Piped and Point Based Water System Asset Analysis and Management

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Background

The Rural Water Supply Department (RWSD) of Uganda coordinates utilization of a district water and sanitation grant that involves resource mobilization and allocation, technical support to districts, monitoring compliance, and capacity-building to the district local governments. In addition, the Department supports planning and development of water systems that traverse local government boundaries. These constitute deep boreholes (42%), shallow wells (25%), protected springs (21%), and gravity flow and motorized piped water schemes (12%).

To date, the Department has over 1,000 gravity flow and motorized piped water schemes which serve many Ugandans. Management of these schemes ranges from community water and sanitation committees for point sources or boards for scheme operators. In 2016, the Department set up a Division of Infrastructure and Operation and Management. As of June 2017, functionality of rural water supplies reduced to 85% from 86% in 2016 and 88% in 2015. This reducing trend calls for careful tracking and on time repairs of water supply assets. Additionally, the majority of systems do not have functioning management models.

Water For People has been constructing piped water schemes and supporting rehabilitation of wells in Kamwenge District Local Government since 2013. To date, Water For People has constructed six piped water schemes serving 13 communities and supported the rehabilitation and management of over 40 deep wells working with the Hand Pump Mechanic Association. Water For People also supports the District Local Government in understanding the costs of keeping the systems functioning. Water For People Uganda uses an annual monitoring method to map water sources in each area of intervention to create a baseline upon which to estimate the required resources for reaching Everyone with water in a sustainable manner. The annual monitoring system, Akvo Flow, is a dashboard-based system used to collect a wide range of variables on the water system from the field using Android phones.

The Asset Analysis is one of the tools within Water For People's monitoring framework aimed at ascertaining the physical state and service levels of a water system, as well as determining cost ofcCapital repair and replacement. Water For People would like to scale up the Asset Analysis of rural piped water systems, working closely with the Technical Support Units.

Problem Statement

Current trends show a stagnancy in the national functionality rate of water sources, mainly due to the rate of break down equaling the rate of new investments. Additionally, there is lack of clear understanding of the total cost of Capital Maintenance (CapManEx) of all water systems in

a district. There is a need to focus on proper planning and timely repairs and replacements of water systems.

Objective of the Water Point System Asset Analysis

The general objective of the Asset Analysis is to identify, catalog, and classify all water systems within a district based on current needs, level of water service provision, and general timeline for eventual repair and/or replacement of significant components.

In order to prioritize which water systems will require intervention, the Asset Analysis tool assesses three different risk areas for a particular water system.

1. ***Age of Water System Components:*** The Asset Analysis takes into account the current age and projected lifespan, or "useful life," of key water system components (e.g. intake structure, storage tank, etc.).
2. ***Overall Functionality and Level of Service Provided by Water System***: The Asset Analysis assesses the overall level of service the water system provides, including an evaluation of water quantity, quality, consistency, and comprehensiveness of water services.
3. ***Physical State of Water System Components***: Finally, the Asset Analysis assessment includes an evaluation of each key water system component's physical state to assess where certain components would be at risk of failure or limited functionality.

Why Water Systems Asset Analysis?

Overall, using the above three risk areas, the Asset Analysis helps to flag, prioritize, and classify different water systems within a district based on risk and need for repair, and helps provide a foundation for a long-term plan to maintain, repair, augment, or replace a water system when necessary. The information will assist District Local Governments who receive conditional grants to plan for Operation and Maintenance (O&M) of the systems. They will be able to identify risk areas with respect to piped water systems in their district and plan for rectification. The Ministry of Water and Environment, Technical Support Units (TSUs), Umbrella Organizations, and Water and Sanitation Development Facilities can then help in providing technical support to the District Local Government. The generated database could also be used by the Monitoring Unit of the Rural Water Department to plan for future surveys and follow-up.

Engagement with the Ministry of Water and Environment, Technical Support Units, and Umbrella Organizations

Water For People works closely with the Infrastructure Operation and Maintenance Department (IOM) of the Ministry of Water and Environment to build the capacity of TSUs and principle and senior engineers on the use of the Asset Analysis tool to ensure determination of CapManEx costs of rural water systems across districts. The process of capacity development included a Training of Trainers (ToT) Workshop in January 2018, during which the Asset Analysis tool was reviewed and aligned to the Ministry's database and data collection tools to ensure alignment to sector indicators. The ToT was followed by identification of a taskforce to further improve the tool and align it to sector definitions. A piloting approach included identifying a few districts to conduct a comprehensive Asset Analysis, disseminating findings and results from the pilots at the national level, further refining the tool & process, and subsequently scaling up to the entire country.

