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SUSTAINING RURAL WATER SERVICES IN ETHIOPIA: RURAL WATER ASSET INVENTORY REPORT

USAID SUSTAINABLE WASH SYSTEMS (SWS) LEARNING PARTNERSHIP CONCEPT I (ETHIOPIA)

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SUSTAINING RURAL WATER SERVICES IN ETHIOPIA: RURAL WATER ASSET INVENTORY

Prepared by:

This report on asset inventory of rural water supply infrastructure in Mile, Afar region and South Ari, SNNPR, is a report produced by the USAID Sustainable WASH Systems (SWS) Learning Partnership. It is one of a series of SWS baseline studies and systems analyses.
The report examines the status of WASH infrastructure assets in these woredas, all water supply schemes were mapped by woreda staff using mobile phone-based surveys.

CONTENTS

ABREVIATIONS

EFY	Ethiopian Fiscal Year
GTP	Growth and Transformation Plan
MoWIE	Ministry of Water, Irrigation and Electricity
NGO	Non-Governmental Organization
NWCO	National WASH Coordination Office
NWI	National WASH Inventory
O&M	Operation and Maintenance
RWB	Regional Water Bureau
SDG	Sustainable Development Goal
SNNPR	Southern Nations, Nationalities and Peoples Region
SWS	Sustainable WASH Systems Learning Partnership
UNICEF	United Nations Children's Fund
USAID	US Agency for International Development
WASH	Water, Sanitation and Hygiene
WASHCO	Water Supply, Sanitation and Hygiene Committees
WUA	Water Users Association
WWO	Woreda Water Officer

EXECUTIVE SUMMARY

Between April and June 2017, the USAID SWS Learning Partnership and the USAID Lowland WASH Activity conducted an asset inventory in two woredas: South Ari in SNNP Region and Mile in Afar Region. The objective of the Mile and South Ari Asset Inventory was to ensure up-to-date information is available on existing water schemes, including functionality and other critical WASH indicators, with a view to supporting the planning and coordination of borehole rehabilitation and maintenance interventions, and to monitor the outcomes of those interventions

The objectives of the asset inventory were to collect data on water supply assets to be used as the basis for a Life Cycle Costs Analysis and for potential future interventions to support maintenance, to demonstrate potential of monitoring tools and develop the interest of the woreda, zone and regional government in the use of monitoring tools for asset management and pilots that test PPP arrangements, specific to solar, motorised and desalination systems, and scale up the most promising.

Asset inventory indicators were developed, peer-reviewed and approved ensuring these were consistent with the main national key performance indicators. The indicators were designed to align with those of the second Growth and Transformation Plan (GTP2), National WASH Coordination Office (NWCO)/ MoWIE, and Sustainable Development Goal (SDG6) indicator sets. In addition, indicators specific to the water supply context in both the Afar and SNNPR Regions were included.

Data collection was undertaken by data collection teams, consisting of Regional and woreda Water Resource Development bureau and offices staffs respectively. In order to ensure consistency in data collector, all enumerators were trained prior to data collection, and supervised during the data collection process.

Asset inventory results show a large gap between the Growth and Transformation Plan (GTP II) targets and the present status of the infrastructure and the services being provided. Rural water coverage in South Ari and Mile stands at 50% and 8% respectively. If functionality is also taken into account coverage decreases to 25% in South Ari and 7% in Mile.

Non-functionality in South Ari is 31% and 13% in Mile. In South Ari, the rate of non-functionality is correlated with the age of the schemes, while in Mile it is not. The main reasons reported for non-functionality are insufficient water at source and a lack of minor and medium scale maintenance. Schemes are often not functional for many years.

In Mile, 59% of the schemes have a WASHCO or utility active and in South Ari 68% have an active management structure, however the management status of WASHCOs was not found to be correlated with the functionality or reliability of schemes.

Water quality test results in South Ari show many of the schemes are not safe for drinking even when the main source of water are protected springs. This public health issue requires urgent attention from the responsible authorities. In both woredas, water quality testing is done only at the time of construction of new water schemes. In the vast majority of the schemes chlorination is not being practiced.

Water in Mile is provided through more complex infrastructure, but it does provide a similar level of service (access, quantity, quality) as South Ari. The estimated quantity of water consumed per person per day in Mile (11 l/c/d) is slightly higher than in South Ari (8l /c/d) but still below national standards. There are very few households reporting using the water points for livestock in Mile, although this might have been related to patterns of livestock movements at the time, and even less (1% or 2 households) in South Ari.

Data is stored on the cloud and is available in woreda offices in hard copy, Excel spreadsheets and via custom dashboards developed using mWater. Analysis has been made available in reports, presentations and via the dashboards. Maps have been printed for the Woreda Water Offices.

In both woredas, data has been used to inform maintenance activities and as evidence for annual planning for new construction, but government and development partners including UNICEF. There is demand from zonal and regional government to extend these activities into further woredas.

Efforts to transition from a baseline inventory to ongoing monitoring are underway. Simple mechanisms are being tested and rolled out to provide regular and reliable updates on the functional status of schemes across the woredas.

INTRODUCTION

This report summarizes an asset inventory of the district (woreda) and town context in Ethiopia for rural water supply. It was prepared as an input to the Sustainable WASH Systems (SWS) Learning Partnership which is focused on testing approaches to strengthen WASH systems and improve WASH services delivery. In this case, systems are referred to not as the physical water supply facilities such as wells and pipes, but rather the wider enabling environments for service delivery. These cover multiple necessary conditions for sustainable services delivery from financing to infrastructure and monitoring.

The two woredas involved in the study were South Ari in the SNNP Region and Mile in the Afar Region (see Figure 1). The projected populations of South Ari and Mile are approximately 280,000 and 118,000 respectively (based on CSA, 2013).Rural water services in both woredas depend on voluntary, village-based Water, Sanitation and Hygiene Committees (WASHCOs) managing facilities under a community management model. In South Ari, wells with hand pumps and springs tap into shallow groundwater, whereas in Mile, there are more complex facilities often accessing deep groundwater and reliant on motorized pumping.

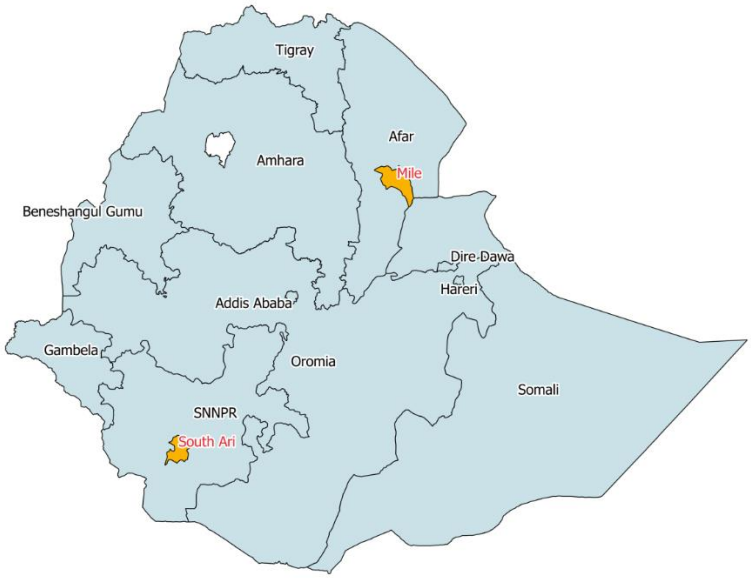


Figure 1: Location of South Ari and Mile woredas.

