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Collecting life-cycle cost data for WASH services: A guide for practitioners

"Final Draft for Review"

Mathijs Veenkant and Catarina Fonseca

Supporting water sanitation and hygiene services for life

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This working paper is a guide to data collection for the asset inventory and life-cycle cost approach (LCCA). See the IRC website for more information on costing and financing tools.

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Abbreviations

FTE	full time equivalent
GTP	Growth and Transformation Plan
JMP	Joint Monitoring Programme
LCCA	life-cycle cost approach
NGO	non-governmental organisation
SDG	Sustainable Development Goal
WASH	water, sanitation and hygiene
WASHCO	water, sanitation and hygiene committee

Purpose

The life-cycle cost approach (LCCA) is a methodology to comprehensively identify and analyse the full costs of delivering water, sanitation and hygiene (WASH) services, including infrastructure and both direct and indirect support. It helps decision makers involved in planning, budgeting and service delivery understand the cost consequences of different service delivery models so that they can make informed decisions.

This document is a guide for collecting data, conducting surveys and interviews, and contextualising the information. It addresses water services but is equally useful for assessing sanitation services. The guidance was developed for Ethiopia; for other countries, some terms may need to be adapted. The goals and realities of the project or programme in which the LCCA is applied may require you to be innovative and deviate from the outlined approach.

For water and sanitation, LCCA roughly consists of two parts: assessment of infrastructure and services, and assessment of costs and financing. The weight given to each part may depend on whether your area already has a monitoring system and good data on infrastructure and services: existing data may be enough to support the assessment of costs and financing. Regardless, the two parts build on each another. Especially if the LCCA will be used in long-term planning for water service delivery, then both parts of the assessment will need to be developed.

1. Introduction

This document is a step-by-step guide to collecting data for a life-cycle cost approach (LCCA) to water service delivery at district level.

LCCA helps decision makers involved in planning, budgeting and service delivery make informed choices about levels and models of water service and understand the cost consequences of each decision.

The first step in understanding life-cycle costs is determining the status of existing water infrastructure by creating an asset inventory. The asset inventory has uses beyond the LCCA: it can form the basis for strengthening government-led monitoring systems, or be used to plan and prioritise maintenance. For these multiple objectives, inventorying all schemes in a district may be warranted.

The next step is collecting cost data. The objective is to establish the cost of current water service delivery and determine the gap between existing services and full coverage at the desired service level. The necessary information is normally collected from government water offices at different levels—local, district, municipal, zonal, or regional, depending on the country's administrative system—and from households and water user committees (WASHCOs in Ethiopia).

Those two steps are the focus of this document. To summarise:

1. Asset inventory

- Create a comprehensive asset inventory of all water schemes—infrastructure components, source type, functionality, age, management, water quality, water reliability—as a basis for making decisions on rehabilitation and maintenance.

2. Costs and financing

- Establish the cost of existing water infrastructure and its maintenance.
- Identify current funding for water service delivery, including all relevant levels and sources (community, government and nongovernmental organisations, or NGOs).
- Determine the affordability and adequacy of tariffs paid by households.

For more information, see https://www.ircwash.org/tools/irc-costing-and-budgeting-tools

2. Definitions

This section defines the terms that field enumerators need to know. Definitions might need to be adapted for the local context.

The following definitions are simplified; references for more formal definitions are provided. Sections 2.5 to 2.8 are based on IRC Briefing Note 1 (Fonseca et al., 2011).

2.1 WATER SOURCES

facility the physical infrastructure that collects, treats or distributes water or collects, transports, treats or disposes of waste (e.g., pumps, pipes, wells, tanks) (Adank et al., 2018).

improved source an 'engineered' water source, with structures designed using non-traditional technologies. A more formal definition from the Joint Monitoring Programme (JMP) is as follows: 'improved drinking water sources are those which, by nature of their design and construction, have the potential to deliver safe water'. An improved source should be a safely managed drinking water service (*see safe water*).

primary source the main source that a household uses for its major daily water requirements

safe water in general, water appropriate for human consumption, according to national standards. Safe water has minimal levels of E. coli and other harmful contaminants and pollutants. The JMP drinking water ladder uses the term *safely managed drinking water*, defined as 'drinking water from an improved water source which is located on premises, available when needed and free from faecal and priority chemical contamination'.[1]

secondary source a water source that is used less frequently, as an alternative to the primary source

unimproved source 'Drinking water from an unprotected dug well or unprotected spring. For example, an open well without protective structures'.1

water scheme the combination of water supply facilities and their management. In Ethiopia this may involve a formal structure such as a WASHCO or town water utility (et al., 2018).

water source an access point from which users withdraw water. It may be a water scheme or surface water (e.g., river, lake, irrigation canal).

2.2 WATER FACILITIES

RURAL SCHEMES

cistern an underground masonry container that collects transported water and runoff. Examples exist in Birka, in the Somali region.

deep bore hole a shaft drilled to a depth of 60 metres or more

expanded scheme a water scheme whose output has been increased to accommodate more users or provide more water per capita

hand-dug well a hand-dug water point that taps water from a shallow water table. Most dug wells are less than 20 metres deep.

on-spot spring a spring with no distribution system. Water is extracted on the spot.

protected pond a small reservoir that collects rainwater and runoff for livestock watering, irrigation and, with water treatment, human consumption

rainwater harvesting the collection of rainwater or runoff and its productive use for domestic consumption, irrigation and livestock watering

rehabilitated scheme a water scheme that has received major repairs, development or equipment replacement since its initial construction

rural piped system, borehole a piped system for water distribution over large rural areas, either gravity based or pump powered, fed from a borehole

rural piped system, spring source a piped system for water distribution, either gravity based or pump powered, fed from a protected spring

self-supply (household) 'Improvement to water supplies developed largely or wholly through user investment usually at household level' (Sutton et al. 2012, p.1)

shallow bore hole a shaft drilled to a depth of less than 60 metres

[1] Definitions taken from the JMP ladder for drinking water; see: https://washdata.org/monitoring/drinking-water.

