

Sustainable WASH Systems Learning Partnership

Ten Factors for Viable Rural Water Services

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Rural Water in Uganda

Most farming and pastoral communities in sub-Saharan Africa lack a piped water service and are reliant on hand pumps for their water supply. In fact, 30 percent of Uganda's rural population does not even have a hand pump to access safe drinking water. Although the Government of Uganda and some aid agencies prioritize piped water supply, rising population rates, financial constraints, and hydrogeological limits for piped supply mean that the majority of the population will remain dependent on hand pumps many decades into the future.

In this situation of high dependency, it is important that hand pumps remain operational. Studies indicate that serious health consequences arise as early as 2 weeks after a hand pump has broken down (Thomson 2018; Hunter 2009). Box 1 describes relevant studies on non-functionality conditions and the implications for persistent poverty cycles.

The Government of Uganda is working with the United States Agency for International Development (USAID) and its partners to develop and test a model that addresses this crisis of functionality and provides consistent service delivery, so that the millions of rural people dependent on hand pumps in Uganda and elsewhere, decades into the future, have a reliable source of water.

Working with the Government of Uganda as an Area Service Provider, Whave Solutions developed and tested a governance framework for maintenance of rural water points centered on public-private partnerships (PPP) between service providers and local district governments. Whave ensures the functionality of water sources through preventive maintenance and

Box 1: Non-Functionality and the Poverty Trap

A Ministry of Water and Environment (MWE) national study found 47 percent of hand pumps functioned inadequately (MWE 2011). An international study of 10 districts in Uganda found 45 percent of hand pumps non-operational and another 32 percent worked inadequately (Owor 2017). Whave Solutions, a Ugandan advocacy group and pilot maintenance provider, conducted baseline studies that generated similar figures. The studies revealed that hand pumps in general suffer from prolonged downtimes. As a result, women and girls — the chief water collectors — resort to using unsafe water sources or to making long treks to fetch water. Either scenario becomes a poverty trap, leading to lower productivity; increased waterborne disease, infant mortality, and early pregnancies; missed school; and the disempowerment of women and girls in general (Asaba 2015).

Box 2: About Whave Solutions www.whave.org

Founded in 2011 in response to persistent low levels of functionality of rural water infrastructure in Uganda and elsewhere in sub-Saharan Africa, Whave has spent a decade documenting the systemic causes of poor functionality and the factors critical to establishing an economic and socially viable system that permanently addresses this issue. The work has been based throughout the period on practical collaboration with hundreds of communities and many district government water authorities as well as central government. Whave's goal is to ensure consistent, reliable, safe water service delivery, sustainably.

pays local technicians on a performance basis to repair hand pumps. Whave's maintenance approach is being studied and documented in detail as part of the USAID Sustainable WASH Systems Learning Partnership's (SWS) investigation of systems-based approaches. One of the core learning areas of the partnership focuses on how different maintenance models for rural water services operate and the characteristics of the systems in which they function.

A water supply installation is only worthwhile if it is safe and reliable, which is achievable with consistent service delivery. A "viable service delivery model" is one that maintains a safe water supply in working condition while being sustainably supported by local finance. This paper presents the factors identified as key to the viability of sustained and consistent service delivery. By sharing its findings and recommendations, Whave hopes to assist global development partners working to improve the design of programs for rural water service

delivery and support developing countries working to achieve safe and sustainable water services.

Rethinking Community-Based Maintenance

Hand pumps are mechanical devices with components prone to wear and corrosion. Their continuous operation relies on the willingness of local mechanics to stock suitable spare parts and travel on difficult roads to remote areas, either to change worn parts before pump failure or to make repairs quickly when failure occurs. For years a community-based maintenance system (CBMS) has served as official government policy for rural water operations and maintenance (O&M) in Uganda. Under this model, government and NGOs invest in water point construction with the expectation that community water and sanitation committees manage maintenance and repairs and collect the necessary funds through water user tariffs. These funds would be directly paid to a local technician in the event of degraded operation or a breakdown (see Figure 1).

In 2019, the Ministry of Water and Environment documented the weaknesses of CBMS, pointing out that while communities commonly agreed to local bylaws specifying maintenance fees, their committees did not have resources to screen for substandard parts or reliable mechanics. Nor did these committees collect maintenance fees in advance of breakdowns to pay for preventive measures or collect fees rapidly enough to ensure immediate repairs or locate spare parts. In most cases the community waited for external financial assistance, extending the time hand pumps remained out of order. Whave conducted baseline studies in many districts that echoed the MWE's findings. The data show that many communities did not organize or pay for repairs, and preventive maintenance and regular servicing seldom occurred.

In 2020, the MWE introduced the Operation and Maintenance Framework for Rural Water Infrastructure (O&M Framework). The framework is known both as the Professional Management Approach (PMA) and CBMS+ (MWE 2019). The MWE is currently working with Whave and other parties to operationalize and disseminate this new approach at national scale. The distinguishing feature of PMA is that it requires each local government water authority to contract a

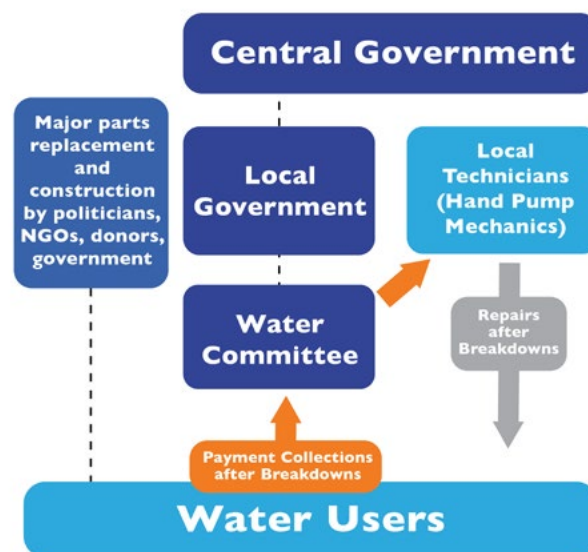


Figure 1. Community-Based Maintenance System

professional maintenance entity, known as an Area Service Provider, to take responsibility for functionality assurance and maintenance services. The Area Service Provider contracts local mechanics and collects maintenance fees from water users.