USAID SUSTAINABLE WASH SYSTEMS LEARNING PARTNERSHIP

The SWS Learning Partnership is a global U.S. Agency for International Development (USAID) cooperative agreement to identify locally driven solutions to the challenge of developing robust local systems capable of sustaining WASH service delivery. Led by the University of Colorado at Boulder, it emphasises partnership and learning for catalytic change in the WASH sector. Coordinating and facilitating interactions amongst partners in four priority countries (Ethiopia, Kenya, Uganda and Cambodia), the project works to meet the rapidly increasing needs of USAID's partner countries for sustainable WASH service delivery.

The partnership has four 'concept' teams. In Uganda and Ethiopia, Concept 1 is led by IRC, working with Tetra Tech and LINC. With other stakeholders, Concept 1 is developing and testing a structured approach to understanding, engaging with and strengthening decentralized woreda (district) and small-town systems for WASH service delivery. Learning alliances that gather local stakeholder seek to provide a safe space for innovation. Comprehensive systems analyses are expected to provide a basis for action research experiments – joint testing of potential improvements involving implementers and researchers – to find new solutions to service delivery and sustainability challenges. Emphasis is on strengthening the WASH service delivery system as a whole, finding a balance between competing priorities to extend, improve and sustain services, and

delivering the capacity development and communications activities that are needed at local, regional and national levels to scale up successful innovations and outcomes.

The expected outcome is stronger service delivery systems in the targeted woredas and small towns. At regional and national levels, Concept 1 seeks to influence the country's wider WASH sector agenda with tools and approaches applied beyond the focus woredas and small towns.

Concept one in Ethiopia is addressing both rural and small town water supply and urban sanitation in different parts of the country. This baseline report is limited to the rural and small-town water activities, and a separate report by Tetra Tech is focused on urban sanitation. Concept 1 emphasises the application of innovation to improve local systems, and works with local actors through multi-stakeholder partnerships, or learning alliances. In the learning alliances, local stakeholders develop understanding of their WASH service delivery system and execute a shared learning and action agenda. It is expected that locally driven innovation will result in better solutions to challenges and changes that increase the sustainability of WASH services.

During year one, with in-country activities starting in January 2017, a strategic partnership was developed with the USAID Lowland WASH Activity led by AECOM and involving the International Rescue Committee and CARE as implementing NGO partners. The USAID Lowland WASH Activity is working in challenging lowland environments in Afar, Somali and SNNP regions to develop, rehabilitate and sustain water supplies and improve sanitation. The partnership provides an opportunity for synergies between the systems-strengthening and learning activities of SWS, and the implementation of a package of construction, rehabilitation and improved maintenance for rural water supply schemes.

Two rural woredas where the USAID Lowland WASH Activity operates were selected for SWS rural water supply activities: South Ari, part of South Omo Zone in the Southern Nations, Nationalities and Peoples Region (SNNPR) (south-western Ethiopia), which relies heavily on hand pumps and springs, and Mile, in the Afar Region (north-eastern Ethiopia), where water schemes include motorised boreholes pumping deep groundwater. Community management is the primary service delivery model for both the simple and the more complex rural water supply schemes, with utility management present only in some small towns.

THIS REPORT

Between April and June 2017, the USAID SWS Learning Partnership and the USAID Lowland WASH Activity conducted an asset inventory in two woredas: South Ari in SNNP Region and Mile in Afar Region. The objective of the Mile and South Ari Asset Inventory was to ensure up-to-date information is available on existing water schemes, including functionality and other critical WASH indicators, with a view to supporting the planning and coordination of borehole rehabilitation and maintenance interventions, and to monitor the outcomes of those interventions. In the short-term the asset inventory was also linked to the interests of USAID SWS learning partnership and USAID Lowland WASH Activity to undertake a Life Cycle Costs Analysis which required such data.

Mile Woreda presents a challenging and relatively difficult context for rural water supply since it is an arid area with deep groundwater, remote and semi-pastoralist communities, very low private sector capacity and high value of water. There is a mix of water supply technologies including motorised, solar and hand pumps. With limited number of on-spot water supply services there has been considerable reliance on a relatively limited number of high-yielding water schemes which draw their water from boreholes tapping relatively deeper groundwater. The ongoing performance of these motorised boreholes is critical to the continuous water service delivery.

In South Ari, rural water supply is dominated by a large number of water schemes with relatively simple technologies both springs and wells or shallow boreholes with handpumps. South Ari is a large woreda, part of South Omo Zone, and surrounding but not including the Zonal capital Jinka. It includes a mix of highland,

midland and lowland terrain but there are no longer any pastoralists. There are about 260 water schemes controlled by the woreda water office.

Both woredas have a critical gap in data relating to rural water supply. Limited accounts of functionality, spare parts and achievement of national targets are available. This asset inventory by IRC and Lowland WASH was conducted to help address these gaps. Since June, IRC has been working towards establishing mechanisms for using and updating the data. This report presents the results of the asset inventory conducted in the two woredas.

METHODOLOGY, DATA COLLECTION, VERIFICATION AND VISUALISATION

Asset inventory indicators were developed, peer-reviewed and approved ensuring these were consistent with the main national key performance indicators. The indicators were designed to align with those of the second Growth and Transformation Plan (GTP2), National WASH Coordination Office (NWCO)/ MoWIE, and Sustainable Development Goal (SDG6) indicator sets. In addition, indicators specific to the water supply context in both the Afar and SNNPR Regions were included. The objectives of the Asset Inventory data collection were as follows;

- Collect data on water supply assets as the basis for a Life Cycle Costs Analysis.
- Collect necessary baseline information for Lowland WASH, including on sites set up with sensors. This is a basis for potential future interventions to support maintenance.
- Demonstrate potential of monitoring tools and develop the interest of the woreda, zone and regional government in the use of monitoring tools for asset management.
- Asset management pilots that test PPP arrangements, specific to solar, motorized and desalination systems, and scale up the most promising.

To ensure consistency the following definition of functionality has been used across the program.

Functional: Water schemes which fully provide service based on the design

Partially functional: Water schemes which is not providing its service at intended service or design (low yield, part of the water points, or stand taps not functioning. E.g.