URBAN SCHEMES

house connection a private water supply by tap located inside a homestead building

public tap a facility, such as a fountain, that has two or more faucets for communal use

self-sufficiency the ability of a town water supply service, to operate independently and earn sufficient income from water sales to pay for operation, maintenance, expansion, administration, accounting, and staff

yard connection, individual a private water supply from a tap in the yard of the resident

yard connection, shared a water supply from a tap in a common place that provides water to neighbourhood users

2.3 FUNCTIONALITY

The functionality of water schemes and water points should be categorised as it exists at the time of inspection.

functional able to provide service at the level for which it was designed

partially functional working but not providing water at the designed or expected level because of low yield or the failure of more than 50% of taps). For example:

- a handpump that provides water only two days a week
- a distribution network with three water points, only one of which is working
- a water point with five faucets, only two of which are working

non-functional not able to provide service without repairs or intervention

abandoned non-functional and not expected to be repaired or rehabilitated in the foreseeable future

2.4 LIFTING DEVICES

Images can be used to help enumerators identify different lifting devices and other infrastructure components. Please see Annex 1 for examples.

2.5 COST COMPONENTS

The cost components for water and sanitation services are fully defined in Fonseca et al. (2011). Briefly, capital expenditure (CapEx) is the capital invested in fixed assets. It includes the cost of initial construction, plus any extension, enhancement and augmentation of the system. It may also include 'software', such as one-time capacity building before construction and meetings with users. Operating and minor maintenance expenditure (OpEx) covers what

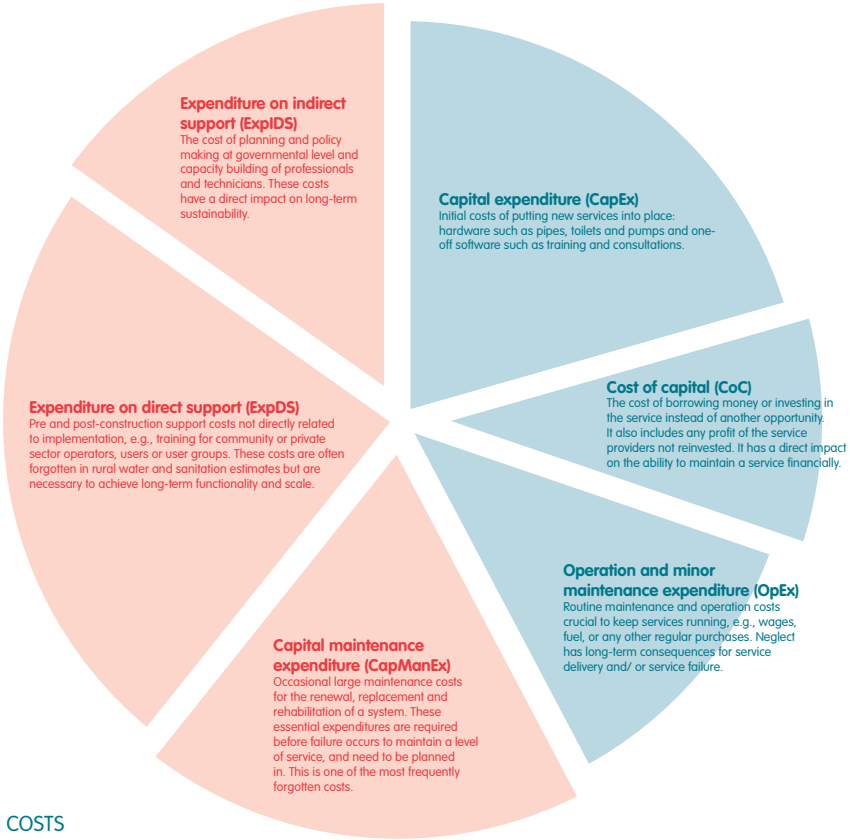


FIGURE 1 LIFE-CYCLE COSTS

is required to keep the system running (e.g., recurrent expenditures for labour, fuel, chemicals, materials, purchases of bulk water). Capital maintenance expenditure (CapManEx) covers asset renewal, replacement and rehabilitation—costs that go beyond regular maintenance. Cost of capital (CoC) is the cost of accessing funds to construct a system (e.g., interest on loans).

Expenditure on direct support (ExpDS) includes pre- and post-construction support activities by public or private service providers (e.g., monitoring performance, handling complaints, building local government's capacity). Urban utilities often include these costs in OpEx. Expenditure on indirect support (ExpIDS) is macro-level support not tied to a specific programme or project. Local categories and terminology may differ, but indirect support might encompass general capacity building, policy making, planning, regulation and contributions to sector working capacity. Ideally, this indirect support is counted in the total water budget.

2.6 CAPITAL EXPENDITURE VS. RECURRENT EXPENDITURE

Capital expenditure is typically related to the costs of providing a service where there was none before or of substantially improving or expanding the level of service. These are one-time expenditures. Recurrent expenditure is the cost of sustaining a service, at its current level, through operations and maintenance, rehabilitation and replacement of systems, management, planning and monitoring of service delivery.