The Whave Model

Whave has acted as both an advocacy body promoting the PMA approach and as a pilot Area Service Provider. With local government and MWE support, Whave has been piloting the PMA in 11 districts in four regions, servicing more than 600 communities as of May 2021 (see Figure 2).

Under Whave's model, PMA agreements are signed between the Area Service Provider and local district governments. A performance contract is developed regulating key points such as the performance review schedule and tariff rates. Once a contract is in place, Whave signs service agreements with communities that allow it to oversee the maintenance of the community's water source and collect fees from water users on an annual basis with installment options. Whave contracts with local technicians training them to provide monthly preventive maintenance and rapidly respond to breakdowns. It also provides them with quality spare parts to make all necessary repairs. Figure 3 summarizes key features of Uganda's O&M Framework and compares them to Whave's model.

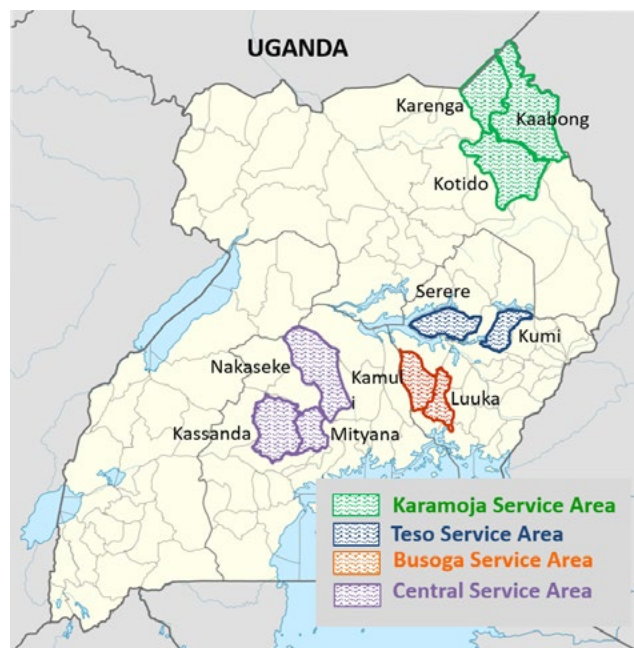


Figure 2. Whave's partnerships with district governments and communities in four regions

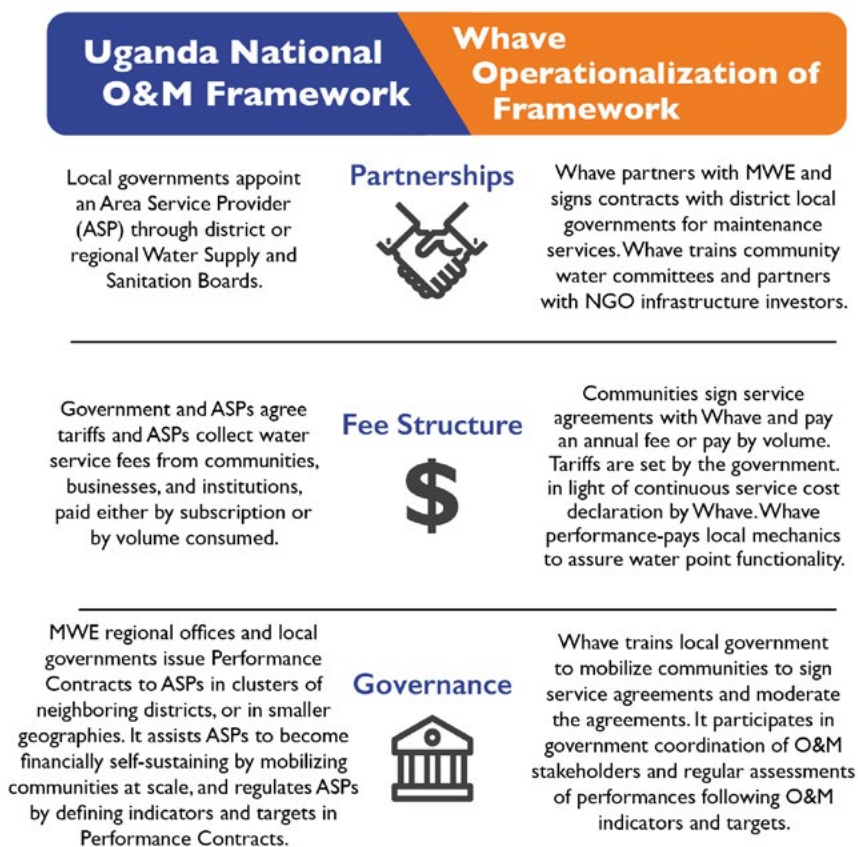


Figure 3. Comparison of O&M Framework and Whave's approach

Whave contracts an independent monitoring team to track all water sources for functionality. Each quarter, it reports its findings, along with financial data, to the local government and joins with local government in stakeholder performance review meetings to track progress and monitor the responsibilities of all parties — the Area Service Provider, local government, entities undertaking construction, and communities. Whave surveys water users to assess customer satisfaction and monitors downtime and repair time to ensure reliability. The data from this rigorous monitoring and the success of its management model have served as the foundation for the government's adoption of Whave's PPP approach as the core element of the new national O&M Framework.