- if there is a hand pump providing water 2 days a week
- if the distribution network has three water point and only one or two points are working
- if one water point has 4 faucets and only one or two are working

Non-functional: Water schemes which have completely stopped providing services

Data collection was undertaken by data collection teams, consisting of Regional and woreda Water Resource Development bureau and offices staffs respectively. In order to ensure consistency in data collector, all enumerators were trained prior to data collection, and supervised during the data collection process.

All improved woreda water schemes/water points were collected as part of the asset inventory using the following four surveys, with sampling identified in brackets.

- Rural and urban water schemes facilities (all schemes)
- Rural and urban public tap stands (all points)
- WASHCO and other management bodies of the water schemes (all schemes and points)
- Users or Households (10 per water point and minimum 30 households per Kebele)
- Water quality (all schemes)

In Mile, mWater Portal was used to build surveys and deploy to enumerators with the mWater Surveyor app installed on smartphones for data collection. A full inventory (of 'in-service' boreholes for water supply and other schemes like hand dug wells) was rapidly established. Data from a total of 31 water schemes was collected by government-led teams over 3 weeks from across all the 12 kebeles in the woreda. Data was cleaned, verified and validated in partnership with Woreda Water Office staff and a de-briefing workshop has been conducted on 27th July 2017 before leaving the woreda. Initial partnership meetings were conducted on 28th June 2017. Training was provided from 5th to 8th July 2017 to 6 water office staffs in Mile Woreda, which has been coordinated by the WWO Head Mr. Hussain Ali and the Core Processor, Mr. Mohammed Eshetu.

Table 1: Data collected

	South Ari	Mile
Number of schemes surveyed in the woredas	245 (100%)	31 (100%)
Number of water quality tests (% of schemes)	71 (29%)	14 (45%)
Number of surveys at the schemes (% of total households in the woreda)	360 (1%)	256 (1%)

In South Ari, an alternative mobile app AkvoFLOW was used. Data from a total of 245 water schemes was collected across the 50 kebeles (46 rural and 4 urban kebeles). Data was cleaned, verified and validated in partnership with Woreda Water Office staff and a workshop has been conducted on May 15, 2017 in Jinka and preliminary results of the assessment presented and validated with the wider audience.

Selected Woreda staff were identified and trained in the use of the mobile data collection software. The training provided critical feedback on the draft surveys that had been developed with alignment made to further meet needs of the Woredas. In South Ari initial partnership meetings were conducted in Jinka on 20th March 2017. Training was provided to 10 water office staff in the Woreda, which has been conducted in Jinka on 21st and 22nd March 2017. Data from all existing schemes were collected from across all kebeles. A total of 4 teams were deployed. It took a total of 3 weeks to complete data collection in all kebeles, with 245 schemes surveyed. 10 mobile phones were used to collect data from all schemes.

The data collectors were equipped with smartphones running mWater and AkvoFLOW Surveyor, and a series of survey forms were developed with input from the woredas. These include forms with basic background information on the water scheme, technical details, functionality status, current use and sample of consumers at the scheme.

The data collection process was closely supervised and monitored by IRC staff in Mile and South Ari. In doing so, the data cleaning started in parallel to the data collection in real time basis. Data cleaning was a continuous process designed for completeness, reliability, consistency and accuracy.

Participants from Mile Woreda attended an initial results discussion held in Mile on 16th August 2017. This concluded that the asset inventory data was complete for all schemes but identified opportunities for enhancing the baseline by expanding to all water access points. There was broad agreement across local stakeholders that Mile Woreda data is a reliable and a true representation of the borehole supply situation in the Woreda.

In Mile systems have been customized to analyze, present and disseminate the asset inventory results. A dashboard automatically analyses and displays key indicator results. This includes summary information, tabulated data, graphical and spatial analysis showing the functionality, accessibility, and repair and maintenance details. Analysis, tables, raw data or the full dashboard can be exported and printed. Working with mWater, a freely available tool, the team developed a set of custom dashboards to analyse and present the asset inventory results from the survey data. The dashboards show maps, tables, graphs and charts. Since different governance levels have different information needs, we have established a set of dashboards relevant for woreda level, showing mostly technical data, and a dashboard for regional level, showing more politically relevant data. Figure 1 shows sample dashboard for Mile woreda asset inventory.

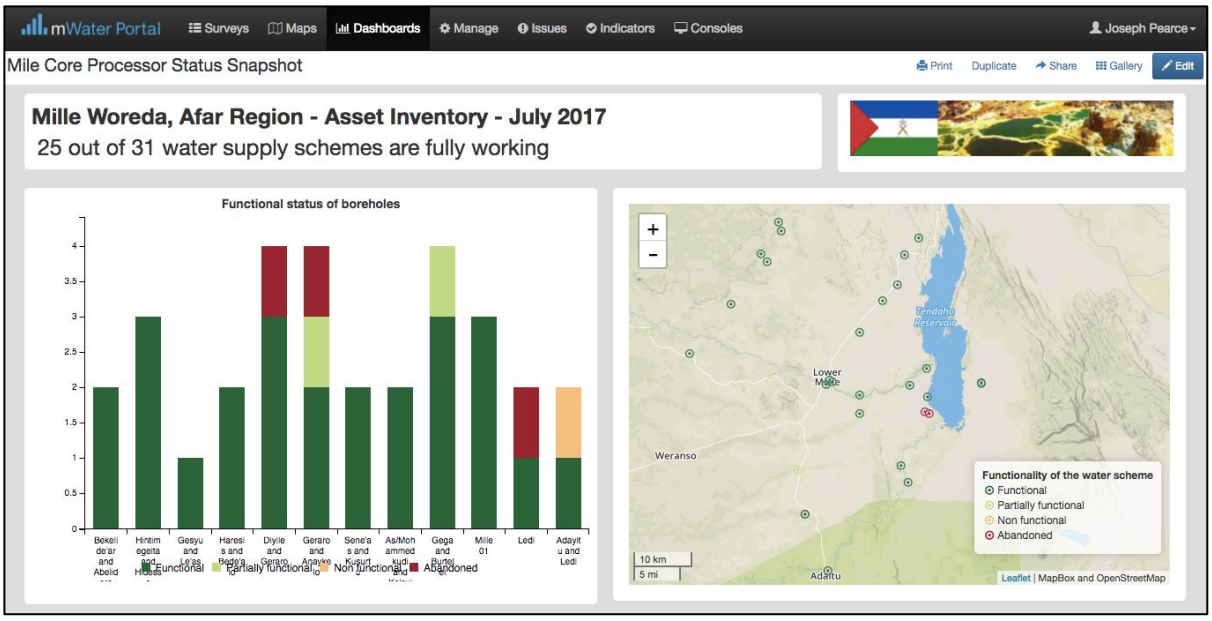


Figure 2: Mile woreda asset inventory sample dashboard from mWater

In Mile Woreda, a mechanism to ensure the database is kept relevant with updated information has been proposed, combining community reporting and data from SweetSense remote sensor devices. The asset inventory data has already assisted in establishing agreed figures for functionality and other KPIs, action on addressing critical water quality issues in two boreholes and planning for the rehabilitation and repair/maintenance works.