Recurrent expenditure also forms the backbone of preventive maintenance, defined as 'regular inspection and servicing to preserve assets and minimise breakdowns' (Davis and Brikké, 1995, p.5). This includes replacement of spare parts and is carried out on a regular basis.

Recurrent costs are recorded per year, as they occur throughout the life span of a system, whereas capital expenditure is a one-time amount for implementation. However, additional capital expenditure for expansion and enhancement can take place several years into the life of a system.

2.7 BUDGET VS. EXPENDITURE

Government entities do not always spend the entire budget that is allocated to them, for various reasons. The difference between budgets and actual expenditure is therefore important. When interviewing government entities, inquire about both the budget and the actual expenditure.

- The government budget is a plan on how money is intended to be spent. It specifies the maximum amounts that can be spent. It is planned government spending.
- Expenditure is the amount that has actually been spent. Usually the amounts are reported through official audits.

At decentralised government levels in many low-income countries, the difference between budgets and real expenditure is significant. Sometimes the money becomes available only in the second half of the fiscal year, so the local government cannot spend it all (this situation may be referred to as a lack of 'absorption capacity'). Understanding the public management system—how the money flows from A to B and when it is made available—is important for the cost analysis.

One problem in Ethiopia is that WASHCOs are supposed to fund maintenance but don't. Government steps in to help but often draws on sources and budget lines that don't clearly relate to rural water supply maintenance.

2.8 ON-BUDGET VS. OFF-BUDGET

On-budget refers to amounts that have been determined and approved formally in the country's congress or parliament.

Off-budget has two meanings:

- In many countries (e.g., India) specific federal entities want to protect some government revenues from normal budgeting processes for social sectors. They are afraid that if all the revenue is up for discussion, the government will appear flush with cash, and the congress will want to spend more on particular areas.
- In many lower-income countries with high percentages of external aid, not all external funding is captured in the national budget. Significant resources are directed through off-budget channels, making it difficult to track how much is actually being spent on education, health, social welfare or water and sanitation. Sometimes a donor requires that its funding be kept separate so that it can bypass the national system and control where the money is spent. The Paris agreement on aid effectiveness discourages this practice.

2.9 PRIMARY VS. SECONDARY DATA

Information that you collect directly—by reviewing budgets and examining receipts, for example—is primary data. Information that was collected by someone else and then conveyed to you—in a publication, on a website—is considered secondary data.

3. Collecting infrastructure data

3.1 BACKGROUND

Understanding the status of infrastructure is critical for costing sustainable services. Because the government has the official mandate for monitoring infrastructure, local government officials should be engaged in collecting, updating, processing and making use of the information in the asset inventory. The indicators for the asset inventory should closely align with the government's national policies and the Sustainable Development Goal (SDG) requirements for Goal 6. The following asset inventory guideline, designed for Ethiopia, uses indicators that align with the country's second Growth and Transformation Plan (GTP2), National WASH Coordination Office (NWCO), Ministry of Water, Irrigation, and Energy, and SDG6 indicator sets. The indicators may have to be tailored to your country context.

Performance indicators:

- Total number of water schemes in service for a community (disaggregated by type of scheme and technology)
- Percentage of functional, partially functional and non-functional water supply schemes, disaggregated by type of scheme and technology)
- (Average) estimated quantity of water supplied from scheme (litres per capita a day, or lpcd); calculated from yield, hours of operation and number of users (disaggregated by people and type of livestock)
- Maximum distance travelled for water collection (km)
- Average quantity of water consumed (lpcd, calculated from data on volume collected and household size and livestock numbers froma sample of 10 households per scheme)
- Average time taken for round trip to collect water (hours), including queuing (disaggregated for travel time and queuing)
- Percentage of safe schemes based on biological water quality test for E. coli using a test method that specifically detects E. coli in a 100 mL water sample
- Percentage of safe schemes based on physical and chemical water quality tests for fluoride, E. coli, total dissolved solids, temperature, pH, colour, odour and other criteria
- Number of people who use improved water services based on GTP-2 minimum service level criteria (25 lpcd within a distance of 1km in rural areas)
- Number of people using safely managed drinking water sources
- Reliability of a water point (downtime due to failures expressed as a percentage of total time, in days)

Regarding water quality, it is important to consider all possible relevant contaminants and pollutants in your area and perform the appropriate tests. In many areas microbial contamination will be the highest risk. This document focuses on E. coli contamination because it is a commonly used indicator of all microbial contamination, but E. coli is not the only contaminant to consider. Water quality tests are recommended only if test data are not already available from national or other assessments.

3.2 SAMPLING

Collect data on infrastructure components, source type, functionality, age, management and water quality (if not already available) on all water schemes in the area. Table 1 lists sample sizes for various kinds of surveys.

Depending on the size and accessibility of the area and the amount of staff available, this information will take one to two weeks to collect with a team of 10 enumerators, two vehicles and two motorcycles. This excludes time for training the enumerators and cleaning the data but is appropriate for most remote areas with a population of about half a million people.

In random sampling, any person or any household (depending on the focus of the survey) has an equal probability of being selected. Random sampling is used because enumerators cannot interview everyone; they must therefore select a mix of people or households that are statistically similar to the whole population of interest.

Simple random selection increases the likelihood that the sample is representative for the population. Because all the formulae assume a random sample, any results not based on a random sample cannot be used. To approximate a random sample for this study, take the first 10 users in the queue at a water point.

TABLE 1 SAMPLE SIZE

SURVEY	SAMPLE SIZE
Rural and urban water schemes	All water schemes
Rural and urban water points	All water points
Water user committees (WASHCOs)	All water schemes
Water quality	All water schemes (from main collection point)
Users or households	10 per water point (random sampling; see text below)

See Table 2 for more details and an alternative approach involving household interviews.