Whave has demonstrated its ability to maintain high levels of functionality, consistently above 97 percent, while maintaining payment compliance and minimizing the number and duration of breakdowns through preventive maintenance. Quarterly measures of "spot-functionality" (numbers of pumps found producing water in a quarterly census) have been 12 percent to 32

percent higher than at baseline. On average less than 10 percent of sources needed a repair in a given quarter. This is in contrast to the baseline findings of more than 65 percent of water sources experiencing a breakdown in the past year. Repair time is under 2 days in more than 80 percent of cases of breakdown, and 100 percent in less than 5 days, in strong contrast to baseline findings of downtimes of weeks and months (Owor 2017). In 2018 and 2019, payment compliance ranged from 78 percent to 100 percent.

Factors for Viable Service Delivery

Based on its experience implementing PPPs, Whave identified 10 factors critical to improved functionality on a sustained basis. The following sections of this paper describe each one.

1. District-Provider Contracts

A professional entity is contracted to take responsibility for functionality of rural water points. The local government water authority contracts this entity as an Area Service Provider and sets appropriate performance indicators and targets to monitor functionality assurance.

The Luganda language does not have words that distinguish repair from maintenance. For example, the English word “service” is used to describe the task of adding oil to the engine of a car or motorbike to prevent a breakdown. English is not used commonly in rural areas, and the word service is therefore rare. Within local government budgets, “maintenance” is commonly understood to refer to major repairs and rehabilitations, not routine maintenance to prevent breakdowns.

The local government actors Whave engages have all stated that the number, frequency, and duration of breakdowns is a huge problem that should be addressed. When Whave introduced the concept of regular pre-breakdown service, they all agreed it was an urgent requirement and used the term “service” when speaking in English. Further, they discussed the need to identify an entity — the Area Service Provider — that is responsible for the reliable operation of hand pumps and other rural water points. The local government should outsource and regulate this position and review the provider’s performance against agreed-upon indicators and targets.

2. Performance-Pay and Service Agreements

Local technicians are contracted on a performance-pay basis to ensure that water points function consistently and that there are no disincentives for reliable operation. Detailed agreements are signed with communities, specifying the roles and responsibilities of each party.

Whave’s baseline findings indicated that local hand pump mechanics have no incentive to prevent breakdowns and no incentive to repair quickly. They make money from breakdowns, and technicians often profit from using substandard materials. In principle, water committees could prevent these practices and provide the necessary incentives to local technicians, for example by paying a regular fee to keep the pumps working every day or penalizing long repair waiting times. In practice, performance-pay contracts of this sort require the resources of a large professional entity rather than those available to a voluntary community committee. With government support, Whave established itself as such a professional entity to test the hypothesis that performance-pay contracts would result in better functionality.

Performance-pay contracting of technicians requires that a professional entity measures the technicians’ quality of work and provides management oversight; it also requires that the professional maintenance company contracts with the community. In 2013, Whave started to sign preventive maintenance service agreements with community water committees. These

Box 3: Factors for Viability

1. District-Provider Contracts
2. Performance-Pay and Service Agreements
3. Pre-Construction Maintenance Protocols
4. M&E Facilitation for O&M Performance Reviews
5. Optimized Service Area Size
6. Major Parts Included in Service Agreements
7. Clear Demarcation of Roles and Cost Responsibilities
8. Transparency of Revenue and Cost
9. Fair Tariffs for Everyone
10. Smart Subsidies



Figure 4. Performance-payment and professionalization of local technicians, and encouragement of women to take lead roles in water committees, have proved decisive factors in viability.

agreements act as a solid foundation for national regulated pricing, demarcation of roles and responsibilities, and coordinated interaction among district local governments, the Area Service Provider, and the communities — increasingly also with NGOs, aid programs, and politicians seeking votes. These service contracts define how the communities make payments for maintenance services. Whave trialed three modalities over several years, and two are currently practiced, as described in the section below on tariffs.

Whave took care to keep technician earnings well within financially sustainable levels based on water user tariff revenue, while still offering technicians a stable and attractive job. Whave-contracted technicians working to an average performance standard have 20 to 30 hand pumps in their care and earn a good income by rural standards. Good performers are awarded larger concessions (Harvey & Mukanga 2020); bonuses are attached to attributes such as

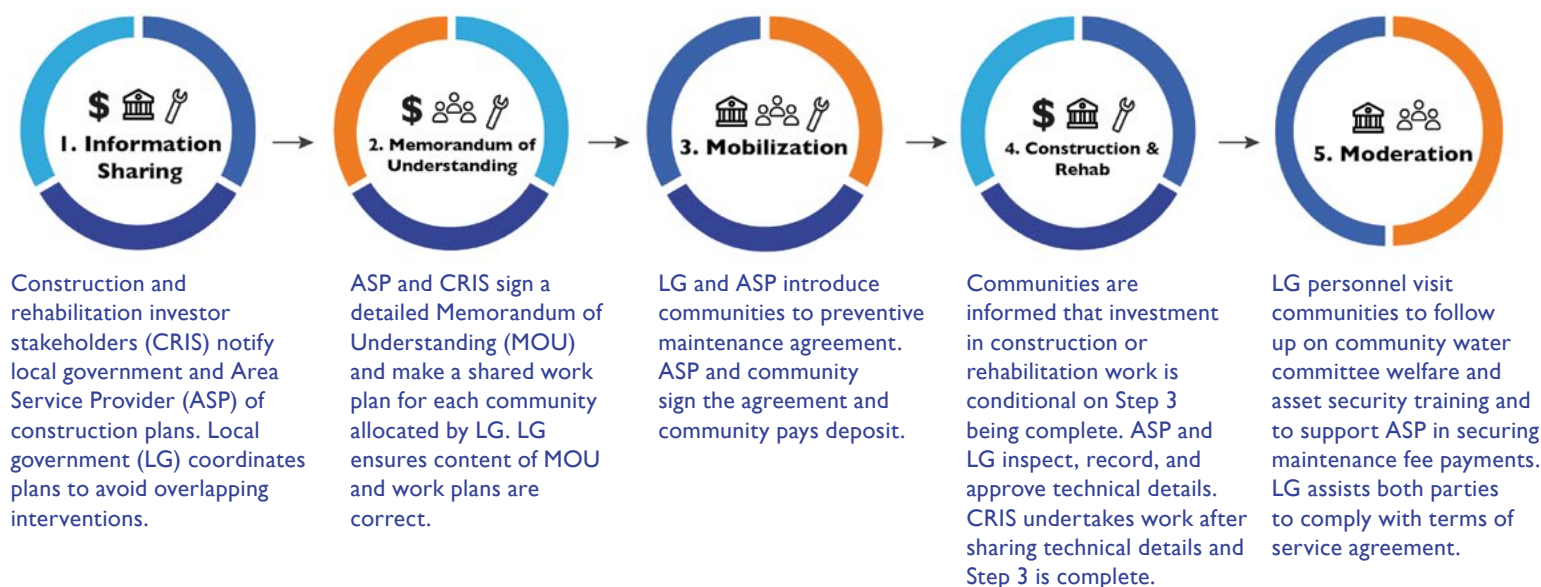
accurate and timely record keeping, while penalties are attached to late repair response.