In South Ari, the results were provided for the woreda as a printed map and access to the data in Excel format. Following successful experience using mWater for visualising results in Mile, a similar configuration was established for South Ari (Figure 3). The asset inventory was uploaded and a dashboard for visualising results was created.

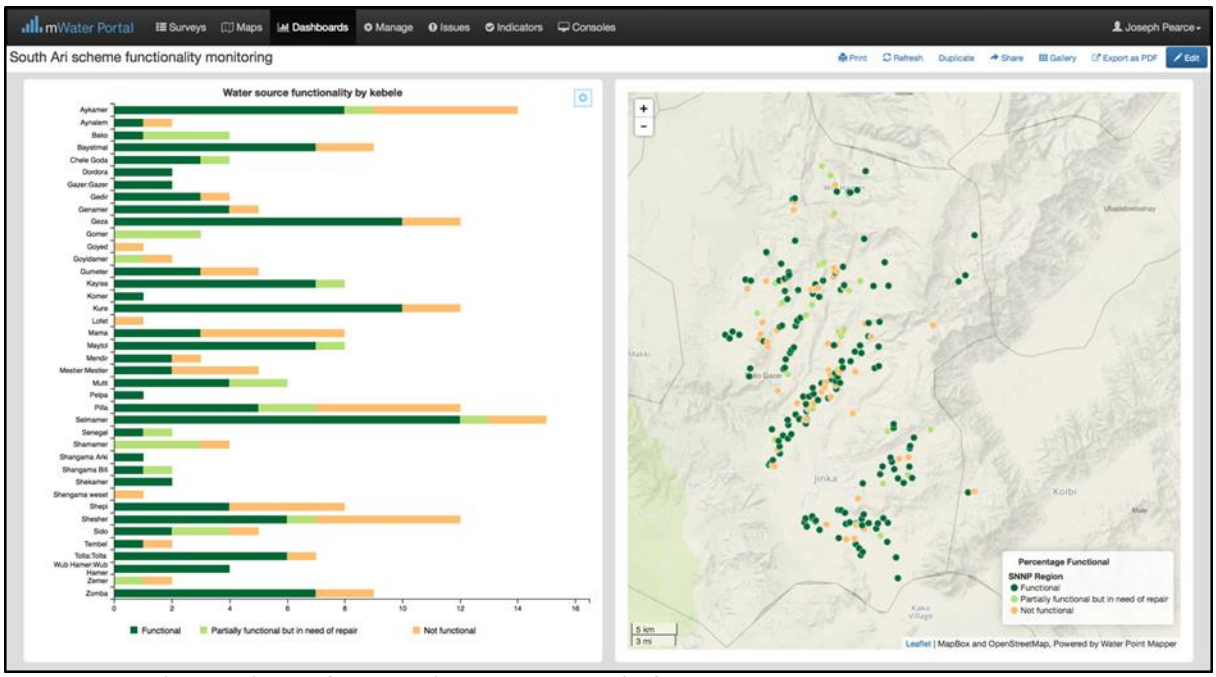


Figure 3: South Ari Scheme functionality monitoring platform

Full guidance documentation has been authored for each process and activity related to the continued management and use of the asset inventory. Plans are in place to build capacity of WWO staff for ongoing management of the system.

Building upon the existing efforts in Mile Woreda, IRC have supported CARE to scale the asset inventory across Zone 5 in Afar. IRC shared and further customised the inventory survey forms and facilitated training on data collection and water quality testing 10-12th October 2017. Results were presented to Afar RWB and other regional stakeholders during a workshop held in Semera, Afar from 2nd to 3rd of November 2017. Memorandums of Understanding have been drafted.

RESULTS

The two woredas have a different hydrological profile and provide water from different sources and different types of schemes. Mile has a mix of point and distribution schemes providing water through shallow and deep wells constructed in the past 8 years and providing for around 20,000 households. South Ari has a large majority of point sources mainly through protected springs, hand dug wells and shallow wells constructed in the past 12 years and providing for 11,906 households.

TYPES OF WATER SCHEMES AND WATER SOURCES

In South Ari, the town of Gazer is served by a spring with distribution system with 23 public standpipes and 314 household connections. These schemes are managed by a Small-Town Utility. In addition, there are two community-managed protected on-spot springs in the town. The three other towns are served by a combination of community-managed hand pumps, protected on-spot springs and springs / deep wells with distribution systems. Overall the woreda is served by 342 communal point sources (including hand pumps, protected-on-spot springs and public standpipes connected to springs or deep wells) and 342 household connections, with a total of 245 schemes. Table 2 provides overview of water schemes in South Ari Woreda. South Ari has a large majority of point sources for rural water supply, mainly through protected springs and hand dug wells. Mile has a mix of point and distribution schemes with more reliance on drilled shallow and deep wells (boreholes).

Table 2: Type and number of schemes in South Ari

Type of Scheme	Number of schemes	Number of taps
Hand dug well with hand pump	64 (Afridev)	NA
Shallow well fitted with hand pump	46 (Afridev) 10 (Indian)	NA
Deep well	5	33
Spring on spot	103	NA
Spring with distribution	17	70
Total	**245**	**98**

Mile woreda is served by a mix of water supply schemes serving the rural population, tapping relatively deep groundwater in this arid context: India Mark II hand pumps (16), shallow and deep wells with motorized schemes with distribution networks (7), 1 deep well without distribution network (1), and deep wells with solar pumped schemes (2). These schemes are assumed to be managed by WASHCOs. In addition, there are 5 motorized deep wells supplying the small town (urban) piped scheme of Mile town and Adayitu & Ledi. These two piped schemes are managed by a small-town utility. Supply in these towns mainly occurs through (joint) household connections.

Overall the woreda is served by 63 communal point sources (including hand pumps and public standpipes) and 1440 household connections, with a total of 31 schemes. Table 3 provides overview of water supply schemes in Mile woreda.