Level of Priority for Repair & Replacement of Piped and Point Water Systems

Working with the TSUs, Asset Analysis was carried out in 6 districts, including Bunyangabo, Ntoroko, Kamwenge, Kiboga, Masindi, and Kibuku to determine the level of priority for repairs, replacement, and CapManex of all water systems in the named districts. Figures 1-8 show the levels of priority for repair and replacement for point sources determined in Kiboga and Bunyangabo districts, which helpful for district-level decision making.

In Figures 1 and 2, results show that 58% of piped water systems and 46% of point water sources in Kiboga district need urgent attention for repair and replacement. Without addressing these needs, the district runs the risk of a complete breakdown of these systems.

Figure 1: Kiboga District Level of Priority to Replace and Repair Piped Systems

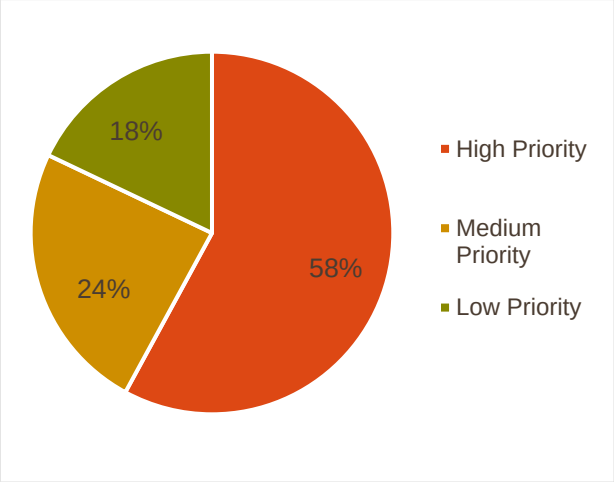
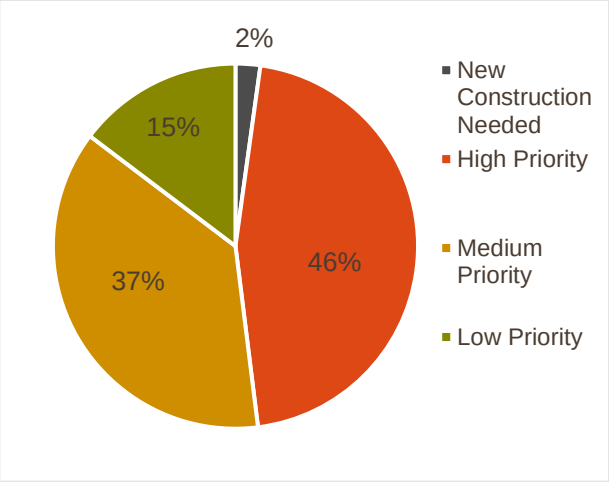


Figure 2: Kiboga District Handpump and Springs Level of Priority to Replace



In Figures 3 and 4, results also show that 57% of the hand pumps and springs in Kiboga district have outlived their useful life and are prone to break down, compared to only 17% of the piped systems that have outlived their useful life

Figure 3: Kiboga District Piped System Risk Based on Age

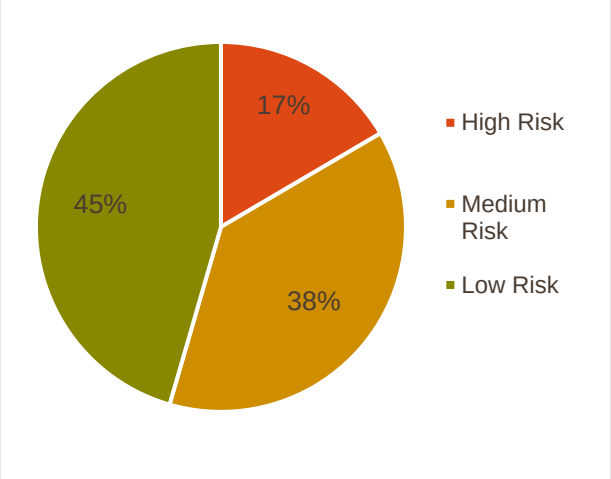
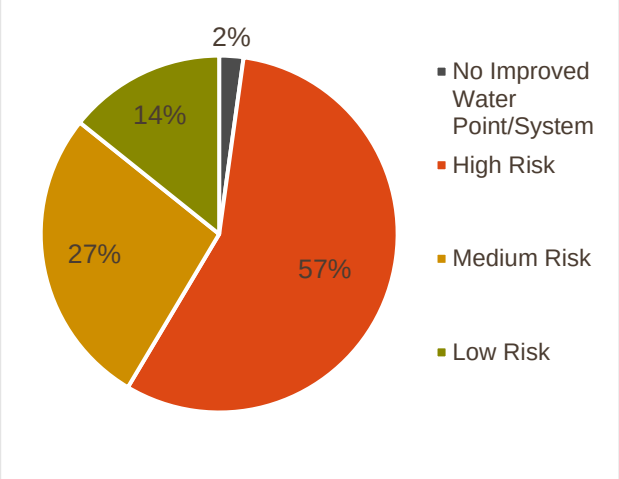