Whave began implementing performance-pay contracting in 2013, and it has consistently demonstrated positive results in all communities in subsequent years. Functionality rates measured using the government's official spot-functionality method have remained above 97 percent consistently over the years, and even above 99 percent in some districts, compared to baselines between 65 percent and 85 percent. Breakdowns are minimized, and repair times of less than 1 day are achieved in 95 percent of communities each quarter. All communities achieve repairs in less than 5 days, compared to the common occurrence of breakdowns and repair delays lasting weeks and months recorded at baseline.

3. Pre-Construction Maintenance Protocol

Donors and donor-funded NGOs should ensure that any new infrastructure investments are protected by professional maintenance protocols, applied prior to construction, to avoid the common and unsustainable gifting approach that encourages a “wait-till-it-breaks” baseline culture.

Figure 5. Pre-construction maintenance procedures



The key purpose of PMA is to ensure that capital investments in construction and rehabilitation are worthwhile. In other words, once the water points are installed, they should provide service continuously thereafter without repeated expenditure except at genuine component end-of-life. Indeed, if maintenance is done well, all future costs should become service costs rather than investment costs.

However, gifting from NGOs or aid organizations can hinder community willingness-to-pay. For example, in 2019 a large grant for water source rehabilitation in Kamuli resulted in many communities not renewing their service agreements. No long-term obligation to support maintenance is expected of aid organizations and NGOs, so when this type of repair grant expires the community is once again left without a maintenance structure and soon suffers from a broken water point.

Mityana District government pioneered a five-step pre-construction maintenance protocol for NGOs. As of mid-2020, several NGOs had complied with the procedures. This pioneering effort to ensure rural water service delivery relies upon the NGOs to coordinate their infrastructure investments with professionalized maintenance. Before a community can receive an infrastructure investment, the protocol requires that they sign a maintenance service agreement with a district-appointed Area Service Provider. This procedure requires funders and donors alike to shift their mindset and approach. Most donors expect implementing NGOs to spend fixed budgets within limited time periods. However, the maintenance protocol outlines a slower pace of expenditure, calling for coordination meetings among the local government, the maintenance company, and the NGO as well as a period of consultation with communities, in contrast to a simple gifting approach. A key factor for viable service delivery is that infrastructure investors verify in advance of commissioning new infrastructure that a coherent O&M system has been implemented.

The pre-construction maintenance protocol will need buy-in from large bilateral or multilateral aid programs, and from politicians seeking votes, to ensure the PMA is implemented and scaled up. Local government advocacy and support for coordination of WASH aid among NGOs and donors can mitigate the damage and failures caused by a disorganized approach to achieving reliable rural water access. In Kumi, Kamuli, and Nakaseke, 22 of 24 local government water authorities interviewed said that an NGO planning to do construction or rehabilitation work should do so in conjunction with the maintenance plan of the local Area Service Provider, with the local government taking on the coordinating role. Local officials identify current donor “silo” conduct as one reason that poor functionality persists. It is essential for aid agencies and donors to proactively coordinate in support of the pre-construction maintenance protocol (see Figure 5).

Whave has worked with several district governments and NGOs committed to infrastructure investment (both drilling new boreholes and rehabilitating broken ones) to implement this essential viability factor. Donors and boards of these NGOs have reduced the pressure to quickly implement construction work that they conventionally imposed on their implementing staff. After a period, the process became smooth and efficient. One example is the collaboration between Wells of Life, a California-based NGO, and Whave, which complies with the Mityana District Government Pre-Works Maintenance Protocol issued to all NGOs active in the district. In this case, 70 water point investments complied with the protocol as of May 2021, and several hundred more are planned. Four additional district governments have also issued the protocol to NGOs in 2020 and 2021.

4. M&E Facilitation for O&M Performance Reviews

Donors and government should support and fund neutral facilitators of performance reviews in each service area to monitor O&M indicators of (a) Area Service Providers, (b) infrastructure investors such as NGOs, and (c) enabling service providers (district governments) on a regular basis such as quarterly or semi-annually. Facilitators should have performance evaluation authority and executive powers on behalf of central government regulators to replace inefficient actors with efficient actors.

MWE Regional Regulation



Figure 6. M&E facilitation of O&M stakeholders

Figure 6 shows the main actors involved in rural water service delivery, which the MWE oversees through its regional regulation centers. Based on recent experience, a critical gap exists between this regional oversight and detailed practical monitoring of actor performance and coordination. A neutral body to facilitate monitoring and regulation of sector actors within designated service areas will increase accountability and fill this gap. Therefore, a critical factor for viable service delivery is financial support for neutral monitoring and regulation within the national regulation budget.