Table 3: Type and number of schemes in Mille

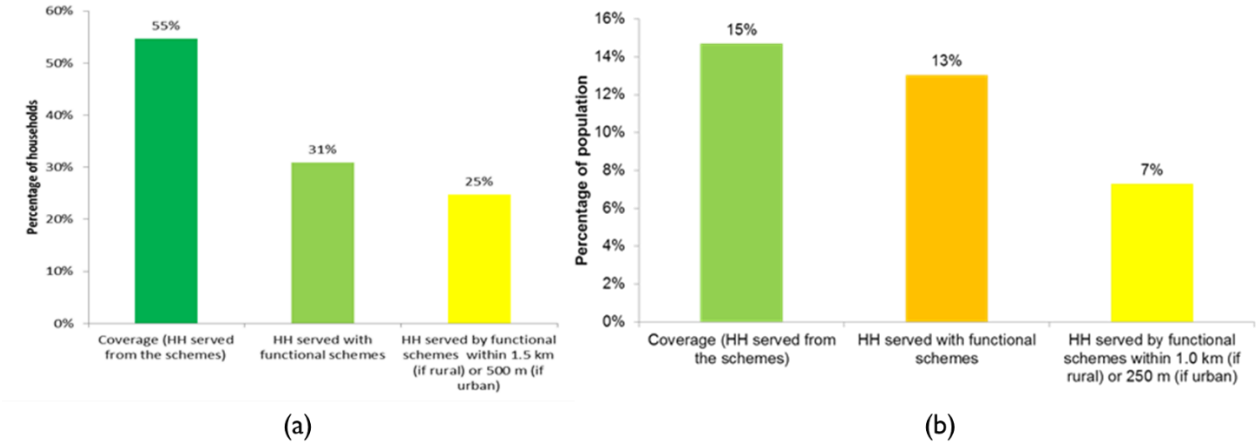
Type of Scheme	Number of schemes	Number of taps
Hand dug well with hand pump	1 (Afridev) 1 (Indian)	NA
Shallow well	14 (Motorized) 3 (Indian Mark II)	6
Deep well	12	40
Total	**31**	**46**

COVERAGE

Based on GTP II standards, the national level rural water supply coverage is 59% and urban water supply is 51% (). At woreda level the targets for the coming 5 years also include reduction of non-functionality, improving water quality and improving the management of the water infrastructure at community level. The main findings include a lower coverage level when national norms are used and even lower if only functional schemes are taken into account. Details can be found in Table 4 and Figure 4.

Table 4: Rural water coverage in South Ari and Mille

	South Ari		Mille	
	GTP II Targets	Baseline Findings	GTP II Targets	Baseline Findings
Rural water	70%	50% Access within 1.5km (rural) and 500m (urban) 25% Population covered with functional schemes	51%	8% Access within 1 km (rural) and 250m (urban) 7% Population covered with functional schemes
Non-functionality	5%	Non-functional 31% Partly functional 16% (Total 47%)	5%	Non-functional 13% Partly functional 6% (Total 19%)
Improved water quality	Na	A sample of 71 schemes (28% of the total number of schemes) indicates that only 22 of the functional schemes are safe	Na	A sample of 14 schemes (45% of the total number of schemes) indicates that only 11 of the functional schemes are safe
Improved community management	Na	106 of the 245 schemes (43%) have an active WUAs or WASHCOs.	Na	7 of the 17 schemes have an active WASHCOs or utility management (59%).



(a) (b)

Figure 4: Rural water coverage in South Ari (a) and in Mille (b)

FUNCTIONALITY OF SCHEMES IN MILE

From the 31 schemes assessed in Mile, 3 schemes are abandoned, 1 is non-functional, 2 are partly functional and 25 are functional. The rate of non-functionality is stable and higher than the woreda target. Most of the non-functional and partially functional schemes are point sources (Figure 5). Generator failure and insufficient water at the sources are the main reasons for non-functionality and partial functionality respectively. No reason has been found for the abandonment of the 3 schemes.

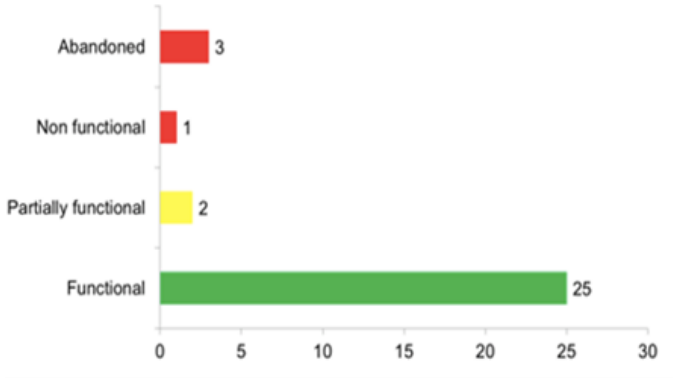


Figure 5: Functionality of schemes in Mille

FUNCTIONALITY OF SCHEMES IN SOUTH ARI

From the 245 schemes assessed in South Ari, 31% are non-functional, 16% are partly functional and 53% are functional (Figure 6). The rate of non-functionality increases with the age of the schemes. Most non-functional schemes are point sources with hand dug wells and protected springs. The main causes for the non-functionality and partly functionality reported to be insufficient water at the source and breakdown of hand pumps, pipeline and other broken equipment.

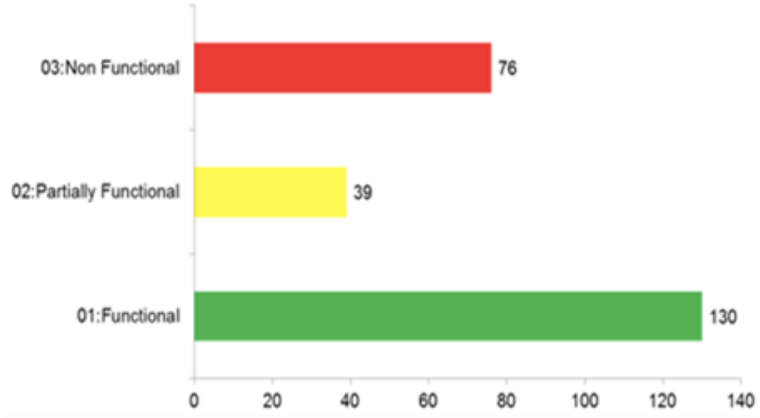
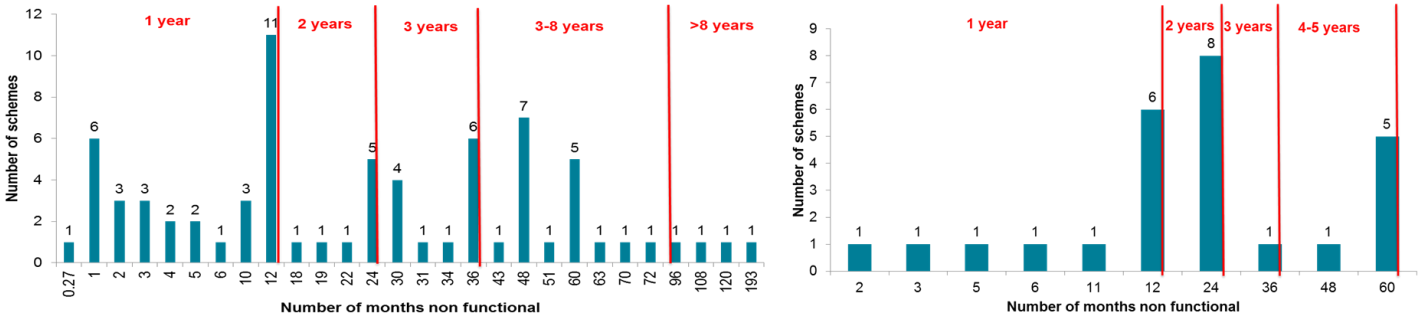


Figure 6: Functionality of schemes in South Ari

WATER SERVICE RELIABILITY

There is not a clear link between management status and functionality: many non-functional or partly functional schemes have functional Water User Associations, and there are functional schemes with no active WUA or utility management. In South Ari most of the non-functional schemes fall within the one-year mark, but there are also many schemes (22) that are not functional for more than three years. In Mile 6 schemes took one year to fix but 8 took 2 years before they were functional again.