3.3 DATA COLLECTION TOOLS

Field enumerators can use paper-based surveys, but mobile data collection tools, such as mWater or AkvoFLOW, offer advantages. With mWater, for example, you can develop customised dashboards to quickly analyse and present the asset inventory results from the survey data. Dashboards can show maps, tables, graphs and charts. Since different governance levels have different information needs, you might develop displays of mostly technical data for municipal leaders, and more general results for regional officials or politicians. mWater also has standard indicators and survey questions with which you can build a survey on its platform. If you do not yet have a survey, you can use the questions suggested in this document. Enumerators should be trained in the use of the selected mobile data collection software. For more guidance on how to use mWater, see Annex 2.

Data collection ideally includes water quality testing for natural contaminants of groundwater, like fluoride and arsenic, and potential pollutants, especially microbial contamination, which is a major risk in many rural settings. The sample survey in this guide used E. coli as an indicator of microbial contamination, which was measured using compartment bag tests.

The compartment bag test is new, relatively simple and designed for use in the field. If you are using this test protocol, see Annex 3 for standard water quality survey questions, sampling, analysis, and testing procedures. Note that Annex 3 assumes you are working with mWater as your digital data collection and management platform. You may wish to adapt the type of water quality test and the corresponding survey sections to your needs.

3.4 PREPARATION FOR FIELDWORK

Prepare for the field visits and actual data collection in advance:

- Recruit one team leader or supervisor.
- Recruit enumerators, ideally from the area of the survey; previous experience elsewhere may also be desirable.
- Prepare a district map showing administrative boundaries, roads, rivers, water sources and water systems. This map will help you assess the level of effort required and set reasonable goals for daily data collection.
- Confirm the enumerators' training and schedule the survey with regional and district officials.

3.5 CONDUCTING THE SURVEY

Begin by entering the infrastructure and management questions in Annex 4 into the asset inventory forms in your preferred data collection platform. Table 2 lists the data sources for the survey.

3.6 DATA PROCESSING AND CLEANING

The data should be processed and cleaned as soon as possible, while memories of the interviews are fresh and corrections can be easily made. See Section 6 on how to clean data in mWater.
Data should be verified and validated in partnership with local government staff. Once reporting is completed, conduct a debriefing. This will increase the likelihood that government officials will accept and use the asset inventory.

TABLE 2 PROCEDURES FOR DATA COLLECTORS

SURVEY	PROCEDURE
Rural and urban water schemes	Visit each communal water scheme and fill in asset inventory form survey.
Rural and urban water points	Visit each communal water point and fill in asset inventory form survey.
WASHCOs and other management bodies	Talk to caretaker or WASHCO members or municipality of water point.
Users or households	Look for users of water scheme or water point. If you cannot interview users while they are collecting water, conduct random sampling of households. Introduce yourself to household and state purpose of survey. Ask for permission and household members' time. Direct questions to women or at least make sure they are present: women are mostly responsible and affected by WASH and therefore best qualified to answer survey questions.

4 Collecting government financial data

4.1 BACKGROUND

Collecting government financial data has several objectives:

- to determine annual water budgets and actual expenditures at each level of government, as well as expenditures by NGOs (perhaps at the regional level) and any other sources, in as much detail as possible
- to calculate the value (replacement cost) of existing infrastructure
- to determine how much local government spends on direct support, understand the required levels of effort on direct support and calculate the cost of reaching universal coverage

Unlike the asset inventory, the data in this section are collected mainly through key informant interviews and focus group discussions. There are no enumerators or digital data collection tools. The meetings are critical to understanding the main financial constraints for managing infrastructure and providing service.

IRC has identified five funding flows at local level and, for constructing flow charts and diagrammes, assigned them colours.

Blue: inter-governmental transfers

Blue: sector project funding at local level

Grey: off-budget funds that bypass national and local budgets

Green: local government budgets and own resources

Green: water service providers' budgets and own resources

Each funding source has its own reporting mechanisms and legislation. It might not be possible to see all the budget or expenditure reports needed, but it is worth a try. Find senior, independent, reliable staff to help you obtain the information. In our experience, retired respected government staff are the best sources of this information.

