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# Lowland Water, Sanitation and Hygiene WASH Activity

## BRIEFING NOTE, JANUARY 2019

### Pioneering a Systematic Approach to Better Operate and Maintain Rural Water Schemes in Ethiopia's Remote Afar Region



*Pastoralist communities in Afar depend on water for subsistence and for their livestock to counter extreme heat and increasing drought*

#### **Afar Region: Challenging Conditions**

Covering over 270,000 Km<sup>2</sup> area with daily temperatures often exceeding 40 Celsius, Afar is an arid region where 1.72 million people, mostly pastoralists, reside in very remote locales unserved by electricity, improved roads and other critical basic services. It is also one of the country's regions most impacted by droughts and changing weather patterns. Water shortages from droughts have led to acute watery diarrhea outbreaks, increases in malnutrition as well as decreases in livestock productivity.

#### **KEY POINTS**

- In Ethiopia's remote and drought-prone Afar region, pastoralist communities depend on water schemes consisting of deep boreholes for subsistence and for their livestock.
- The Afar Regional Water Bureau (RWB) and the Woreda Water Offices (WVOs), responsible for maintaining over 150 of these motorized borehole schemes, are working to enhance their asset management and operations and maintenance (O&M) practices.
- The USAID Lowland Water, Sanitation and Hygiene (WASH) Activity is supporting the Afar RWB and its 29 WVOs to institute a systematic approach for asset inventory that links to improved O&M using new monitoring technologies and tools for delivering safe water.
- Indicative activity results point to the need for (1) more institution building to adopt and adapt these technologies and tools effectively for decision-making and preventive O&M and (2) continued capacity building to improve asset management and to deliver timely O&M services.
- This note complements the USAID Lowland WASH Activity and USAID Sustainable WASH Systems Learning Partnership (SWS-LP) Briefing Note on ["Real-time Monitoring for Improved Water Services in the Ethiopian Lowlands."](#)

## IMPACTS OF MULTIPLE DROUGHTS IN ETHIOPIA

**“The Government of Ethiopia is no stranger to drought. From 2003 to 2017, it has faced at least five serious droughts affecting millions of people. Studies have shown that droughts make the poor even poorer. In the 2015/16 drought, for example, most people’s livestock holdings fell by nearly 50%. And it often takes as many as four years for many households to recover from a drought.”**

**- MOVING AWAY FROM HUMANITARIAN APPEALS TO MANAGING DROUGHTS IN ETHIOPIA, MAY 2, 2017,**

<http://www.worldbank.org/en/news/feature/2017/05/02/moving-away-from-humanitarian-appeals-to-managing-droughts-in-ethiopia>



Sensors, like the one being installed at this borehole well site in Afar, Ethiopia, are helping provide key water data to address critical water supply challenges.

**“The main challenges in rural WASH are low implementation capacity, high levels of non-functionality, low absorption capacity and significant human resource capacity challenges, in particular, at woreda level. This situation has persisted despite large but limited capacity building initiatives.”**

- Source: Federal Democratic Republic of Ethiopia, Community Managed Programme Implementation Manual, Revised edition, Within the One WASH National Programme, Full Version: Final, Date: 29/12/2014, Addis Ababa, Ethiopia, Page 2, 1.2.3 Motivation for Introducing CMP

Most of Afar’s pastoralists rely on water pumped from motorized boreholes from depths of 100 to 600 meters for both human and livestock use. Historically however, the functionality of these boreholes and their complex electro-mechanical accessories are low. A 2013 UNICEF report indicates over 30 percent of water schemes in Afar were not functioning due to lack of effective operations and management capabilities, lack of proper organizational structures and incentives<sup>1</sup>. Many communities therefore resort to water collection from unsafe sources such as traditional birkads, rivers, or shallow ponds. Others crowd those systems that are functional or pay for trucked water delivery.