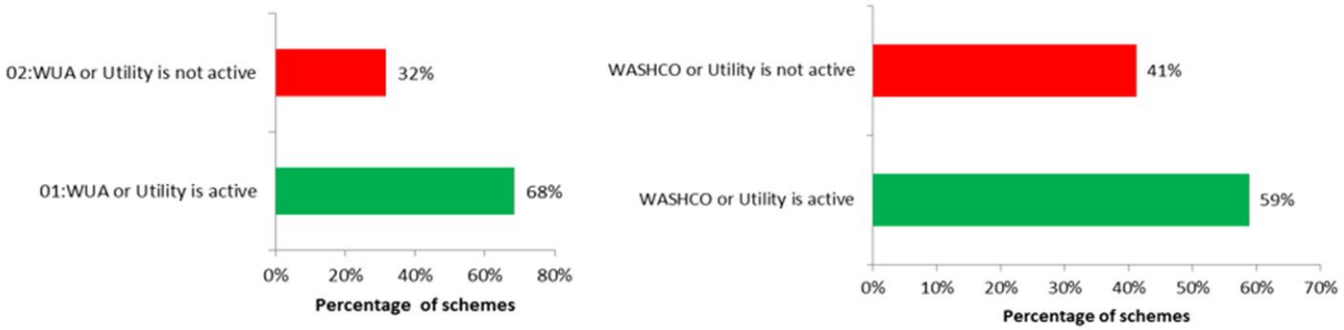


(a) (b)

Figure 7: Length of Non-functionality in South Ari (a) and in Mille (b)

MANAGEMENT OF SCHEMES

In Mile, 59% of the schemes have active WASHCOs or utilities and in South Ari 68% of the management structure is through Water User Associations.



(a) (b)

Figure 8: Management of schemes in South Ari (a) and in Mille (b)

WATER QUALITY FINDINGS

Water quality testing focused on E. coli as an indicator of contamination, using Compartment Bag Tests supplied by the company Aquagenx. Samples were collected following the specified procedures and transferred to the compartment bag and incubated for 24 hours in a portable incubator.

In Mile the majority of schemes had low risk water quality. In South Ari the results showed a greater problem with unsafe water (Figure 9a). The two schemes in Mile considered unsafe are deep boreholes while most of the unsafe schemes in South Ari are protected springs (Figure 9b).

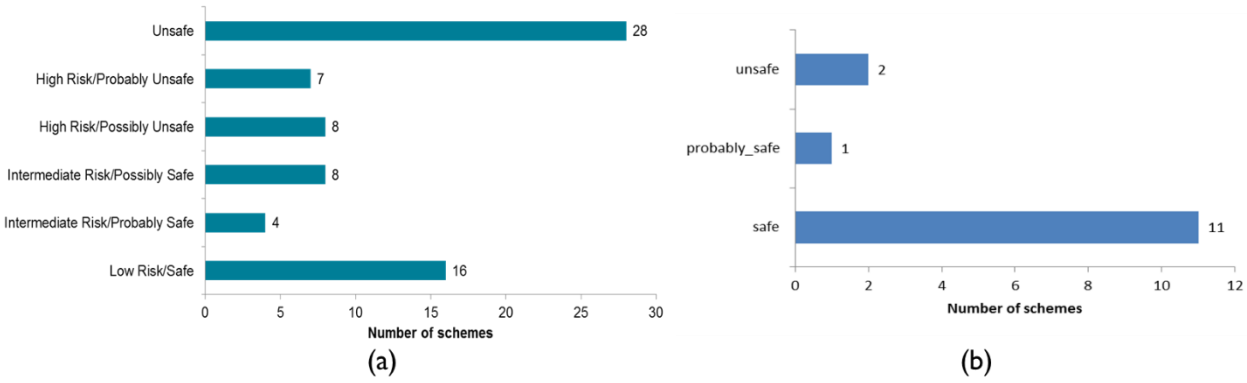


Figure 9: Water quality test findings in South Ari (a) and in Mille (b)

Prior to this assessment, water quality testing had not been done for the large majority of the schemes. Only 2 schemes in Mile have been tested (in 2008 and 2009 EFY), which revealed water safe for drinking at the time of the test. For South Ari, water quality tests had been undertaken at 8 schemes between 1982 and 2009 ETY, but results were unavailable. In South Ari, 124 (50%) of the schemes practice chlorination: well or borehole disinfected, reservoir disinfected, chlorination in the collection box, chamber or dispenser. In Mile chlorination is only practiced in 4 (13%) of the schemes, mainly the reservoir is disinfected.

CONCLUSIONS AND RECOMMENDATIONS

An inventory of all rural water schemes was completed, providing critical insight into the extent of improved rural water supply service delivery. Data was made accessible to woreda government for use in extending and improving services. A complete and up-to-date asset inventory potentially enables improved decision-making, resource allocation and fundraising.

The asset inventory dashboard and results are presently available to only a few WWO, zonal and regional staff engaged in the programme. It is becoming increasingly important for those staff to champion the programme and disseminate the results throughout the RWB departments, with other regional government and non-government partners, and with relevant zonal and woreda administrations. The more the data is shared and understood, the more value and impact the asset inventory will have. A function to print the results is embedded within both the mWater dashboard.

The Mile Woreda Core Processor has reported that it has already found the data useful. The Woreda Water Office is the main intended user of the data to inform and coordinate borehole maintenance and rehabilitation. Data has already been used for addressing critical water quality issues in several boreholes. Similarly, the South Ari baseline inventory data has been used as evidence for citing the location of new boreholes by government and development partners.

Identifying further potential for data use across woreda, zone and regional departments should be prioritised. This can help understand precisely which parameters need to have regular data submitted, and who needs to have access to this data. As more people use and rely on data for their work, the more data and the processes which underpin the collection, analysis and sharing are valued.

To operationalise data use it will be necessary to assign responsibilities for managing and sharing the data within woreda and regional levels. This responsibility requires a continuation of appropriate instruction, training and resources. Capacity development has been a continuous element throughout the project implementation. Each step has been taken in consideration and partnership with the woredas, who are established as the process owners. Trainings have included technical aspects related to data collection, smartphone usage, mobile application, detailed description of survey questions, managing surveys, online visualization tools and data use. However, there are still remaining challenges, including under-resourcing, competing demands, time restraints and availability of spare parts.