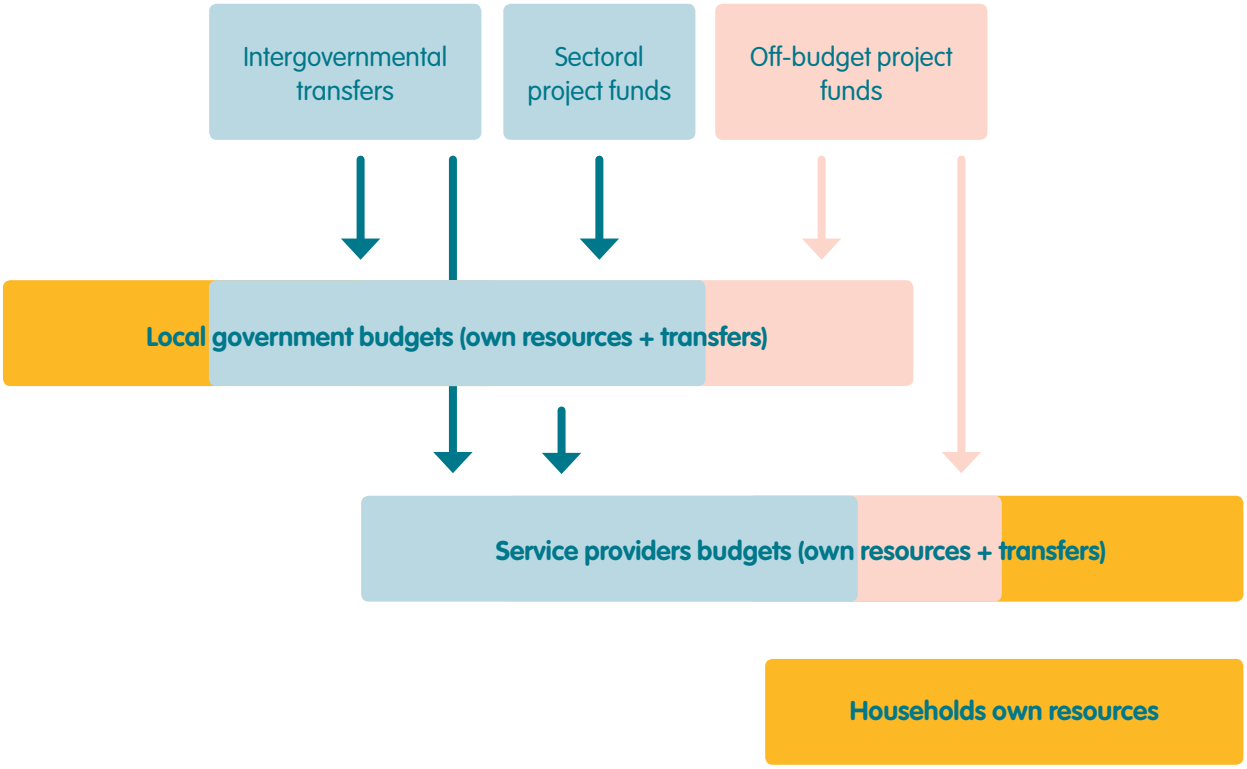


FIGURE 2 FUNDING FLOWS AT LOCAL LEVEL

4.2 GOVERNMENT STAFF INTERVIEWS AND FOCUS GROUPS

Conduct interviews and focus group discussions at district (municipal), zonal and regional water offices and reconcile secondary data (collected from budget and expenditure reports) with what you learn from government staff.

Allow approximately one hour for primary data collection and two to three hours for secondary data collection at each level of government. Plan on multiple visits. The focus group discussions take two to four hours each.

For analysis, budgets and expenditures must be disaggregated into the standard LCCA components (see Section 2.5), but an office may use different categories. If budgets for a district or municipality are not available, estimate by dividing the total zonal or regional budget by the number of local jurisdictions. The interview with local staff may be combined with the focus group discussion.

Budget and expenditure survey

The following questions are intended to guide the discussion and should not be used literally.

1. Can you provide the water office budget and expenditure for this year?
Request both budget and expenditure figures.

2. Do you have the budgets and expenditures for recent years?
Request that data be as detailed as possible, for as many years as possible. Request both budget and expenditure figures.

3. Which sources of funds are included and which are excluded?

- Central and regional government contributions?
- NGO and foundation funding?
- Do you collect local taxes?
- Do you have contributions from any other entities?

4. Can you provide the budgets for other offices (e.g., education, women's affairs, police)? The goal is to compare the water sector budget with other sector budgets.
Request data for as many years as possible.

Secondary data should confirm the information gathered in interviews but may reveal discrepancies. In Ethiopia, budgets are usually posted outside the office (budgets are public information), so you can take a photo. Record the year and distinguish between budget and expenditure. Also take photos of posted lists, such as WASH staff names and salaries.

Infrastructure management and oversight survey

After collecting budget and expenditure data, continue by asking questions about how the funds for infrastructure management are actually managed. The goal is to see how responsibilities are distributed across different levels of government and identify the main challenges and opportunities at local level.

1. Who pays for capital infrastructure?
Challenges? Opportunities?
2. Who pays for minor maintenance?
Challenges? Opportunities?
3. Who pays for major maintenance?
Challenges? Opportunities?
4. Do you have spare parts in storage? Where? May I see them and take a picture?
5. Who has paid for them?
6. What's the total value?
7. Do you have an inventory of spare parts? If not, why not? Does anyone ask for it?
8. Who can access the spare parts?
Challenges? Opportunities?
9. Does your team regularly visit the communities? How often?
If not, why not?
10. Does your team have a budget for travel?
Yes / no
11. If yes, what does it include?
Per diem? Gas?
12. How is maintenance scheduled?
When someone calls? When an NGO representative comes?
13. Do you have a preventive maintenance system?
If not, why not?
14. Do staff members have a target number of communities to visit?
If not, why not?

Focus group on infrastructure costs

Water infrastructure costs can be estimated from asset inventory assessments and unit costs derived from focus group discussions with local technical experts. The result will give decision makers an overview of the value of their existing infrastructure and the potential capital losses from inadequate maintenance budgets. For example, how much of the money that has been invested is being wasted because the infrastructure is non-functional or only partial functional?

First, conduct an asset inventory assessment[2] (see Section 3). List infrastructure by type and include dates of installation. Also obtain actual or estimated average life spans for each type of infrastructure.

Estimate the current replacement costs for each water service delivery scheme in the district or municipality and record your assumptions. Table 3 shows an example. Then show the asset inventory to the local technical staff. Discuss the total infrastructure value and ask whether it is correct. Revisit previous estimations if necessary.

Focus group on direct support costs

This part of the assessment will require input from district or municipality managers, plus finance, human resources and technical staff, and it may involve supporting NGO staff as well. Count only direct support provided by the service authority and NGOs, not users.

IRC has developed the Direct Support tool to guide you through the process[3]. With this tool you can calculate, per person, the actual direct support expenditure, the required direct support expenditure and the gap between the two.

