
Citation:
Adam Harvey, *Cost Model v1.2 for Rural Water in Uganda*, www.whave.org, April 2019
The purpose of this cost model is to capture practical information from field experience, followed by projections of optimum design and cost of a national O&M framework. The model is continuously updated with data drawn from practical functionality assurance services in several hundred communities in more than five districts.

The guiding principle is that a national O&M framework should assure full supply functionality and universal access for all rural water users including the poorest, while complying with the Ugandan Government’s Community-Based-Maintenance System (CBMS) principle that sufficient maintenance fees are paid by water users for reliable supply.

The design and costing approach seeks to realize in practical terms the Ugandan National Development Plans and the SDG goals. Whave works in close collaboration with local and central government under government regulation. Integrated water resource management and Water-for-Production are priorities alongside reliable daily access to safe drinking and washing.

Whave is a Ugandan non-profit social enterprise with over 50 staff, operating as a Service Area Provider building benchmark data on performance and cost. We are also consultants, advising on regulation, aid co-ordination, and providing training for rural water Service Area Providers.
Acknowledgments

Our primary service cost funders and collaborators are rural community leaders who pay service fees to Whave acting in its role as a Service Area Provider. Service fees are paid in exchange for assurance of functionality of a water source. We collaborate on financing also with local governments who play the leading role in the Public-Provider Partnership described here, alongside community Water and Sanitation Committees and Hand-Pump Mechanics Associations (HPMAs). The enthusiasm and knowledge of rural communities and local sub-county councils is acknowledged as the lead expertise underpinning this study, with district government and MWE support.

The O&M strategy described here was developed collaboratively with communities, local government and HPMAs through many in-depth workshops each year participated in by the Ugandan Ministry of Water and Environment (MWE). The work started in 2011 with support from the Rural Water Department of MWE for innovation by Whave in performance-payment of local Hand-Pump Mechanics. Since 2017, Quarterly Performance Reviews have been held with local governments as formal Public-Provider Partnership functions.

Investment finance is gratefully acknowledged from University of Colorado Boulder (UCB USAID project SWSLP), UNICEF Uganda, and Siemens Foundation (Germany); funders since 2013 also include the Austrian Development Agency (ADA), Osprey Foundation (USA), Waterloo Foundation (UK), Silicon Valley (USA), and the Climate and Development Knowledge Network (UK and NL). This cost model was requested severally by the UCB USAID program SWSLP, the Ugandan Ministry of Water and Environment (MWE), UNICEF Uganda and the Austrian Development Agency (ADA).
If we establish an O&M framework that assures that hand-pumps function reliably on strength of tariff payments, it acts as a justification for large-scale investment in rural (point-source) piped systems for human health (safe drinking/washing), animal husbandry and crop irrigation.
Content

1. Institutional, policy, legal, contractual framework:
   Alignment with MWE discussions regarding Public Utility Model / Service Area Approach / Improved CBMS.

2. Roles and Cost responsibilities: alignment with national development and Vision 2040 goals for sustainable financing in a middle class Uganda. Demarcation of rural service gazette areas.

3. Costings for >98% functionality. Detail of Service Cost experience: Hardware Replacement, Technicians, Management

4. Payment modes. Can the direct service cost be met by tariffs? Analysis of payment modes, based on cost evidence to date.

5. Three cost items: Service costs (paid by tariffs), recurrent enabling costs, and investment costs. What is the investment cost associated with a pilot service areas and replication nation-wide?

6. Generating the necessary investment. Is the money available?

7. Potential Pilot Service Area.
1a. Agreeing the contractual framework

**MWE : Utility Regulation Dept**

**Performance Contracts**

- **Umbrellas, NWSC**
- **Regional Rural Regulator**
- **Regional Utilities**
- **District and Sub-County Gov**
  - **Indirect services, Legislation**

**Service Area Providers**

- **Rural <5000 people**

1. **Performance Contracts**
   - O&M and BOT

2. **Regulated Price Plans**
3. **Legislation**:
   - Ordinances,
   - Sub-County By-Laws:
   - Mobilization,
   - Indirect Services

4. **Technician Performance Contract**

5. **Preventive Maintenance and Continuous Rehabilitation Agreement**

6. **CBO / WSC constitution**

**Local technicians**

- (e.g. HPMA members)

(4) **O&M, full functionality**

**Payment for service**

**Water and Sanitation Committee WSC**

- Welfare, Universal access

**Households, schools, businesses, institutions**
1b. Agreeing the policy and legal framework

The priority is a system which links all stakeholders with clarity, assures full functionality of, and universal access to, rural water sources, while being sustainably financed. The Cost Model focuses on this output.