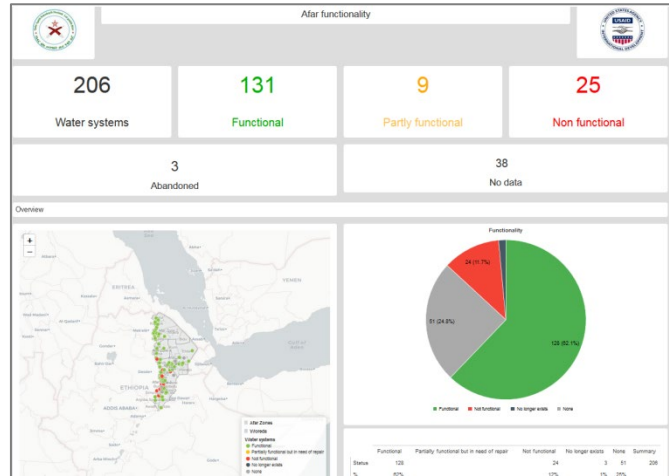
### Working Systematically to Improve Water System Functionality and Service Delivery

Faced by these environmental, institutional and operational constraints, the Afar RWB and its 29 WWOs seek to improve the functionality of more than 150 motorized water supply borehole schemes they maintain, and to establish a proper asset inventory and maintenance process. They are looking to effectively take inventory of what they have; understand how those water systems operate; and develop improved procedures for maintenance to extend their operational lifespan and increase level of service. To support the Afar RWB and WWOs, the USAID Lowland Water, Sanitation and Hygiene (WASH) Activity is introducing a systematic approach for managing their assets and for implementing O&M practices and services delivery more effectively using digital technologies and modern tools (see Table 1).

**TABLE 1: INNOVATIVE PROCESSES AND TOOLS FOR IMPROVED WATER SYSTEM O&M**

Applicable Tools	Function	Purpose
Handheld geospatial positioning systems	Locate and tag borehole locations with map	<b>Asset management</b> – system location, functionality
Smart phones and associated tablets	Visualize functionality and system information	
Remote water system GSM and satellite sensors	Capture data of borehole functionality	<b>Asset characteristics</b> – system level data measurements
Ultrasonic water flow meter	Record actual pumping flow rates	
Ultrasonic well head water measurement meters	Observe static and dynamic well water levels	
Infrared water temperature meters	Measure borehole water temperature	
Total Dissolved Solids (TDS), pH, and Electrical Conductivity (EC) field test meter	Provide basic chemical parameters of well water	
Fluoride field test	Inform fluoride level of well water	
Compartment bag test (CBT) E-coli field test kit	Test well water for bacterial contamination	

<sup>1</sup> Briefing note by the USAID Lowland WASH Activity and USAID Sustainable WASH Systems Learning Partnership on “Real-time Monitoring for Improved Water Services in the Ethiopian Lowlands” summarizes the institutional challenges for RWBs, WWOs and their counterpart committee organizations to effectively maintain borehole systems.



Left: SweetSense sensors placed near a rehabilitated borehole to detect functionality and water flow. Right: The Afar region customized web-based platform that provides real time functionality monitoring for the RWB and WWOs, allowing for better decision-making at the regional level

Collaborating with SweetSense ([www.sweetsensors.com](http://www.sweetsensors.com)), USAID Lowland WASH Activity supports the RWB and WWOs to identify and tag each borehole and place remote sensors to characterize borehole pump operations and water flow. These sensors gauge the electrical power to the pump and generate daily information on pump functionality and operational duration. Combined with additional information on water scheme users, the RWB and WWOs can estimate service levels such as the maximum average water produced, or pumped per day.

With partner mWater support ([www.mwater.co](http://www.mwater.co)), the Activity alongside RWB and WWOs have customized a cloud-based asset inventory and management platform to track critical borehole scheme operational data generated by the SweetSense sensors and field inputted data. Designed for standard computers, tablets and smart phones, the web-based platform enables the RWB and WWOs to review functionality, flow, and maintenance information and make informed decisions about O&M.

In addition to asset inventory, basic tools and instruments to monitor pumped water characteristics are provided to warrant safe water delivery. As noted in Table I, this equipment measures flow, temperature, and water quality and provides levels of service data for the RWB and WWOs that link to overall water scheme operations and management. They also help with early warning of possible contamination and identify maintenance and repair needs.

### Identifying and Institutionalizing Needed System-Wide O&M Procedures

From the start, the Activity recognized the need to clarify the relationships and capacities of the RWB, WWOs and local community organizations (WASHCOs) to perform and sustain O&M services. USAID Lowland WASH therefore engaged both international and Ethiopian engineers experienced in rural water O&M to assess the stakeholder intricacies and capacity gaps. Based on this assessment, the Activity initiated and continues to build the technical and institutional capacities of the RWB and WWOs to adopt and effectively use these technologies and tools for planning and decision-making.