The tool consists of boxes with blanks that you fill in. Boxes 1–3 cover the actual situation, and Boxes 4–6 cover the desired situation. You can fill them in on paper, but for two sections in Boxes 3 and 5, on monthly salary costs per function that include formulae, it is easier to use the tool.

Alternatively, calculate the results manually, being certain to enter data in the correct units. For example, Box 3 requires months per year, but if you obtain the data in days per week or month, convert the values before feeding them into the tool. Once all the data is collected, calculate the gap between actual and required direct support expenditure (see Box 6 in the tool). The international benchmark for direct support per person per year is roughly 1–3 USD (Smits et al., 2011).

TABLE 3. SAMPLE ESTIMATE OF REPLACEMENT COSTS

SCHEME TYPE	UNIT COST (Ethiopian birr)	QUANTITY	TOTAL VALUE (US dollars)	DESCRIPTION, ASSUMPTIONS
Hand-dug well, Afridev handpump	115,000	64	272,320	New well, average 21m deep (digging, concrete ring lining, handpump, headworks), based on contracting out
Shallow well, Afridev handpump	260,000	46	442,520	New shallow well, 40m deep (drilling, casing, wellhead, handpump, installation)
Shallow well, India MkII	600,000	10	222,000	New shallow well, 60m deep (drilling, casing, headworks, pump, installation)
Deep well	800,000	5	148,000	Drilling, casing (115 m depth)
Distribution network	500,000	17.1km	316,350	GS pipe, 5 schemes with average 2.8km distribution network length
Storage facility (for deep well)	1,100,000	5	1,017,500	50m3 concrete ground reservoir
Waterpoint	25,000	12	55,500	6-faucet tap stand

Source: Veenkant et al., 2018.

[2] See the asset registry assessment tool at https://www.ircwash.org/tools/irc-costing-and-budgeting-tools.

[3] Go to https://www.ircwash.org/tools/irc-costing-and-budgeting-tools and click on 'Direct Support tool.' This will direct you to the 'DS-instructions tab.' Read it carefully before proceeding to the 'DS-Data Entry' tab next to it. The 'DS-Graphs' tab then presents the results.

The tool converts the results into insightful graphs. For some examples, see Section 6.

BOX 1: GENERAL DATA	
Country	
District or municipality	
Actual number of systems in district	
Actual number of communities in district	
Actual total population (persons living in district)	
Water technology in district (gravity, handpump, electric pump)	
Year of analysis	

In Box 2A, enter the actual Full Time Equivalent (FTE) of district staff providing direct support and their salaries.

BOX 2A: DISTRICT STAFF PROVIDING DIRECT SUPPORT FOR WATER SERVICES (ACTUAL DATA)		
Posts	Actual number of people (FTE per year)	Actual annual gross salary
Director		
Technical staff		
Social promoters		
Administrative staff		
All NGO staff members		
Total FTE for water sector		

In Box 2B, enter the actual full-time equivalent (FTE) of NGO staff providing direct support and their yearly salaries.

BOX 2B: NGO STAFF DETAILS (OPTIONAL)		
Posts	Actual number of people (FTE per year)	Actual annual gross salary
NGO staff member 1		
NGO staff member 2		
NGO staff member 3		
Etc.		

In Box 3, enter the number of days that staff members spend on their functions, based on national or local sector policies or guidelines. The names of the functions can be adjusted to the local context. Assume an average of 21 working days per month. Enter these data into the tool and calculate total actual direct support expenditure per month and per person.

BOX 3: ANNUAL DIRECT SUPPORT EXPENDITURE (ACTUAL DATA)	FUNCTIONS						TOTAL PER MONTH
	Supervision of new infrastructure works	Supervision of rehabilitation and expansion works	Monitoring of service delivery	Technical support to consumers and service providers	Planning, coordination, reporting	Others	
Day per month dedicated by director							
Days per month dedicated by technical staff							
Days per month dedicated by social promoters							
Days per month dedicated by administrative staff							
Days per month dedicated by all NGO staff							
Total days per month							
Monthly total of per diem of staff (amount per person per day)							
Monthly transport costs (fuel, depreciation, maintenance)							
Monthly office costs and administration							
Monthly costs of meetings and workshops (meals, room, per diems, transport)							
Other monthly NGO costs (transport, office, meetings)							
Total costs per month							

In Box 4 you can indicate how many district FTE would be needed to meet national standards for sustainable service provision. These figures represent the desired, not the actual, situation.

BOX 4: DISTRICT STAFF NEEDED FOR SUSTAINABLE WATER SERVICES (DESIRED SITUATION)		
Posts	Number of people required per year (FTE)	Required annual gross salary
Director		
Technical staff		
Social promoters		
Administrative staff		
Total FTE for water sector		

In Box 5, enter the number of days the district staff should spend on specific functions, using the terminology for the local context. Consult national or local sector guidelines and policies for more information. Enter the figures into the tool and calculate the total required direct support expenditure per month (and per person).

BOX 5: REQUIRED ANNUAL DIRECT SUPPORT EXPENDITURE (DESIRED SITUATION)	FUNCTIONS						TOTAL PER MONTH
	Supervision of new infrastructure works	Supervision of rehabilitation and expansion works	Monitoring service delivery	Technical support to consumers and service providers	Planning, coordination, reporting	Others	
Days per month dedicated by director							
Days per month dedicated by technical staff							
Days per month dedicated by social promoters							
Days per month dedicated by administrative staff							
Total days per month							
Monthly per diems of staff							
Monthly transport costs (fuel, depreciation, maintenance)							
Monthly office costs and administration							
Monthly costs of meetings and workshops (meals, room, per diems, transport)							
Total costs per month							

5. Collecting users' financial data

5.1 BACKGROUND

You want to learn how communities contribute financially to water service delivery, and how tariff setting and collection could be improved. Household discussions should be done last to allow for ground truthing of the other parts of the assessment.