“Universal access” is key to legal structure. Service Area concessions or “gazettes” are performance contracts which give the Service Area Providers the right to operate in high-revenue communities and oblige them to assure functionality in small communities.

The Public Utility/Service Area model described here is compliant with the Community Based Maintenance System (CBMS) which is the overarching policy for rural water maintenance in Uganda. It is also compliant with official policy of promotion of local Hand-Pump Mechanics Associations as Service Area Providers.

See section 6 below, and “The Baby and the Bath Water” available on the Whave website publications list.
## 2. Agreeing roles and cost responsibilities

<table>
<thead>
<tr>
<th>Service Area Providers (SAPs)</th>
<th>MWE Regional Regulators</th>
<th>Min Finance, Govt Utilities, DLGs, Service Area Providers, NGOs, Partners</th>
</tr>
</thead>
</table>
| **Role:** Operation and Maintenance, Build-Operate-Transfer (BOT)  
Performance indicator: Functionality >98%.  

<table>
<thead>
<tr>
<th>Recurrent / Permanent</th>
<th>Recurrent / Permanent</th>
<th>Temporary</th>
</tr>
</thead>
</table>
| O&M / Direct Service  
Paid by Tariffs | Enabling / Indirect Service Costs  
Paid by national budget | Investment  
Paid by national budgets, Development Partners (DPs) |

Details in section 6 below
3a. More than 98% functionality; people served

**Whave Solutions** is a prototype SAP providing O&M services since 2013. with Preventive Maintenance and Continuous Rehabilitation Agreements (PMCRAs) signed by community Water User Committees. **Functionality over 98% has been consistent in over 300 communities over several years in three districts:** 98% is less than 8 days down-time/year

Performance Reviews are conducted quarterly by the DLG water authorities, under **Public-Provider (PPP) MOUs**, as prototype Performance Contracts

- **Nakaseke PPP**
  - Pop Served: 7,971
  - PMCRAs: 46
  - Func: 98%

- **Mityana. Public-Provider Partnership established.** Planning of maintenance contract for a District-funded piped system with Whave as SAP

- **Kamuli PPP**
  - Pop Served: 53,075
  - PMCRAs: 219
  - Func: 99%

- **Kumi PPP**
  - Pop Served: 26,202
  - PMCRAs: 80
  - Func: 100%
3b. How is > 98% functionality achieved?

**Performance-payment contracts** for local technicians (HPMA members) has resulted in consistent >98% functionality (see Contract 4 in Framework)

- This requires a management team to monitor functionality, train the HPMA members/technicians to make 4 checks/year on each source signed off by WSC, pay monthly fees varied according to number of sources maintained and functionality performance of each technician
- A Service Area Provider therefore has a significant **Management Cost**, including senior engineering, accounting, management oversight, both at regional, national and local levels (including Kampala HQ costs).
- Management costs in Q4 2018 dropped due to staff transfers to Mityana District.

<table>
<thead>
<tr>
<th>PMAs</th>
<th>Number of technicians (HPMA members)</th>
<th>Direct service spend</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total techs</td>
<td>Total technician earnings</td>
</tr>
<tr>
<td>2018 Q1</td>
<td>233</td>
<td>9</td>
</tr>
<tr>
<td>2018 Q2</td>
<td>268</td>
<td>17</td>
</tr>
<tr>
<td>2018 Q3</td>
<td>292</td>
<td>17</td>
</tr>
<tr>
<td>2018 Q4</td>
<td>341</td>
<td>20</td>
</tr>
</tbody>
</table>
### 3c. Hardware replacement: OpEx and CapManEx