Keeping the data continuously live, relevant and useful is critical. Presently there are efforts to transition from one-time data collection into an ongoing monitoring system. These are now in infancy, but initial steps show promising results, especially in South Ari. To help support the operation and maintenance process, we recommend an inventory of spare parts (availability, access and other sources like private operators). In addition, a mechanism to ensure capturing of new constructions in the asset inventory needs to be considered.

To strengthen the overall process of tracking and updating the datasets, improved coordination and cooperation with other organisations, discussing co-sharing cost and logistic agreements between zone, woreda and the NGOs is critical. The asset inventory data has been verified by IRC staff at the time of baseline, but a mechanism should be established to verify the continuous data updates. More needs to be done to capture and share the successes and lessons.

To help scale the asset inventory beyond Mile and South Ari woredas supporting documentation has been prepared. A Guideline has been authored to outline the initiative's aims and objectives, and set clear instruction for the processes and using the tools. The use of asset inventory data should be expanded at woreda, zone and regional levels to support scheme management, planning of repair and maintenance, site selection for new borehole drilling, water trucking activities, to monitor the status of boreholes and generally to efficiently allocate resources based on evidence.

In Afar, the asset inventory has led to scaling at regional level, in partnership with the Afar Regional Water Bureau and other development partners, such as CARE. A comprehensive inventory is now available for all schemes in Afar. Meanwhile, the partnership with SweetSense has advanced towards installing remote sensing devices on all schemes across the region.

The asset inventory has provided a valuable insight into the major critical aspects of large scale water supply infrastructure and the patterns of access and use around these. A limitation is that not all data from water access points in Mile have been captured. Capturing information relating to all points should be considered to enable full understanding of service delivery and tracking of national and project targets.

REFERENCES

Central Statistics Agency (2013). *Population Projection of Ethiopia for All Regions at Wereda Level from 2014 – 2017*. Federal Democratic Republic of Ethiopia.

Operating surveys and dashboards; October 2017; John Butterworth (PhD), Joseph Pearce and Michael Abera

Water Facilities or Water Services? A Life Cycle Costs Analysis of rural water supply in South Ari and Mile Woredas ; August 2017; Catarina Fonseca, Desta Dimtse, Asmelash Kebede

IRC Ethiopia. 2017. Progress Report on Asset Inventory of Water Schemes in South Ari Woreda Sustainable WASH Systems Initiative - Asset Inventory data collection guidelines

ANNEX 1. ASSET INVENTORY QUESTIONNAIRE IN MILLE

1. Water supply facilities

General Information

- Zone
- Woreda
- Kebele
- Village
- Context
- Name of water supply scheme

Contact details

- Contact 1 name
- Contact 1 position
- Contact 1 telephone number
- Contact 2 name
- Contact 2 position
- Contact 2 telephone number

Water scheme details

- Year of water scheme construction (or most recent rehabilitation) in EFY
- What is the total number of water sources supplying the scheme?
- Type of scheme
- Total number of tap stands
- Total number of household connections
- Total number of institutional connections

Water source (to be filled for as many water sources as available for the scheme)

- Type of water source
- Location of the water source
- Please take a picture of the water source
- Is there a water meter at the water source?
- Is the water meter working
- What is the current reading of the water meter
- Borehole/Well
    - Name of the borehole/well
    - Construction year of the well/borehole in EFY (or the year of rehabilitation)
    - Borehole or well depth (meters)
    - Borehole or well diameter (inches)
    - Is the well seal unsanitary?
    - The well/ borehole is not fenced, or the fencing is damaged, permitting unauthorised entry?
    - Is there any other source of pollution (e.g. animal excreta, rubbish, surface water) within?
    - Is there a latrine within 30 meters radius?
    - Where is the location of the latrine?
    - Does the water point have adequate drainage so that excess water drains away and does not?

    - Is the well/ borehole vulnerable to flood damage?
- Surface water
    - Construction year of the surface water in EFY (or the year of rehabilitation)
    - Physical state of the surface water intake
- Spring
    - Construction year of the spring in EFY (or the year of rehabilitation)
    - Physical state of the spring protection
- Sensor
    - Is a sensor installed?
    - Type of sensor installed
    - Date of installation of sensor
    - Sensor serial number
    - Sensor telephone number
    - Picture of sensor installation
    - Sensor installation notes
- Pump
    - Year (EFY) pump installation (or last repair/replacement)
    - Physical state of the pump
    - Types of lifting device (power)
    - Type of hand pump
- Generator
    - Year (EFY) when generator was installed (or year of re-installation)
    - Physical state of the generator
    - Generator brand
    - Generator model
    - Generator serial number
    - Generator fuel
    - Is fuel securely kept in a safe location?
    - Generator KVA
    - Generator max Amps(starting amps)
    - Generator last service date
    - Generator alternator manufacturer
    - Generator alternator model
    - Generator alternator serial number
    - Generator picture
- Generator House
    - Is there a generator house?
    - Is the generator house lockable and securely protects the installed equipment?
- Solar installation
    - Year of solar installation (or year of re-installation)
    - Physical state of the solar installation
    - Who installed the system (name of contractor)?
    - Solar installation picture
    - Type voltage of submersible pump
    - D/C to A/C Voltage Inverter Manufacturer
    - D/C to A/C Voltage Inverter Model
    - D/C to A/C Voltage Inverter Rate Power (watts)
    - D/C to A/C Voltage Inverter Peak Power (watts)

    - D/C to A/C Voltage Inverter: A/C Current Charging Range (amp)
    - Pump controller manufacturer
    - Pump controller model
    - Pump controller serial number
    - Power (max) Kw
    - Pump controller input current (Amps)
    - PV panels manufacturer brand
    - PV panels model number
    - PV panel type
    - PV panels size (individual, metres longest side)
    - PV panel wattage (per panel)
    - Total number of PV panels
    - Are the PV panels in a fenced area?
    - Tick if the following components of the installation are present
- Switchboard (Electricity/Generator/Solar)
    - Switchboard manufacturer
    - Switchboard model
    - Switchboard power (KW)
    - Switchboard voltage
    - Switchboard Ampere
    - Switchboard picture
- Water Level and flow-rate measurements
    - Water Level measurement
        - Is a water level measurement done during this survey?
        - Date and time when water level measurement was done
        - Which type of device was used to measure water level?
        - Was the static Water level measured BEFORE pumping?
        - What is the static water level measurement BEFORE pumping in meters?
        - Reason for not doing the 'BEFORE pumping' water level measurement?
        - How long (in minutes) has the pump been running continuously on the day of the survey?
        - Was the water level measured AFTER pumping?
        - What is the water level measurement AFTER pumping (in meters)
        - How long (in minutes) the pump worked before the static water measurement conducted
        - Reason for not doing the AFTER pumping measurement?
    - Flow-rate measurement
        - Is a flow-rate measurement done during this survey?
        - How was the flow-rate calculated?
        - What was the flow-rate measurement (litres/sec)
        - Reason for not measuring the water flow-rate?
-

Scheme functionality

- Is the water scheme currently functional?
- Please take a picture illustrating the non-functionality or partial functionality
- Main cause of non-functionality or partial functionality
- Describe the functionality problem/s
- Number of months since non-functional
- While functional, does the scheme have any emerging problems that might lead to non-functional
- Please describe the problems that might lead to non-functionality in the near future
- Was the water scheme out of service one or more days in the last month?
- Number of days out of service in the last month
- Production of system: yield or discharge (l/sec)
- On average, how many hours a day is the water source operating?
- Is this a seasonal water scheme that commonly fails in the dry season?