Whave has piloted quarterly performance reviews in recent years and shared performance data collected quarterly by an independent monitoring team. To date, the reviews have focused on local government progress in mobilizing communities to adopt PMA and on Whave's performance in providing continuous functionality. In 2021, the reviews started to include progress reports from NGOs investing in water infrastructure as a means of tracking their support for mobilizing maintenance agreements. Since 2019, Whave led a group of NGOs active in advising government on O&M regulation and in establishing themselves as Area Service Provider entities. The MWE's PMA documentation adopted several key performance indicators (KPIs). Box 4 outlines the KPIs that are being proposed, as of May 2021, for a neutral M&E facilitator to use in his/her regular reviews. This function requires experience and skill in neutral auditing and record keeping. M&E facilitators will be expected to follow up on O&M stakeholders' commitments. The position is an example of system investment initially funded by donors and later by government.

The M&E facilitator is a critically important actor, having the necessary knowledge and neutrality to measure, evaluate, and reward services appropriately. He/she acts as an agent of the MWE in its regulating role and assists district governments to remove poorly performing Area Service Providers. The M&E facilitator would assist donors to direct system investment funds to districts where enabling services are satisfactory and withhold funds where it is lagging, thus triggering complementary performance on the part of all actors.

While the proposed M&E facilitator is an essential requirement for viable service delivery, equally important is the advent of a fully resourced and empowered National Water Regulator in Uganda, with the power to coordinate urban piped-water utilities and rural water O&M service providers. This role is needed to promote piped water nationally while still ensuring a universal, reliable supply for the majority of the population not served by piped water for decades to come.

5. Optimized Service Area Size

Optimizing the geographic concession size of an Area Service Provider is a key factor for viability. This factor ensures cost efficiency through economy of scale, permits quality control of materials, and is a basis for consensus on tariff levels. In the Ugandan context this implies clusters of four or five neighboring districts ensuring reliability for about 1 million people in each service area.

Box 4: Multi-Stakeholder KPIs

Area Service Providers

- Number of breakdowns, repair time
- Spot functionality
- Financial declaration: progress to sustainable matching of cost and revenue

District Government Water Supply Service Board

- Guidance to infrastructure investors on pre-construction maintenance procedures
- Coverage
- Service agreement enrollment
- Enabling services, e.g., service agreement moderation

Investors (NGOs, Politicians, Sponsors)

- Coverage
- Compliance with pre-construction maintenance protocol

System Investors (Donors, Aid Programs)

- NGO coordination, resourcing M&E facilitator
- Results-financing for enabling services
- Results-financing of Area Service Provider growth and discount subsidies

Uganda is divided into more than 100 districts with decentralized powers, each being a water authority in its own right. Rural population sizes vary considerably, averaging out at approximately 250,000 people per district. Whave's experience suggests that the number of hand pumps an Area Service Provider can most cost-efficiently service is approximately 4,000, implying 1 million people or four neighboring districts. The MWE agrees that to optimize costs Area Service Providers need to operate in geographic areas (clusters) of this size. Clustering solves certain other key problems.

First, Whave found a major cause of poor functionality to be the prevalence of substandard hand pump materials and components, and the temptation among installers to profit from their installation. Well-intentioned installers faced the problem that quality materials are not available in local areas, which obliged them to use poor quality components. The presence of an Area Service Provider addresses the problem, since bulk purchases of materials become possible combined with proper quality controls. The Area Service Provider survives and grows only by virtue of its success in maintaining functionality at least cost, so it has no incentive to use substandard parts, since it is meeting the cost of premature parts replacement and excessive breakdowns.

Second, community members discuss pricing of maintenance service across district boundaries. As soon as price differences arise between two neighboring districts, or even differences in tariff collection methods, service recipients suspect unfair treatment and become unwilling to pay. Clustering of districts into service areas encompassing several neighboring districts is therefore critical to build consensus on tariffs and payment modalities.

In summary, the size of an Area Service Provider's concession is critical for business viability and quality assurance, which together minimize cost and reduce tariffs to affordable levels, and builds consensus on uniform tariffs and willingness-to-pay. It is also clear that demonstration of cost optimization is needed to secure willingness-to-pay.

6. Including Major Parts in Service Agreements

In addition to minor maintenance tasks, major repairs and major parts replacement must be included in service agreements between communities and Area Service Providers. This ensures viability because it removes the inclination of water users to neglect minor faults and early warnings of imminent breakdown as a method of passing costs to an external party.

Prior to implementation of PMA, the community bore responsibility for low-cost repairs, and local governments, NGOs, or politicians handled the more expensive repairs. This arrangement incentivized communities to neglect warning signs of imminent breakdown and instead wait for major breakdowns to occur. Since major breakdown costs are high and give rise to longer repair waiting periods, this cycle has become a key systemic cause of low functionality rates.

To address this issue, Whave included major repairs and major parts replacements within the service agreement between the community and the Area Service Provider. This means that the Area Service Provider is responsible for all functionality assurance costs, for example end-of-life renovation of expensive stainless-steel pipes in a borehole. Whave analyzed the tariff levels necessary to cover this cost and found them to be affordable. Under such service agreement terms, communities no longer ignore warning signs of imminent pump failure and instead are willing to report signs of component failure using Whave's toll-free number, since the Area Service Provider handles both small preventive tasks as well as major tasks.

7. Clear Demarcation of Roles and Cost Responsibilities

Viability depends on each O&M actor knowing its role and its cost-bearing responsibility. The four key roles are maintenance service (the role of the Area Service Provider), enabling service (the role of local government), infrastructure investment (undertaken by NGOs, sponsors such as vote-seeking politicians and government), and system investment (undertaken by donors and government). The government should eventually finance in full the latter two roles. Tariff revenue finances maintenance, and government provides enabling services. A critical step to viability will be foreign aid donors' adoption of this guidance because of the predominant influence they wield in the WASH sector at all levels of government and among communities.

Confusion over who does what and who pays for what is a key obstacle to effective service delivery. The absence of a clearly agreed-upon terminology exacerbates this confusion. For example, is an Area Service Provider a local technician or is it the entity that contracts and supervises local technicians? Is a district water authority a regulator or is that term reserved

for central government? What word is used to describe the district water authority, M&E facilitator, or water board overseeing a performance contract?