<table>
<thead>
<tr>
<th>Component</th>
<th>Unit Cost [UGX]</th>
<th>Lifetime [Years]</th>
<th>Average Annual</th>
<th>Lifetime Anticipated</th>
<th>Expected Average Annual Cost [UGX]</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pump Head Assembly</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Examples</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M12*20 Hex Bolt [Top Bolt]</td>
<td>1,000</td>
<td>2</td>
<td>500</td>
<td>3</td>
<td>333</td>
</tr>
<tr>
<td>M12 Washer [Axle Washer]</td>
<td>1,200</td>
<td>2</td>
<td>600</td>
<td>3</td>
<td>400</td>
</tr>
<tr>
<td>M10*40 Hex Bolt [Chain Bolt]</td>
<td>5,000</td>
<td>2</td>
<td>2,500</td>
<td>3</td>
<td>1,667</td>
</tr>
<tr>
<td>U2 Water Tank w/ 32 mm Socket</td>
<td>120,000</td>
<td>10</td>
<td>12,000</td>
<td>15</td>
<td>8,000</td>
</tr>
<tr>
<td>Other components</td>
<td>806,200</td>
<td>various</td>
<td>various</td>
<td>various</td>
<td>various</td>
</tr>
<tr>
<td><strong>Total Cost</strong></td>
<td>933,400</td>
<td></td>
<td>176,058</td>
<td></td>
<td>130,042</td>
</tr>
<tr>
<td><strong>Riser Main [24 m]</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Examples</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>U2 PVC White Pipe 1.25&quot;</td>
<td>45,000</td>
<td>8</td>
<td>5,625</td>
<td>12</td>
<td>3,750</td>
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<tr>
<td>U2 SS Connecting Rod [12 mm, SS202]</td>
<td>73,000</td>
<td>10</td>
<td>7,300</td>
<td>14</td>
<td>5,214</td>
</tr>
<tr>
<td>U2 SS Rod centraliser</td>
<td>3,500</td>
<td>6</td>
<td>583</td>
<td>8</td>
<td>438</td>
</tr>
<tr>
<td>Other components</td>
<td>1,007,500</td>
<td>various</td>
<td>various</td>
<td>various</td>
<td>various</td>
</tr>
<tr>
<td><strong>Total Cost</strong></td>
<td>1,129,000</td>
<td></td>
<td>132,494</td>
<td></td>
<td>106,392</td>
</tr>
<tr>
<td><strong>U2 Cylinder Assembly</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Examples</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>U2 Upper Valve Rubber seating</td>
<td>3,000</td>
<td>1.29</td>
<td>2,328</td>
<td>2.0</td>
<td>1,500</td>
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<tr>
<td>U2 Lower Valve Sealing Ring</td>
<td>2,000</td>
<td>1.13</td>
<td>1,769</td>
<td>2.0</td>
<td>1,000</td>
</tr>
<tr>
<td>U2 Lower valve</td>
<td>22,000</td>
<td>3</td>
<td>7,333</td>
<td>4</td>
<td>5,500</td>
</tr>
<tr>
<td>Other components</td>
<td>242,200</td>
<td>various</td>
<td>various</td>
<td>various</td>
<td>various</td>
</tr>
<tr>
<td><strong>Total Cost</strong></td>
<td>269,200</td>
<td></td>
<td>63,000</td>
<td></td>
<td>49,083</td>
</tr>
<tr>
<td><strong>Civil Works</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Examples</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Concrete Apron Casting</td>
<td>129,000</td>
<td>10</td>
<td>12900</td>
<td>15</td>
<td>8,600</td>
</tr>
<tr>
<td>Concrete Drainage Channel Casting</td>
<td>86,000</td>
<td>10</td>
<td>8600</td>
<td>15</td>
<td>5,733</td>
</tr>
<tr>
<td><strong>Total Cost</strong></td>
<td>215,000</td>
<td></td>
<td>21,500</td>
<td></td>
<td>14,333</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>393,052</td>
<td></td>
<td>299,851</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

VAT is included in this pricing, therefore projection is conservative  $81/year / hand-pump
3d. Costing > 98% functionality

The table here shows costs as follows:
- On left, under current conditions of **OpEx Hardware only** (because Recovery Rehabs are temporary investment); and non-economic scale
- One the right, under conditions where **Rehabilitation is continuous**, and management cost reduces with **Service Area economy of scale**

<table>
<thead>
<tr>
<th>O&amp;M Direct Service Costs at economic scale, with CapManEx</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Whave data Dec 2018: Per Hand-Pump per year</strong></td>
</tr>
<tr>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>87,248 People</td>
</tr>
<tr>
<td>341 Hand-pump communities</td>
</tr>
<tr>
<td>99% Average functionality</td>
</tr>
<tr>
<td>256 Average persons/hand-pump</td>
</tr>
<tr>
<td>$48 Technicians earnings</td>
</tr>
<tr>
<td>$27 Hardware replacement (OpEx)</td>
</tr>
<tr>
<td>$431 Management</td>
</tr>
<tr>
<td>0% Non-Revenue Water / VAT on revenue</td>
</tr>
<tr>
<td>$506 Total Direct Service</td>
</tr>
</tbody>
</table>
4a. Payment modes. Pay for Volume Hybrid (PfVh) and Improved Subscription

Kamuli, Nakaseke, Kumi
Improved Subscription
PFV will be introduced. Piped supply (BOT) in 2019

Mityana. Under discussion: Pay-for-Volume hybrid (PFVh) for Hand-Pumps and piped supply (BOT)

Trading centres: PVFh
Farming communities: Improved Subscription
Collection is either by WSC or SAP
Combinations will exist into future decades.
Eventually PFV Direct Collection by SAP will dominate in tap-stands and metered premises
4b. Pay-for-Volume hybrid, direct Collection by SAP
Hand-pumps and Piped supply. VSLAs for deposits/standing charges