USAID Lowland WASH's technical capacity building program entails hands-on/field and classroom training. To date, over 100 staff from the RWB and nearly all the WWOs have participated in sensor installation and troubleshooting, asset management, tools application, platform customization and data analysis. Asset management training incorporates inventory assessment and O&M for motorized borehole components such as solar powered water systems and diesel generators. Institutional capacity building includes development of asset management procedures, budget analysis, and financial planning. The Activity is deploying training and direct consultations to assist designated RWB and WWO personnel to establish procedures and work flows to collect and analyze field data, and deliver preventive maintenance. To assist with financial planning and budget analysis, USAID Lowland WASH in collaboration with USAID SWS-LP, has introduced the lifecycle cost analysis (LCCA) concept for motorized and



Testing the well water for pH, TDS and EC to check on level of service improvements

non-motorized water systems to help estimate appropriate budgetary outlays for capital and operational expenditures. Piloted in the Mille Woreda, the RWB is evaluating how to replicate the LCCA for the remaining 28 Afar woredas.

## Looking Forward

While the technical and institutional capacity building is a long-term need, the Activity has also identified other key challenges for effective O&M including:

- **Lack of oversight on water scheme management and O&M.** National level policies assign responsibilities to the WASHCOs, WWOs and RWB; in practice many of these roles are simply not performed. For example, the WASHCOs are required to do preventive maintenance (PM) on their systems, but rarely do. Exacerbating this problem is that neither the WWOs nor RWB perform any type of PM on the water systems. With no PM being performed by anyone, when the mechanical equipment of the motorized boreholes breaks down, the issue is typically significant and often requires major repairs, or equipment replacement by RWB.
- **Balancing budgetary allocations among the RWB, WWOs and WASHCOs.** While WASHCOs sometimes collect tariffs to cover operational expenses (e.g. fuel for generators), they do not collect funds to perform critical PM of their systems. Based on observations of the WWOs and the RWB, most of their budgets are dedicated to covering staff costs, with some for construction of new systems, but with little to none for travel to the remote water systems or for performing maintenance and repair functions. As such, many non-functional water systems are often down for extended time periods.

USAID Lowland WASH and SWS-LP are collaborating to address these challenges by placing an embedded specialist within the RWB to facilitate this process. The specialist will also support the RWB to develop its capacity to monitor and improve services delivery, focusing on information-based decision-making, and assist in mining data from the RWB and WWOs to warrant completeness of data for the new asset inventory system. In addition, the Activity is exploring collaboration with the USAID Building the Potential of Youth (POTENTIAL) activity to train youth who have recently graduated from the Technical and Vocational Education and Training (TVET) program in Afar to conduct basic preventive maintenance for motorized boreholes and establish a small O&M business in the greater Semera area.

While continuing capacity building and institutional strengthening is necessary, the Activity's interventions have introduced for the first time innovative and pioneering tools and technologies that will support the Afar RWB and its WWOs to provide effective, total O&M services and safe water supply. All motorized borehole water schemes are in process for sensor installation and for increased monitoring for level of service. The Government of Ethiopia's Ministry of Water, Irrigation, and Electricity has also expressed interest to learn from efforts in Afar and to identify opportunities to replicate a similar system in other regional water bureaus throughout Ethiopia.

**Acknowledgements:** This briefing note was prepared by Scott Short with support from Petros Birhane, Asmelash Kebede, Michael Blair, Nikita Salgaonkar, John Butterworth (SWS-LP), Arijanto Istandar and Darren Saywell.

## ABOUT

**The USAID Lowland Water, Sanitation and Hygiene (Lowland WASH) Activity:** USAID/Ethiopia's flagship WASH activity delivers technical assistance, develops small-scale infrastructure, and builds the capacity of national and regional governments and stakeholders in the lowland Somali, Afar and Southern Nations, Nationalities and Peoples (SNNP) regions. In support of the Government of Ethiopia's Growth and Transformation Plan and One WASH National Program, it aims at (1) increasing access to improved drinking water supply sources on a sustainable basis; (2) increasing adoption of key hygiene behaviors and increased access to improved, sustainable sanitation; (3) improving efficiency and sustainability of food production from irrigated and rain-fed agricultural systems; and (4) improving water governance and data management. For more information, contact Petros Birhane, Chief of Party, at [pbirhane@lowash.com](mailto:pbirhane@lowash.com).

This brief is made possible by the support of the American people through the United States Agency for International Development (USAID). The contents are the responsibility of the Lowlands WASH Activity and do not necessarily reflect the views of USAID or the United States Government. For more information, contact Kathrin Tegenfeldt, USAID Climate and Water Advisor in Ethiopia, at [ktegenfeldt@usaid.gov](mailto:ktegenfeldt@usaid.gov).