Table 1 presents terminology that clarifies who pays for what and how to distinguish the costs of maintenance, and it summarizes principal actors and functions. For example, local government provides enabling services, which include the tasks of mobilizing and moderating. “Mobilizing” is the process of explaining the benefits of service agreements and prompting communities to sign up. “Moderating” ensures compliance with agreements once they are signed.

While not shown in the table, communities are also included in this taxonomy; they share the tariff collection cost, secure the assets, and manage welfare of vulnerable people, ensuring water access for all.

Table 1. Who Pays for What and Who Does What? Roles and Responsibilities

| Cost Category | Maintenance Service | Enabling Service | Infrastructure Investment | System Investment |
|--------------------------------------|--|---|---|--|
| Is this ongoing or once only? | Recurrent, ongoing every year | Recurrent, ongoing every year | Once only in each case of construction or rehabilitation | Once only building an effective system in each district or region |
| Who is responsible to pay? | Water users pay maintenance tariffs to the Area Service Provider, also known as the Rural Water Utility | Local government budgets subsidized by aid, transitioning to taxpayer via government | Central government budgets and aid, NGOs, sponsors such as politicians and churches | Aid directly to pilot, then taxpayer via government assisted by aid, then taxpayer via government |
| Who is responsible? | The Area Service Provider is responsible for achieving targets set for these tasks: | Local government is responsible for achieving targets set for these tasks: | Infrastructure investors (such as NGOs, politicians, and government) responsible for achieving targets set for these tasks: | System investors (such as aid programs, NGOs, and government) are responsible for achieving targets set for these tasks: |
| What are the tasks involved? | <ul style="list-style-type: none"> Preventive maintenance and major parts replacement Technician management Tariff collection Routine decontamination Cost-quality optimized hardware procurement and stocking Toll-free customer support Achieving functionality and repair time targets | <ul style="list-style-type: none"> Multi-stakeholder M&E facilitator Aquifer yield and structural issues e.g., silting, casings Persistent contamination Tariff setting and public information Mobilization and moderation of service agreements | <ul style="list-style-type: none"> Construction of new water sources Restoration of degraded sources Compliance with pre-construction investment procedures Compliance with design and materials quality standards Compliance with abstraction and other regulations | <ul style="list-style-type: none"> Coordination between government and other system investors Collective establishment of coherent system for regulation and M&E for O&M stakeholders Financing of the above Training of local government in digital aids Financing development of cashless payment systems |

8. Transparency of Revenue and Cost

Service providers must be transparent with consumers and water authorities regarding their use of revenue collected and the actual cost of maintenance service provision.

Baseline field studies revealed that most rural community members do not trust their water committees with maintenance tariff revenue due to poor accountability. The University of Colorado at Boulder and Whave carried out a factor analysis that found committees to be the most influential of several factors determining whether a WASH system was ineffective or effective. During Whave's quarterly partnership performance review meetings, district officials claimed that water committees are usually too weak to collect fees and commonly misuse them. Qualitative interviews with local government pointed to the difficulty of strengthening the committees' accountability.

Experience has shown that transparency of revenue use is a critical part of the solution. Even when fee levels are easily affordable, it is essential that all community members have direct information on how their money is used and trust that no revenue is misused. Whave service officers, therefore, train and support committees to call regular community meetings to share financial information. Whave encourages communities to elect women into senior committee posts, drawing on experience that the more trusted and accountable committees are those with active women members.



Figure 7. Calculating maintenance costs

Whave, in its role as Area Service Provider, collects fee payments directly, and includes local government officers in community meetings and committee trainings. Whave accounts for all maintenance costs in detail and shares open account books with stakeholders in quarterly performance reviews. This strategy builds a strong public understanding of the cost of full functionality, justifying tariff levels publicly and promoting willingness-to-pay. Financial transparency will become effective in securing full fee collection once coordination is in place in each service area.

An initial step toward financial transparency is to determine what maintenance costs Area Service Providers need to factor in to determine community tariffs, as shown in Figure 7.

9. Fair Tariffs for Everyone

To ensure viability, tariffs must be affordable to low-income rural families and still generate enough revenue to balance service costs. Tariff modalities must be accepted by all water users, and seen to be fair, implying a single tariff for hand pumps within a given region or language group, or nationally. Trials of different tariff modalities are still ongoing and necessary. The government plays an essential role in the ultimate determination of tariffs.

Whave's work with an NGO group advised the MWE to include recognition of a financial sustainability pathway involving declining growth and discount subsidies over several years in its O&M Framework. The framework recognizes that operations costs include items such as procurement, stock control, accounts, monitoring and supervision of technicians, and non-revenue water losses. Labor includes technician fees and tariff collection, while hardware includes major as well as minor parts replacement. The process of tariff collection includes the cost of Area Service Providers maintaining a physical presence in each community, involving local government in mobilization, as well as in moderating community meetings and committee trainings.

Most communities, local governments, and NGO staff advise that low-income households can afford between 2,000 and 4,000 Ugandan shillings (UGX) per month in return for a reliable hand pump. Councillors in sub-county and district government who live and work in rural communities have on many occasions passed resolutions that set service fees at 2,000 UGX per month per household, while businesses such as builders are expected to pay 100 UGX per jerry can or more. For example, Kumi District sub-county councillors mandated all households pay 2,000 UGX per month. On average 70 households in Kumi share a hand pump, making the expected revenue per hand pump serviced 140,000 UGX per month, or 1.68 million UGX annually. Whave's current cost of maintenance is up to 100 percent more than this (Harvey & Mukanga 2020). However, Whave carries the cost of assuring full functionality at a premature stage of business growth. As customer volume grows from the current 600 communities (170,000 people) to the break-even volume of 4,000 communities (1 million people) in any one service area in a cluster of districts, costs are predicted to fall to 1.2 million UGX per year per hand pump, which a tariff between 500 up to 4,000 UGX per household per month, depending on community size.