Figure 4: Kiboga District Handpumps and Springs Risk Based on Age



In Figures 5 and 6, results show that in Bunyangabo district, point sources are at a higher priority for repair and replacement (38%) compared to 2% of piped systems with high priority for repair and replacement.

Figure 5: Bunyangabo District Piped Systems Level Of Priority To Replace/Repair The System

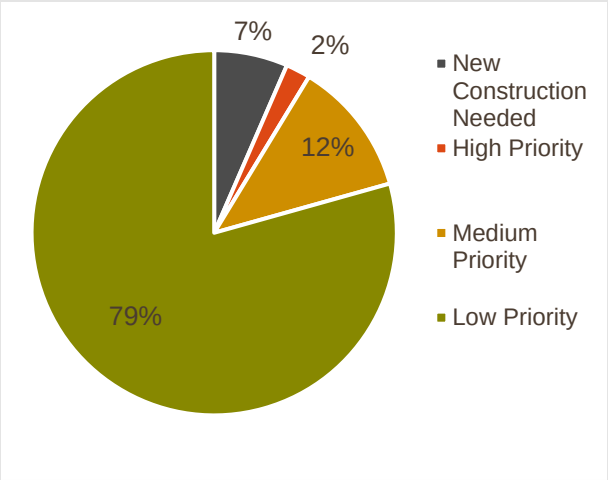
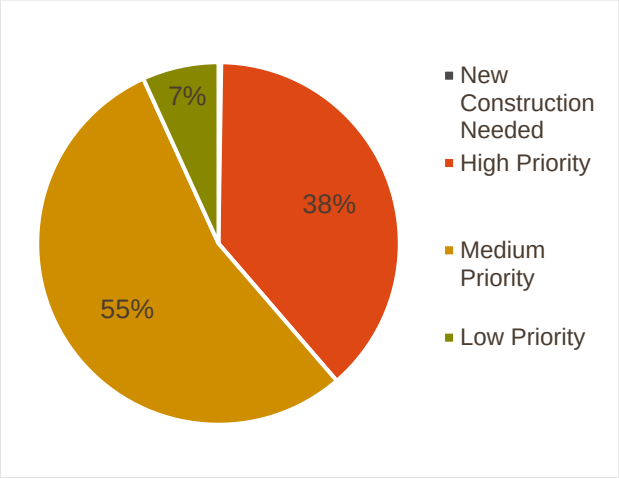


Figure 6: Bunyagabo District Handpumps and Springs Level of Priority to Replace



In Figures 7 and 8, results show that because 77% of piped systems in Bunyangabo district are fairly new, they are at low risk of repair and replacement. Additionally, most (74%) of the point water sources are beyond their useful life, and there is need to plan for the timely repair of the source components.

Figure 7: Bunyagabo District Piped Systems Risk Based On Age

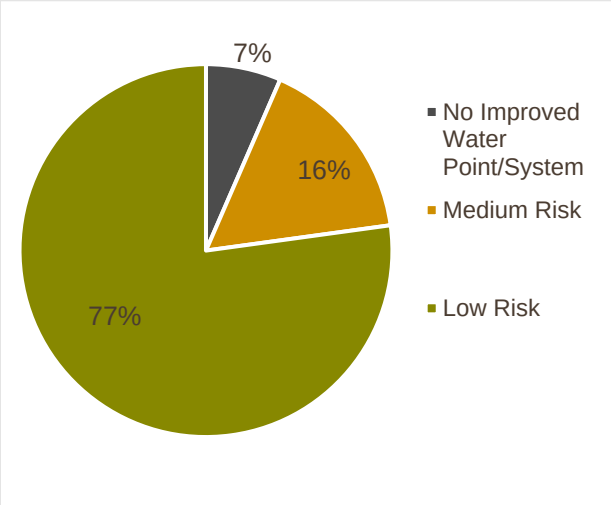
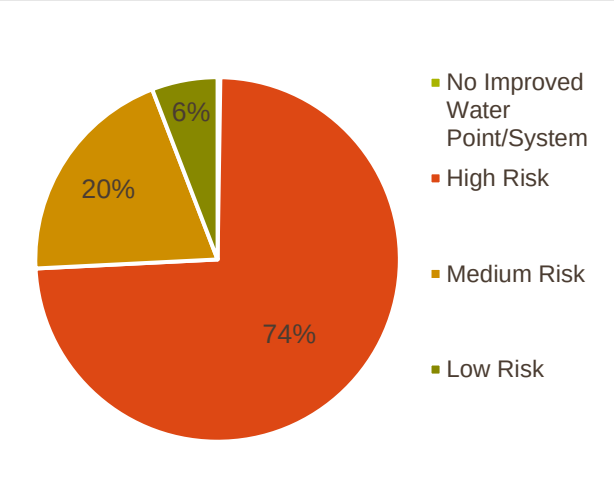