**Pay-for-Volume (PfV)** includes direct household metered connections, pay-as-you-fetch from tap-stands or hand-pumps (automatic and manual), and payment of subscriptions by some users for example schools sometimes pay 1000UG/pupil/term, therefore “hybrid”

- Water-VSLA, Community Income
- Technician Fees Hardware Management
- Attendant / Auto-Disp Service Area Provider
- WSC
- SAP Service Fee $319
- Surplus over cap

**Volume Tariffs** (PAYF and hh connections)
- VSLA deposits
- Subscriptions (eg schools)

**Homes, Businesses, Institutions**
SAP and Attendant cash flow deficit in low-revenue communities is compensated by surplus earned in high revenue communities. This is automatic as per insurance.

**4c. Pay-for-Volume hybrid, direct Collection by SAP**

Hand-pumps/point source piping. VSLAs for deposits/standing charges, deposits exempted in small communities.

Min payment is 200UGX/5 jerry-cans as health incentive, except welfare exemptions. Pie charts show monthly revenues. Income from household connections is not yet shown: this is known to improve economics.

**Tariff collected by SAP via Automatic Water Dispenser (AWD)/Attendant:**
1. Basic is paid to Attendant and SAP
2. Remainder divided between SAP, Attendant, VSLA (or VSLA if PAD)
3. When SAP cap is reached, remainder divided between Attendant and VSLA
4. After VSLA cap, Attendant and VSLA each are capped

Note that Attendant arrangement acts as back up in case of non-functioning PAD

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**Servicing Area Provider, including local technicians fees, hardware, management, UGX 100,000, 17%**

**VSLA, UGX 150,000, 25%**

**Attendant fee, UGX 200,000, 34%**

**Surplus available, UGX 141,000, 24%**

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**50 households, same price plan, 2jc's/day (40/jc), no non-lifeline consumers, no school or subscriber, no special deposit to VSLA**

**VSLA, UGX 6,667, 6%**

**Service Area Provider, including local technicians fees, hardware, management, UGX 56,667, 47%**

**Attendant fee, UGX 56,667, 47%**

**Surplus available, UGX 0, 0%**
4d. Improved Subscription, collection by WSC, fixed charge to SAP. Both Hand-pumps and Piped supply, mostly HPs

WSC costs (or voluntary)

Service Area Provider
- Preventive Maintenance
- Replacement of Hardware
- Management of Technicians

SAP Service Fee $319

WSC
CBO registration, with bank account

Pay subscriptions set by WSC

Homes, Businesses, Institutions
4e. Improved Subscription, WSC collection: Declining discount as a market build strategy. However common proximity of alternative hand-pumps free of charge, and frequency of politicians and NGOs offering free repairs, implies that the priority is scaling and saturation in concentrated Service Areas for social normalization, together with creating demand for PFVh / piped supply with Prepaid Automatic Water Dispensers (PADs).

<table>
<thead>
<tr>
<th>Service Area Provider (SAP)</th>
<th>2018</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whave Service Fee</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Number of pipes</th>
<th>Community Service Fee CSF $ /year</th>
<th>2018</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 to 5</td>
<td>$282</td>
<td>$215</td>
<td>$67</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$188</td>
<td>$94</td>
</tr>
<tr>
<td>6 to 9</td>
<td>$309</td>
<td>$215</td>
<td>$94</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$188</td>
<td>$121</td>
</tr>
<tr>
<td>&gt; 10</td>
<td>$336</td>
<td>$215</td>
<td>$121</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$188</td>
<td>$148</td>
</tr>
</tbody>
</table>

Additional Contributions:

<table>
<thead>
<tr>
<th>Institutions</th>
<th>WSCs discretion</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$322</td>
</tr>
<tr>
<td></td>
<td>$188</td>
</tr>
<tr>
<td></td>
<td>$134</td>
</tr>
<tr>
<td></td>
<td>$161</td>
</tr>
<tr>
<td></td>
<td>$161</td>
</tr>
<tr>
<td>Businesses</td>
<td>WSCs discretion</td>
</tr>
<tr>
<td></td>
<td>$322</td>
</tr>
<tr>
<td></td>
<td>$188</td>
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<tr>
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<td>$134</td>
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<td></td>
<td>$161</td>
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<td></td>
<td>$161</td>
</tr>
</tbody>
</table>
4f. Improved subscription: 2018 Cost recovery

The table shows portion of cost recovered under current conditions:

- **Scale** is below breakeven - still at start-point at left of chart
- **Discounted pricing** is necessary to introduce the Improved CBMS system, then scaling as priority
- Service Cost includes management, procurement of quality hardware, accounting, engineering oversight overheads in Kampala

<table>
<thead>
<tr>
<th>Kamuli-Nakaseke-Kumi 2018</th>
<th>Number of Service Agreements (PMAs)</th>
<th>People served at full functionality</th>
<th>Annual Service Charge</th>
<th>Average revenue received per PMA</th>
<th>Compliance</th>
<th>Equiv annual O&amp;M Spend</th>
<th>Revenue / Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018 Q1</td>
<td>233</td>
<td>62,366</td>
<td>$90</td>
<td>$78</td>
<td>87%</td>
<td>$806</td>
<td>10%</td>
</tr>
<tr>
<td>2018 Q2</td>
<td>268</td>
<td>69,067</td>
<td>$55</td>
<td>$47</td>
<td>85%</td>
<td>$844</td>
<td>6%</td>
</tr>
<tr>
<td>2018 Q3</td>
<td>292</td>
<td>77,730</td>
<td>$92</td>
<td>$81</td>
<td>88%</td>
<td>$763</td>
<td>11%</td>
</tr>
<tr>
<td>2018 Q4</td>
<td>341</td>
<td>87,248</td>
<td>$143</td>
<td>$117</td>
<td>82%</td>
<td>$506</td>
<td>23%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>284</td>
<td>74,103</td>
<td>$95</td>
<td>$81</td>
<td>85%</td>
<td>$730</td>
<td>11%</td>
</tr>
</tbody>
</table>
4g. Cost recovery without tariff raise

Two adjustments are necessary:

- Hardware includes major component replacement, **CapManEx**, so that all costs are included as direct service. This is a key solution to functionality issue, together with BOT incentive.
- Management cost assumes economic scale.

### O&M Direct Service Costs at economic scale, with CapManEx

<table>
<thead>
<tr>
<th>Whave data Dec 2018: Per Hand-Pump per year</th>
<th>Scaled and CapManEx included</th>
</tr>
</thead>
<tbody>
<tr>
<td>87,248 People</td>
<td>1,000,000 Size of Service Area</td>
</tr>
<tr>
<td>341 Hand-pump communities</td>
<td>3,908 2 to 4 districts in Service Area</td>
</tr>
<tr>
<td>99% Average functionality</td>
<td>99% Average functionality</td>
</tr>
<tr>
<td>256 Average persons/hand-pump</td>
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<tr>
<td>$48 Technicians earnings</td>
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</tr>
<tr>
<td>$27 Hardware replacement (OpEx)</td>
<td>$81 Hardware: CapManEx and OpEx</td>
</tr>
<tr>
<td>$431 Management</td>
<td>$125 2.5x increase in Management</td>
</tr>
<tr>
<td>0% Non-Revenue Water / VAT on revenue</td>
<td>20% NRW / VAT on revenue</td>
</tr>
<tr>
<td>$506 Total Direct Service</td>
<td>$319 Total Direct Service</td>
</tr>
</tbody>
</table>

| Revenue per Hand-Pump at end of 2018         | $117 |
| Revenue / Cost if revenue stays at 2018 level | 37% |

**Will Improved Subscription ever get tariffs above 2018 level?** Yes, if scaling/saturation of PMCRAs takes place. No, if not. Is PfVh an alternative? Yes it is a step to piped supply and it may accelerate progress. However, scaling/saturation of PMCRAs (gazetting of service areas) is the essential priority.
### 5a. Three Cost Items

<table>
<thead>
<tr>
<th>Service Area Providers (SAPs)</th>
<th>Enabling / Indirect Service Costs</th>
<th>Investment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Role:</strong> Operation and Maintenance, Build-Operate-Transfer (BOT)</td>
<td><strong>Role:</strong> Regulation, performance monitoring SAPs, issue Build-Operate-Transfer (BOT) contracts. Mobilize and support WSCs. Set tariffs, service fees, regulate discounts. Substitute for SAP where necessary. <strong>Water Resources management.</strong> Address yield, water quality, and silting issues</td>
<td><strong>Role:</strong> Welfare access by poor. Security. Hygiene. Collection of tariffs when in WSC collection payment mode. Comply SLG and DLG PM bylaws/ordn’s</td>
</tr>
<tr>
<td><strong>Source finance to build the contractual framework, train SAPs and government actors</strong></td>
<td><strong>Source infrastructure finance for upgrades to piped supply, prepay (PADs) and metered home water supply</strong></td>
<td><strong>Paid by national budgets, DPs</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>O&amp;M / Direct Service</th>
<th>Recurrent / Permanent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paid by Tariffs</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MWE Regional Regulators</th>
<th>Min Finance, Govt Utilities, DLGs, Service Area Providers, NGOs, Partners</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gov Utilities/ Water Authorities</td>
<td><strong>Role:</strong> Regulation, performance monitoring SAPs, issue Build-Operate-Transfer (BOT) contracts. Mobilize and support WSCs. Set tariffs, service fees, regulate discounts. Substitute for SAP where necessary. <strong>Water Resources management.</strong> Address yield, water quality, and silting issues</td>
</tr>
<tr>
<td>DLGs SLGs</td>
<td><strong>Role:</strong> Welfare access by poor. Security. Hygiene. Collection of tariffs when in WSC collection payment mode. Comply SLG and DLG PM bylaws/ordn’s</td>
</tr>
<tr>
<td>WSCs</td>
<td><strong>Role:</strong> Source infrastructure finance for upgrades to piped supply, prepay (PADs) and metered home water supply</td>
</tr>
</tbody>
</table>
5b. Investment