Water reservoir (to be filled for as many reservoirs as available)

- Location of the reservoir
- Please take reservoir picture
- Ground or elevated reservoir?
- Reservoir type
- Reservoir capacity in cubic meters?
- Year of construction of the reservoir in EFY (or year of rehabilitation)
- Physical state of reservoir

Distribution network

- Year of the main line was constructed in EFY (or year of rehabilitation)
- Physical state of main line
- Year of construction of the secondary distribution network in EFY (or year of rehabilitation)
- Physical state of secondary distribution network

Water treatment

- Is there a water treatment plant?
- What kind of water treatment plant it is?
- Physical state of treatment plant
- Year treatment plant was constructed (EFY), if replaced, year of most recent replacement
- Is chlorination practised?
- Describe chlorination practice
- How often is chlorination practised?

Livestock water

- Are there livestock drinking facilities?
- Physical state of livestock drinking facilities
- Year livestock drinking facilities were constructed in EFY (or rehabilitated)

Water quality test

- Microbiological test (E. coli)
    - Is the source selected for water quality sampling?
    - Date of taking water quality sample
    - Select a unique code comprising woreda initials e.g. EL1 for the first sample from Elidar
- Fluoride test
    - Is the source selected for Fluoride test?
    - Date of Fluoride test done
    - Write the Fluoride test result in mg/l
- EC/TDS test
    - Is the source selected for EC/TDS test?
    - Date of EC/TDS test done
    - Write the EC test result in ppm (mg/l)
    - Write the TDS test result in ppm (mg/l)
    - Write the temperature reading of the water
- pH test
    - Is the source selected for pH test?
    - Date of pH test done
    - Write the pH test result

2. Management

- Management
    - Management body
    - Current management status
    - To what extent are women represented in the WASHCO?
    - How much money is currently held by the WASHCO (in Birr)?
- Users
    - How many households live in this village or town?
    - Total number of households currently served from the scheme?
    - How many households are served by the scheme that live within 1.0 km (if rural) or 250 m (if ...
    - Is the water schemes used for livestock?
    - Estimated number of camels using scheme (per day)
    - Estimated number of cattle using scheme (per day)
    - Estimated number of horses/donkeys using water point (per day)
    - Estimated number of goats/sheep using water point (per day)
    - Is the water scheme used for water trucking?
    - Number of trucks filling per day?
- Tariffs
    - Type of tariff system (most common)
    - What is the tariff amount (in Birr)?
    - Is there a special tariff for livestock (per animal)?
    - What is the tariff per camel (Birr)
    - What is the tariff per cattle (Birr)
    - What is the tariff per Horse/Donkey (Birr)
    - What is the tariff per goat/sheep (Birr)
    - Is there a tariff per institution (schools, health centres etc)
    - What is the monthly institutional tariff (Birr)?

    - Number of institutions supplied by scheme that pay a monthly institutional tariff
- Time
    - Maximum one direction time taken to reach the water point(s) in minutes by any regular user

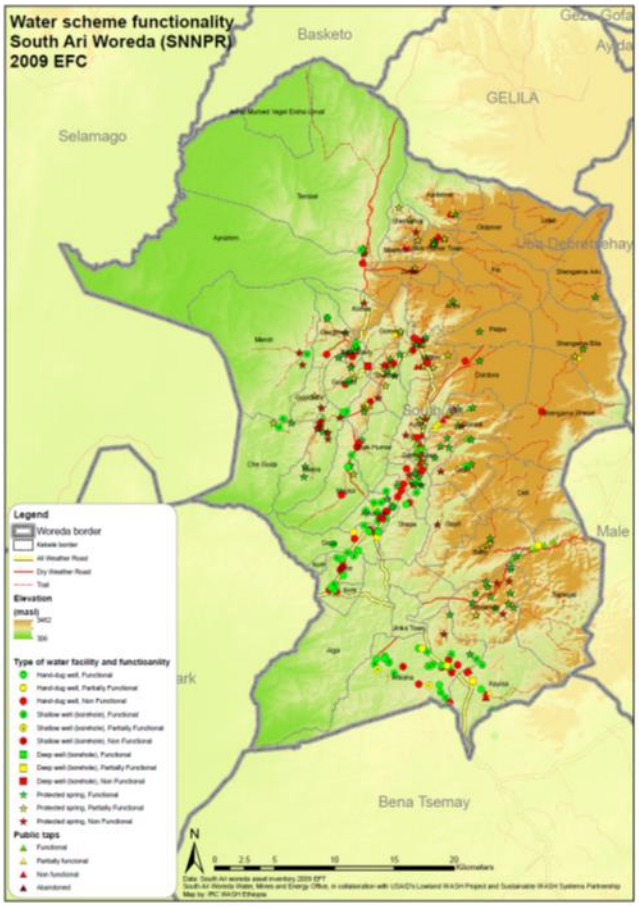
3. Public tap stands

- Tap stand (To be filled as many number of tap stands as available)
    - Woreda
    - Name of the tap stand
    - Tap location
    - Year of tap stand construction in EFY (or the year of rehabilitation)
    - Is the public tap stand currently functional?
    - Tap picture
    - Number of months since non-functional/partially functional
    - Main cause of non-functionality/partial functionality
    - Physical state of the tap stand
    - Is there a water meter at the tap stand?
    - Is the water meter working?
    - What is the current reading in water meter?
    - Is this public tap selected for water quality test?
    - Select a unique code similar with the code you used to label the test bag

4. Sample of users (To be completed for the first 10 users in the queue)

- Tariff and water collection
    - Do you pay for water?
    - How do you pay?
    - What is the tariff amount (Birr)?
    - Do you also collect water from this source/ water point for livestock?
    - Is there a tariff for livestock?
    - What is the tariff per camel (Birr)
    - What is the tariff per cattle (Birr)
    - What is the tariff per Horse/Donkey (Birr)
    - What is the tariff per goat/sheep (Birr)
    - Select the livestock that depend on the water you are collecting
    - How many Jerry cans (20l) of water per day do you normally collect for your household from...
    - How many adults (age 18 years or above) are in your household?
    - How many children (age less than 18 years) are in your household?
    - How long do you usually spend waiting (queuing) at the source/waterpoint? (mins)
    - How long does it take you to walk from your home to this source/water point? (mins)

ANNEX 2. WATER SCHEME FUNCTIONALITY IN SOUTH ARI



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