Figure 8: Bunyagabo District Handpumps and Springs Risk Based on Age



Costing for Repair and Replacement of Piped and Point Water Systems

The process of CapManEx cost determination is supported by a taskforce consisting of a Ministry of Water and Environment engineer, economist, IT representative, monitoring and evaluation (M&E) staff, a UNICEF representative, and a Water For People engineer and M&E officer.

Table 1 highlights the key components of a point water system (borehole or spring), their useful/design life, cost for replacement of each component, and estimated annual cost for repair and maintenance.

Table 1: Point Based Water System Component Costing Template Based on Estimate

Component	Design life time (years)	Cost for replacement of each component (District costs)	Annual Cost for repair (District costs)
Well	20	UGX 17,000,000	UGX 0
Pump (Cylinder, head assembly, pedestal)	10	UGX 2,000,000	UGX 300,000
Apron/Seal	20	UGX 500,000	UGX 100,000
Desilting of a well	20	UGX 350,000	UGX 100,000
Spring Protection (this includes all masonry works)	20	UGX 500,000	UGX 60,000
Spouts	10	UGX 50,000	UGX 10,000
GI Pipe and Rod (All to be replaced with SS)	5	UGX 360,000	UGX 280,000
PVC Pipes and Rod	5	UGX 235,000	UGX 235,000
SS Pipes and Rod	10	UGX 360,000	UGX 180,000

Tables 2 and 3 show the determined costs of repair and replacement for water systems in the pilot districts. In Bunyangabo district (Table 2), results show that the total cost of repair and replacement of key components of point water sources that have outlived their useful life is about USD 230,338 (UGX 875,285,000). Sources with five useful years left require about USD 252,218 (UGX 958,430,000) to repair and replace.

Table 2: Bunyangabo Capital Maintenance Costs for Hand Pumps and Springs

Level of Priority to Replace/Repair the System	Sum of Replacement Costs that Need Immediate Attention (0 useful years)	Sum of Replacement Costs >0 but Less than 5 Years
High Priority	528,165,000	631,315,000
Medium Priority	347,120,000	327,115,000
Grand Total	**875,285,000**	**958,430,000**

In Kiboga district (Table 3), results show that the total cost of repair and replacement of key components of point water sources that have outlived their useful life is about USD 248,892 (UGX 945,790,000). Sources with five useful years left require about USD 437,284 (UGX 1,661,680,000) to repair and replace.

Table 3: Kiboga Capital Maintenance Costs for Hand Pumps and Springs

Level of Priority to Replace/Repair the System	Sum of Replacement Costs that Need Immediate Attention (0 years)	Sum of Replacement Costs >0 but Less than 5 Years
High Priority	623,975,000	890,600,000
Medium Priority	321,815,000	771,080,000
Grand Total	**945,790,000**	**1,661,680,000**

Challenges

The biggest challenge in the Asset Analysis process is availability of reliable and complete data of water sources in the district. Because of the lack of complete data in most cases, fresh surveys had to be conducted to collect data on the types of water systems, age of system components, yield, functionality, and physical state, among others. Additionally, the cost of surveys is expensive, which increased the total cost of conducting the Asset Analysis process.

Collection of data can be tedious and cumbersome; however, we used mobile phones with the Akvo Flow tool to collect and analyze this data easily. Additionally, the art of using mobile phones for data collection is new, especially among local governments; thus, we supported the TSUs to train 10-15 enumerators at the district level on the use of phones.

Lessons Learnt

Drawing experience from the six pilot districts, the Asset Analysis process does support the determination of CapManEx costs of piped and point water systems in the districts, which supports timely planning and execution of replacement plans.

Depending on the age, state, and functionality of water systems in the district, the costs of repair and replacement vary and may be high. However, it is recommended to phase replacement plans depending on the availability of funds.

Results of the Asset Analysis provide a clearer picture of the requirements for water system repair and replacement (CapManEx) costs, and can be used as a planning and a resource mobilization tool for the districts.