1. Refine contractual framework at ground level

2. Build Public Utility/Improved CBMS at ground level to introduce PFVh SAP collection to reduce discount and non-revenue water

3. Train SAPs and government actors

4. Sub-standard installations need restoration: Recovery Rehabilitation

5. Provide for discount investment and non-revenue water supply

6. Finance upgrades of hand-pumps to piped supply

7. Upgrades to prepaid automatic water dispensers (PADs)

8. Upgrades to metered home water supply
5c. Projection of pilot Service Area with 30% piped water

- The chart shows one pilot service area.
- Mix of payment modes: Improved Subscription and PRVh, collection by SAP, collection by WSC.
- **PFVh collection by SAP** in hand-pump communities, promoted as an **eligibility step for upgrade to piped supply**, as incentive for willingness-to-pay.
5d. One investment item is discount: promotional tickets on Uganda airlines? Scaling to breakeven tariff viability:
• Tariff revenue is insufficient while scaling
• With multiple payment modes, discounts needed for fewer years. **Discount is investment (not subsidy).**
• OpEx increases to include CapManEx. Management reduces as scale increases.
5e. Recurrent Enabling costs

Keys to functionality and rural productivity, health:

1. Economy of scale and geographic saturation for social normalization of tariffs, therefore gazzeting of rural functionality Service Areas

2. Co-ordination of Development Partners and NGOs to create scale and saturation, with focus on Service Areas. Government Enabling function is to direct donors to Service Area approach.

3. Community willingness to adopt Preventive Maintenance Service Agreements (PMAs) is mobilized by HPMA member, councilors, SLG/DLG extension staff. SLG resolutions are helpful.

4. Water and Sanitation Committees need some way of addressing minority who resist tariff payments: SLG resolutions are helpful. Examples already exist.

5. Ordinances will follow as the Public-Provider partnership develops. Council meetings are underway.

6. Current SLG resolutions mandating PMAs in 21 sub-counties already form a legal basis for gazzetting rural Service Areas. See contractual f/work number 3.

7. Existing budgets are sufficient for the enabling role: Regulation, mobilization, exclusions.

Examples:

Councilors in Kamuli explain PMA to communities, and use the Whave toll-free number in to address technical questions during meeting.

A CDO in Kamuli was called by a WSC to deal with a community member who refused to pay a maintenance tariff; because the CDO knew the resolutions were in place and the committee had signed a PMA, he was able to call police and the recalcitrant was fined.

SLG officers and HPMA are active in Kamuli, Nakaseke and Kumi, and are mobilizing communities for PMAs.

In Kamuli, in 2018 and 2019 the DWO has transferred hardware in procured under government grant to the SAP for use in recovery rehabilitations, following an analysis that the money was used 4x more efficiently an avoided repetition of rehabilitation.

These functions are undertaken under normal government budgets without extra facilitation.
### 5f. Initial pilot 30% piped

30% of 1 million people is 300,000. At average 1000 people per Piped, that’s 300 piped supplies, and approx. 2700 hand-pumps

