perception of system governance, though there was a surprising correlation between longer length of time spent repairing a system and user willingness to pay for water. This could be due to a link in improved understanding of the complexity of the system by users and an appreciation of the technical skill needed. Paying a higher cost for water in cash at time of service correlated with more positive perceptions of system governance and higher user engagement. In addition, there was a higher coefficient associated with distance being the reason that people used other water sources at endline (77 percentage points) compared to a lower price (8 percentage points), indicating that distance is a much stronger indicator of water source use than payment level ($p<0.01$).

- While CBWSOs and village government reported requesting feedback more often at endline, feedback from water users to providers and from CBWSOs to village government fell. Reduction in feedback may be related to additional demands on service providers' and users' time due to COVID-19, but it also may be due to the change in water system leadership from local to national. There is also the potential that the transition from COWSOs, which were integrated into the village system, to CBWSOs, which are led by RUWASA and still working on streamlining meetings and other communication platforms with the village government in some cases, may have led to fewer meetings and fewer opportunities for dialogue between users and providers at endline.

- There was disagreement between water providers and users on the number of system operational days, with users reporting fewer operational days, but there was agreement that when an operational system broke down, it took the operators fewer days to resolve the problem at endline.

- The number of women who provided feedback fell at endline at a similar rate to that of the general population. Women and people with self-reported disabilities generally provided feedback at a similar rate to the rest of the population, though more women reported providing feedback to the village government than the CBWSOs.

- There were some differences between results at midline and endline, emphasizing the importance of continued research throughout the year and over time to account for seasonality and other contextual changes.

- Overall, there was an increase from baseline to endline in the percentage of users who felt that their concerns were consistently addressed. The percentage of users who thought that their payments for water were used appropriately increased significantly, but the number of users who believed that the system would be functional in a year and who believed service providers cared about them fell significantly at endline.

- This evaluation details many instances of both improvements and declines in governance from baseline to endline. Any transition to a new system, especially one with as broad a scope as that of RUWASA's oversight, will take some time to settle, and additional research is required to determine its successes and continued challenges. This additional research could also include a cost-benefit analysis to determine the impact of each dollar expended on various governance activities.

Water insecurity is one of the most pressing global issues of our time, and there is a clear connection between water system governance and water access, especially in rural areas. It is important for research into water governance to continue in order to further contribute to best practices for rural water systems in East Africa and beyond.

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