Collecting this type of financial data has two objectives:

- To understand expenditures and investments at the community level
- To analyse the affordability and adequacy of existing tariffs paid by households

The right to water is defined as 'the right of everyone to sufficient, safe, acceptable and physically accessible and affordable water for personal and domestic uses'. Affordability means that what a household spends on water and sanitation will not reduce its well-being. This assumes that households have an income in the first place, and they spend part of it on water and sanitation.

Ultimately, responsibility for affordability rests with service authorities or regulators, but measuring affordability is crucial so that service providers do not charge tariffs or employ payment modalities that households cannot afford. And if tariffs are beyond a poor household's means, that household's access to safe water needs to be protected by other social mechanisms.

The existing literature on the topic is limited and related mostly to the percentage of overall household budgets spent on water and sanitation services that is considered affordable. The most quoted standard for water and sanitation affordability is 3 to 5 per cent of household expenditures.

Affordability is difficult to measure. However, used in combination with other service level indicators (is it the poor quality of the service, and not high cost, that keeps people from paying a tariff?), affordability measures can be useful for tracking progress towards universal water and sanitation services.

5.2 WATER USER SURVEYS AND FOCUS GROUPS

Primary data for this part of the analysis come from surveys and focus group discussions with three or four sample households per district or municipality and the corresponding WASHCOs.

Household and WASHCO data are best collected through focus group discussions. Some data may be available from household surveys conducted as part of other assessments in your project, but focus group discussions will help you put the information in context. Sample three or four villages, each with a different but representative water scheme.

Allow about two hours for each focus group discussion.

Focus group on community and household expenditure

Collect the following information for the Cash Flow Analysis tool (available in Excel)[4]. There may be considerable overlap with the data collected for the asset inventory and asset management assessments, but some information may not be readily available and may require some discussion to tease out.

The tool converts the results into insightful graphs. For some examples, see Section 6.

General information

1. Households in community
2. Households connected to system
3. Persons per household (average)
4. New members and connections allowed (yes / no)
5. Population growth rate (from secondary data)
6. Type of system (e.g., pumped and piped system)
7. Responsible party for operation and maintenance
8. Flow rate (litres per second)
9. Required litres per capita a day

Operational maintenance expenditure

This is the minor maintenance required to keep the system running (e.g., recurrent expenditures for labour, fuel, chemicals, materials and purchases of bulk water). Collect expenditures per month or per year and record the unit of analysis.

[4] https://www.ircwash.org/tools/irc-costing-and-budgeting-tools

1. Total monthly or annual salaries and payments for operation and maintenance staff
2. Operations: office supplies, rent, communication
3. Transportation
4. Water quality testing
5. Electricity or gasoline to power pump
6. Maintenance of pumps
7. Tubing, accessories, other materials
8. Chlorine
9. Other materials
10. Any additional expenditure on operation and maintenance

Total average OpEx per year: .....

Capital maintenance expenditure

These major expenses include infrastructure renewal, replacement and rehabilitation—costs much bigger than regular maintenance. Collect the data per month or per year and record the unit of analysis. Ask for receipts to cross-check the figures.

1. What was the expenditure for?
2. How much?
3. When?
4. Who paid for it?

Total average CapManEx per year: .....

Service provider revenue

Ask for registry books to cross-check the information you receive.

1. Type of tariff
   a. Uniform flat rate: flat rate regardless of how much water is used
   b. Single-block rate: fixed rate per unit (e.g., jerry can, cubic meter)
   c. Two-part tariff: fixed charge plus charge per unit
   d. Rising block tariff: higher charges for higher levels of water consumption
2. If uniform flat rate, what is the monthly tariff?
3. If price is per unit, what is the price per cubic metre?
4. If two-part or rising block tariff, what are the rates?
5. Average monthly tariff per household
6. Average monthly consumption per household
7. Total households in community
8. Number of households that pay tariff
9. Cost of new connection
10. Monthly tariff for institutions (e.g., schools, health centres)
11. Number of institutions that pay tariff
12. Are tariffs adjusted for inflation?
13. Income from tariffs for previous year
14. Income from emergency quotas for previous year
15. Bank balance
16. Annual interest rate on bank savings account
17. Other resources (petty cash)
18. Amount of current loans
19. Annual interest rate charged on loans
20. Annual contribution per household for future replacements

Total average revenue per year: .....

Focus group on household water service

A discussion will yield more contextual information than a survey. Use the questions below to invite discussion, and use the answers to complete the Cash Flow Analysis tool. Hold one focus group discussion in each sample community.

Water system

1. What type of water system do you use?
   Piped and motorised system, non-piped handpumps, deep or shallow well, etc.
2. Who is responsible for operation and maintenance? Who is responsible for paying?
   Discuss how this works in practice. Who is responsible for what and who actually does what? The answers can be cross-checked with the WASHCO responses.

Tariff system

1. What type of tariff system do you have?
   a. Uniform flat rate: flat rate regardless of how much water is used
   b. Single-block rate: fixed rate per unit (e.g., jerry can, cubic meter)
   c. Two-part tariff: fixed charge plus charge per unit
   d. Rising block tariff: higher charges for higher levels of water consumption
2. If uniform flat rate, what is the monthly tariff?
3. If price per unit, what is the price per cubic metre?
4. If two-part or rising block tariff, what are the rates?
5. Average monthly tariff per household
6. How much do you pay in tariffs per month?