<table>
<thead>
<tr>
<th></th>
<th>O&amp;M Costs and Tariffs</th>
<th>Enabling / Indirect Service by Gov</th>
<th>Investment over 6 years: 2020 to 2025</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pilot service Area:</strong></td>
<td><strong>Recurrent / permanent expenses</strong></td>
<td><strong>Temporary Expenses:</strong></td>
<td><strong>PPP System Build, Infrastructure Capital</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Full-functionality; Direct Collection and PFV for both Hand-Pumps and Piped Supply</strong></td>
<td><strong>Conversion of HP to Piped</strong></td>
<td><strong>Regulation over 6 yrs</strong></td>
</tr>
<tr>
<td></td>
<td>262 Av people per hand-pump</td>
<td>30% Conversion of HP to Piped</td>
<td>$63,211 PPP System Build</td>
</tr>
<tr>
<td></td>
<td>46 Av # hh per hand-pump (HP)</td>
<td></td>
<td>$178,850 Discount and NRW</td>
</tr>
<tr>
<td></td>
<td>$319 SAP Annual Service Fee HPs</td>
<td></td>
<td>(NRW 15%) 20% NRW included in Discount</td>
</tr>
<tr>
<td></td>
<td>$322 VSLA-WSC deposit/year</td>
<td></td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>$430 Attendant/caretaker</td>
<td></td>
<td>$30,156 HP Recovery Rehabilitation</td>
</tr>
<tr>
<td></td>
<td>$1,071 SAP total annual service cost (incl NRW)</td>
<td></td>
<td>$634,855 Capital cost or conversion to Piped</td>
</tr>
<tr>
<td></td>
<td>$500 Non-Lifeline revenue/cross-subsidy per year</td>
<td></td>
<td>($86,859) Community HP Rehab contribution</td>
</tr>
<tr>
<td></td>
<td>$2.18 Service /person/yr</td>
<td></td>
<td>($27)</td>
</tr>
<tr>
<td></td>
<td>$0.96 Tariff/nominal hh/mth</td>
<td></td>
<td>$20,000</td>
</tr>
<tr>
<td></td>
<td>$3,587 UGX/nominal HH/mth</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1000 Av people per piped supply PS</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>189 Av # hh per piped supply PS</td>
<td></td>
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<td>$3,036 SAP total annual service cost (incl NRW) PS</td>
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<td></td>
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<td>$1,000 Non-Lifeline revenue/cross-subsidy per year</td>
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<td>$2.04 Service /person/yr PS</td>
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<tr>
<td></td>
<td>$0.90 Tariff/nominal hh/mth PS</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$3,347 UGX/nominal HH/mth PS</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note 1:** Maximization of Pay-for-Volume (PFV) Direct Collection, for both Hand-Pumps and Piped Supply

**Note 2:** Tariff payments are doubling as deposits in VSLAs; in communities with little non-lifeline revenue and few users, there is cross subsidy from high-revenue communities

**Note 3:** Fund-raising and funder liaison is not included

**Note 4:** PPP Build includes testing, finalization and national dissemination of Full Functionality PPP contractual framework

**Note 5:** Target of Pilot Service Area is to socially normalize tariffs and remove need for Discount approach in subsequent and parallel national replication
## 5g. Replication: 10 Service Areas 60% Piped

<table>
<thead>
<tr>
<th>Replication: mainly piped supply, fewer Hand-pumps</th>
<th>O&amp;M Costs and Tariffs</th>
<th>Enabling / Indirect Service by Gov</th>
<th>Investment over 6 years: 2026 to 2031</th>
</tr>
</thead>
<tbody>
<tr>
<td>10,000,000 people</td>
<td>Recurrent / permanent expenses</td>
<td>Recurrent</td>
<td>Restoration and O&amp;M for approx 16,000 HPs and conversion of approx 24,000 to Piped Supply</td>
</tr>
<tr>
<td>Some hand-pumps are converted to piped supply, and some are restored and maintained by SAP.</td>
<td>Full-functionality; Direct Collection and PFV for both Hand-Pumps and Piped Supply</td>
<td>Current budgets probably sufficient to regulate Public Utility / Improved CBMS. CDOs, Parish Chiefs, councilors mobilize and moderate</td>
<td></td>
</tr>
<tr>
<td></td>
<td>262 Av people per hand-pump</td>
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</tr>
<tr>
<td></td>
<td>$319 SAP Annual Service Fee HPs</td>
<td>Training, PPP System Replication</td>
<td>$600,000</td>
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<td>3587 UGX/nominal HH/mth</td>
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<td>Note 3 Fund-raising and funder liaison is not included</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Note 4 PPP Replication includes training and also testing, finalization and national dissemination of Full Functionality PPP contractual framework</td>
<td>2018 actual</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Note 5 Discount approach is still needed in some areas but mostly removed as tariffs match direct service cost; however NRW is still accommodated in cost</td>
<td>2018 actual</td>
<td></td>
</tr>
</tbody>
</table>
5h. Replication nationally

40 million people. No discounts, tariffs are normalized. Investment costs are increasingly amortised within tariffs, especially in view of investment for irrigation, better health, less urban migration and therefore and increasing rural productivity and incomes.

Vision 2040 and SDG 6.1/2 Timelines: Conversion of Hand-Pumps to Piped Supply
6a. Generating Investment

Is the money available?