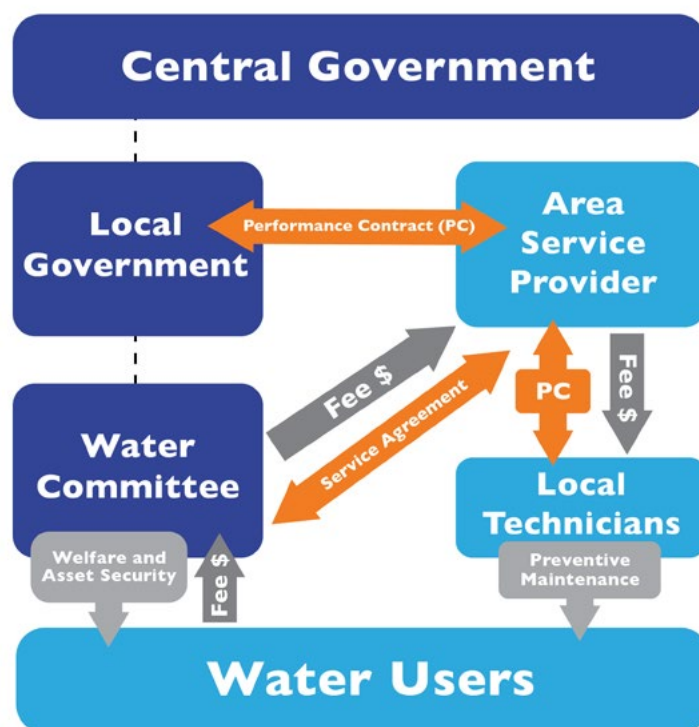


Figure 8. PMA structure and Uniform Technology Fee

Describing maintenance tariffs in terms of a fee per household per month is popular in Uganda, but Whave found it limiting. Several factors determine fair universal affordability and actual gross revenue collected. For example, wealthy farmers consume large amounts of water for domestic and commercial reasons, while other families consume very small amounts, although they share the same hand pump. The amount of water schools consume depends upon the number of pupils and the length of school days or terms. Businesses and institutions come and go and may have very small or very large consumption needs. Different regions have different rainfall patterns, affecting consumption significantly in areas that benefit from rainwater harvesting.

The selection of a tariff modality that is accepted and workable for all water users is a key factor for viable service delivery. Whave trialed three approaches: Uniform Household Tariff, Uniform Technology Fee, and Uniform Volume Tariff. The household tariff is a subscription fee, usually expressed as a monthly fee that each family pays quarterly or annually regardless of amount of water drawn. The technology tariff is an annual service price for the hand pump technology, again irrespective of volume taken, and a lump sum for all water users sharing one hand pump. The volume tariff is a price per 20-liter container of water fetched at the hand pump.

Through its work in hundreds of communities, Whave found implementing the Uniform Household Tariff impractical because communities represented themselves as composed of fewer and fewer families until revenues became insufficient for financial sustainability. Communities and government in most districts preferred the Uniform Technology Fee approach. This is because it suits local administrative arrangements that assume a water committee, with government head of the village oversight (such as the chair of local council I), is competent and sufficiently accountable to collect tariffs and set bylaws regarding management of the hand pump asset.

However, one district, Mityana, had two reasons for choosing the Uniform Volume Tariff. First, the councillors reported that hand pump communities in Mityana had become accustomed to paying per 20-liter container because vendors commonly transported water into communities with failed hand pumps and sold it at prices between 200 and 1,000 UGX per

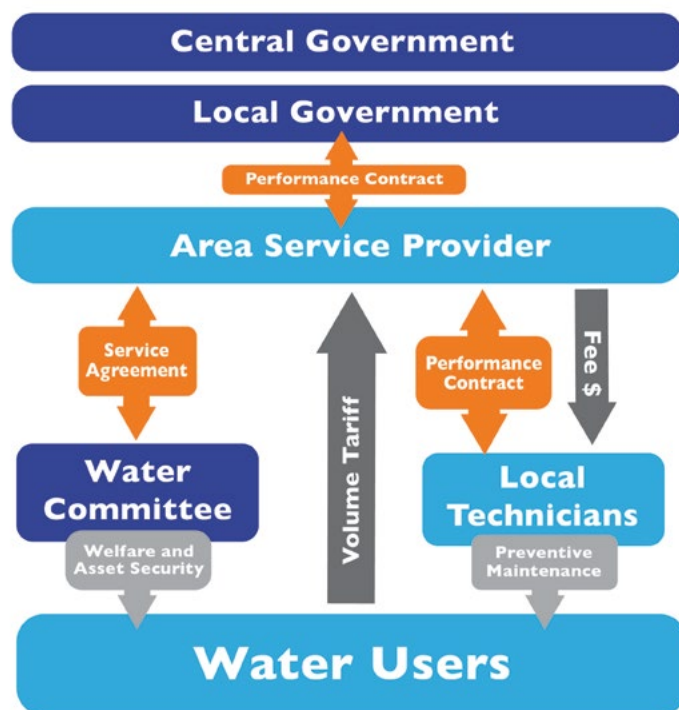


Figure 9. Uniform Volume Tariff

container. Second, they presented examples of communities where a church or school arranged continuous maintenance and assured functionality, charging 50 or 100 UGX per jerry can, and this appeared to be working well with satisfied customers. The district, therefore, legislated a regulated volume fee for water. It chose 40 UGX per jerry can as a price for registered domestic consumers, and 100 UGX per jerry can for visitors such as vendors, businesses, and institutions.