Yes, larger sums are being spent currently without functionality improvement.

Performance-payment of local HPMA members is proof-of-concept, showing that functionality is feasible at affordable tariff levels. Training of HPMAs as SAPs is official government policy. HPMA members are mobilizing PMCRA agreements, communities are paying service fees.

Improved economic productivity of rural areas is essential to Uganda’s Vision 2040 and National Development Plans. This Public Utility / Improved CBMS / Service Area model is the practical engine that delivers functionality from which economists expect a four-fold return in investment. Thousands of jobs in rural areas are created.

The key is co-ordination of funds provided by Development Partners and Government. Current expenditure is sufficient if co-ordinated.

In the districts where Whave operates, NGOs and DLGs are starting to join hands. Co-ordination of DP/NGO/Gov finance is sufficient investment.
6b. Addressing climate change

Investment funding is being prepared focused on water-for-production for cattle and agriculture in climate-affected zones. This complements O&M tariff willingness-to-pay.

Whave is working with MWE on investment for solar-pumped water for production. The map shows initial Whave focal areas affected by increasing drought periods where solar pumping for cattle and irrigation is planned. Revival of wind-powered pumping is also being considered in the northeast.
6c. A policy and legal framework that generates investment

- **Gazetting is by area**, not by type of water system i.e. gazetting cannot be for piped water only, or RGCs only, but must create an obligation to create functionality for all sources within an economically viable area such as five districts).

- Public Utility / Service Area / Improved CBMS Framework is agreed and shared with all stakeholders (donors, sponsors, government, politicians, NGOs, churches, private sector) who co-ordinate and comply with roles and responsibilities. MWE Regulation Department regulates the DPs/NGOs as well as the SAPs.

- Development Partner, NGO and government finance for infrastructure (drilling new wells, rehabilitations) is **strictly conditional** on communities signing into **long-term O&M tariff agreements** (such as PMCRAs).

- **Build-Operate-Transfer principle** is applied to ensure least-cost maintenance.

- Communities are mobilized by sub-county and district government staff and councillors, following appropriate bylaws and ordinances.
7. Potential Rural Water Utility Service Area

**Legend**

- **Districts with PM MOUs in place with Whave office and ASP team**
- **Districts with potential to join a full-functionality Service Area in 2019-2020, serviced by ASPs contracted to Whave RWU**

**Gazetting is by area, not by type of water system i.e. gazetted cannot be for piped water only, or RGCs only, but must create an obligation to create functionality for all sources within an economically viable area such as five districts.**
### Conventional CBMS vs. Improved CBMS / Public Utility model

<table>
<thead>
<tr>
<th>Non-functional sources in farming communities, exclusive pricing in rural trading centers</th>
<th>Full functionality</th>
</tr>
</thead>
<tbody>
<tr>
<td>As current CBMS, communities attend to welfare, assure universal access to water. <strong>Improved CBMS improves assurance with increased WSC accountability</strong></td>
<td></td>
</tr>
<tr>
<td>Bath-water: Unclear cost responsibilities cause frequent prolonged breakdowns: minor faults are allowed to become major breakdowns</td>
<td>Clear definitions: major and minor parts replacement together paid for by O&amp;M Tariffs</td>
</tr>
<tr>
<td>Tariffs normalized by government...see examples of DWO regulating..... <strong>Same with CBMS and improved CBMS</strong></td>
<td></td>
</tr>
<tr>
<td>Local technicians not incentivized for Preventive Maintenance</td>
<td>Incentive for Preventive Maintenance by SAP with HPMA implementers (demonstrated in hundreds of communities at &gt;98% functionality over several years already)</td>
</tr>
<tr>
<td>Tariff not regulated across rural Service Area, leading to extreme ad-hoc pricing in some communities (200/= up to 1000/= per jerry-can common) excluding the poor.</td>
<td>Tariffs are regulated, for example see Pay-for Volume Hybrid example. A SAP operates like an insurance company and supports low-revenue sources</td>
</tr>
<tr>
<td>Hardware/installation quality is not sufficiently regulated, causing early disfunction and over-expensive rehabilitation</td>
<td>Quality regulated by same build-and-operate contracts (BOT)</td>
</tr>
<tr>
<td>Urban/rural demarcation unclear, poor co-ordination of Donors/NGOs causing no saturation/scaling for Service Areas and dis-economy of scale for P. M. Providers</td>
<td>Clarification e.g &lt;5000 population = rural and co-ordination by donors/NGOs to build rural Service Areas, gazetting by GoU</td>
</tr>
</tbody>
</table>

Citation:
Adam Harvey, *Cost Model v1.2 for Rural Water in Uganda*, www.whave.org, April 2019