The comparison of tariff modalities continues to be a learning process. The Uniform Technology Fee puts individual families in small communities, who pay relatively more, at a disadvantage compared to those in larger communities. For example, a hand pump serving 200 families collects 500 UGX per month per household, which is much less than the socially acceptable subscription level of 2,000 UGX per month per household. Meanwhile, a hand pump serving 25 homes would need to collect 4,000 UGX per month per home — more than is acceptable currently but still less than 3 percent of average rural income. The Uniform Volume Tariff is the better option in this regard, since individual water users everywhere are paying the same, and large communities automatically

cross-subsidize small communities. However, its weakness is that people are unfamiliar with volume payment at a hand pump, although this may be solved if, and when, prepaid auto dispensers become feasible.

10. Smart Subsidies

Subsidies from donors are necessary, but must be provided in smart way to ensure service providers grow their business volume large enough to break even and that discounts on tariffs decline to zero so tariff revenue fully covers service costs. Government must adopt the techniques used to ensure break-even volume and elimination of discounts, so it is important that the foreign aid support process is conducted through government protocols, and that government ensures compliance among stakeholders nationally.

A major premise of viable service delivery is that revenues from tariffs balance service costs. However, this balance will take several years to achieve and will only be achieved if the four major stakeholders perform their roles and responsibilities as summarized in Table 1. A smart subsidy is one that triggers the stakeholders to accomplish their tasks and declines to zero in the shortest possible time. First, this requires that Area Service Providers grow their business scale sufficiently to reduce costs to a minimum realistic amount per hand pump on average. This cost level is termed the Projected Economic Cost. If all stakeholders deem this cost level to be reasonable and affordable — costing less than 3 percent of average rural income in line with the UN guideline — then the second requirement is that revenue collected rises to this level. This is termed the Projected Economic Tariff.

The two smart subsidies, as shown in Figure 10, first help the Area Service Providers grow to economic scale, and second fill the shortfall between revenue actually collected and the revenue expected from compliance with the Projected Economic Tariff. In practice, the first is the cost of mobilizing communities to sign into service agreements, and the second is the cost of promotional discounts necessary to start providing services to early-start communities. Whave has built an evidence base to enumerate the values, providing a full system investment guide for self-sustaining service delivery, to be published in 2021 (see www.whave.org/publications). The guide takes the reader through a sequence of calculations, following a tariff-setting and subsidy-determination process that the MWE formally endorsed in 2020. The guide presents evidence of costs experienced to date and projects a declining cost of maintenance services until an optimum cost is reached at economic

scale. This is the cost of ensuring full functionality continuously. Assuming that the cost falls below the UN affordability threshold, the projected economic cost determines the projected cost-recovery tariff. The next step is to calculate the declining growth subsidy. This is the difference between the declining cost and the projected economic cost.

To make progress in a context where payment of maintenance tariffs is unfamiliar, promotional discounts are needed to stimulate early-start communities to sign into service agreements. The agreements always clarify that the discounts are temporary and decline to zero over time. Once discounted tariff levels are decided, the amount of subsidy is calculated over the period of declining discount. Finally, the two subsidies, growth and discount, are summed, as a conclusion to the investment needed to bring about cost-recovery sustainability over a period of years.

This pathway to financial sustainability of a fully reliable, functional water supply is a decisive factor for viable service delivery. It is included in the national O&M Framework in Uganda.

Conclusion

Whave has implemented a rural water service delivery model and led sector learning on the viability of rural water service delivery since 2011, which has culminated in identifying key factors influencing viability. These ten factors are considered essential to an effective and sustainable system for delivery of safe water in rural areas. They focus on the importance of coordination of rural water sector actors and the means through which this can be accomplished, the intermediate and long-term roles of various forms of financing for professionalized maintenance services, and the relationships and incentives among key actors, including professional service providers, communities, donors and donor-funded NGOs, and national and local governments. The demonstrated high levels of hand pump functionality that have resulted from Whave's implementation of a performance management approach provide a roadmap going forward to others considering alternatives to the community-based management model of the past.

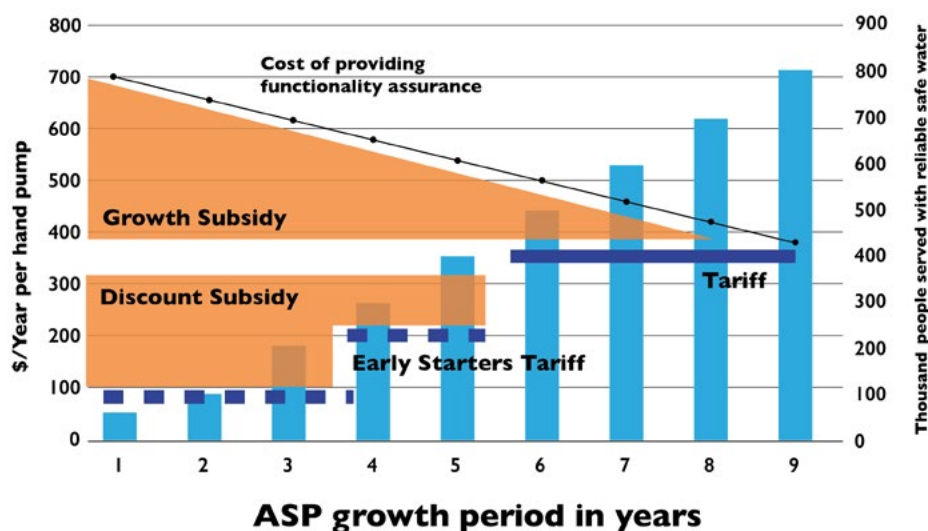


Figure 10. Two smart subsidies

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About the Sustainable WASH Systems Learning Partnership: The Sustainable WASH Systems Learning Partnership is a global United States Agency for International Development (USAID) cooperative agreement with the University of Colorado Boulder (UCB) to identify locally driven solutions to the challenge of developing robust local systems capable of sustaining water, sanitation, and hygiene (WASH) service delivery. The consortium of partners—Environmental Incentives, IRC, LINC, Oxford University, Tetra Tech, WaterSHED, Whave, and UCB—are demonstrating, learning about, and sharing evidence on systems-based approaches for improving the sustainability of WASH services in four countries.

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