Discuss how tariffs are collected, how often and by whom. Ask about any problems with tariff payments. Try to determine how common non-payment is. Record the data in the same format as the WASHCO surveys to allow for cross-checking.

Community contributions and affordability

1. How much (in local currency) and how often do you contribute to operating the system?
   a. Major maintenance and replacements?
   b. Minor maintenance and replacements?
   The categories may not be clearly defined. Ask what categories are used locally and what they include.
2. How does the community contribute to different levels of maintenance and replacement?
   How is it structured? You can cross-check the responses with those from the WASHCOs.
3. What is the average monthly or yearly household income in the community?
   This is very important because it determines affordability. You may need to ask additional questions:
   a. What are the major sources of income?
   b. Are there other sources of income—for example, during the harvest?
   Get a conversation going, and don't make it personal. When everyone is nodding in agreement, you have a good average estimate.
4. Are some households in the community—the very poor, widows, elderly, disabled—exempted from paying water tariffs? How many?
   Be delicate about this. The goal is to get an idea of the number, not ask about individual households.

Next, determine whether the community has made any investment in the water infrastructure. Present the data per scheme, as suggested in Table 4.

TABLE 4. TEMPLATE FOR RECORDING COMMUNITY INVESTMENTS IN WATER INFRASTRUCTURE

MAJOR INFRASTRUCTURE	COST	YEAR OF INITIAL (OR MOST RECENT) CONSTRUCTION	REAL LIFETIME
Water intake			
Conduction line			
Storage tank			
Distribution and connection network			
Well			
Pump station (pump house, sump pump)			
Treatment plant			
MINOR INFRASTRUCTURE	**COST**	**YEAR OF INITIAL (OR MOST RECENT) CONSTRUCTION**	**REAL LIFETIME**
Meter			
Valve			
Tap			

[5] Actual life spans for infrastructure may have to be obtained from local technical staff.

6. Processing and displaying the data

6.1 DATA PROCESSING

Once all the data have been collected, they must be "cleaned" to correct mistakes. Download the raw data report as an Excel file. In the mWater dashboard, go to the Data tab and then Data cleaning, or to the Reports tab and then Export reports. You can inspect, edit and delete data in the Data tab, under Inspect data. In the same tab, you can download a raw data report in Excel.

Sorting the raw data in the raw data tab makes it easier to check for mistakes. When doing so, please make sure to select *all data*. If only several columns are selected and sorted, the data will be mixed up.

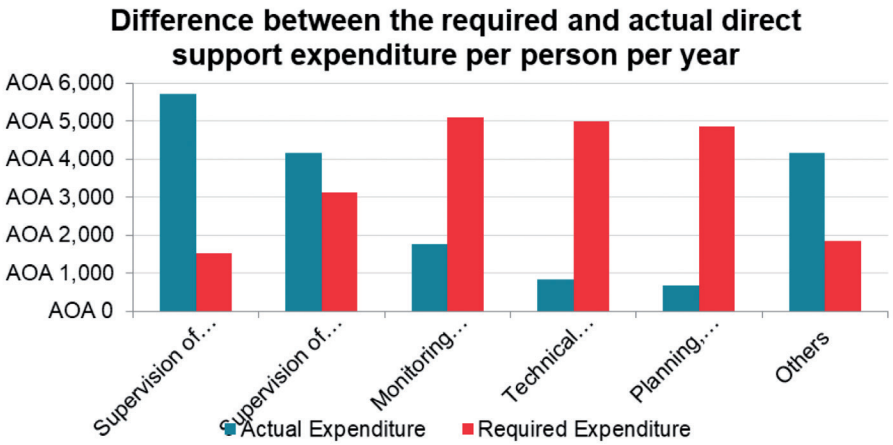
When you are confident that the data have sufficiently been cleaned, copy and paste the data into a new file and save the file with the following name: RAW_DATA-[survey number].

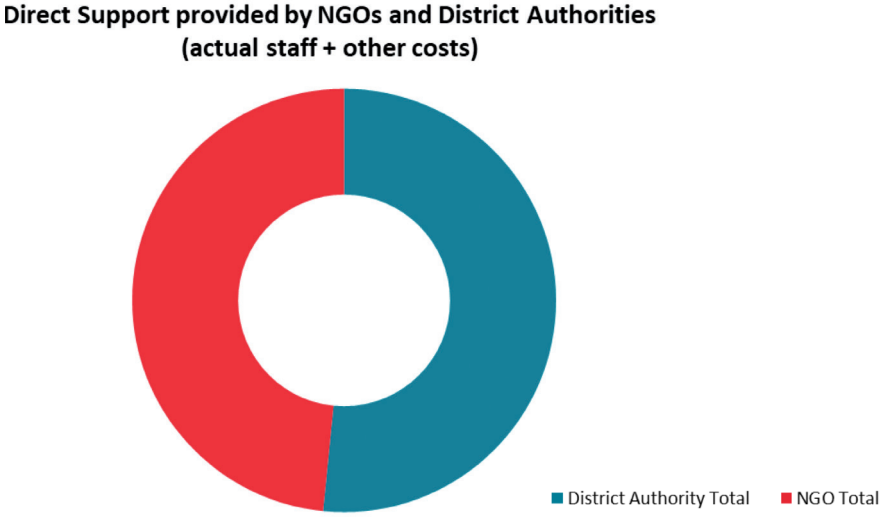
For a particular water point, for example, you would name the file RAW_DATA-26194132. When the cleaned file is ready, use the Import cleaned survey data function under the Data cleaning tab to upload the data to mWater.

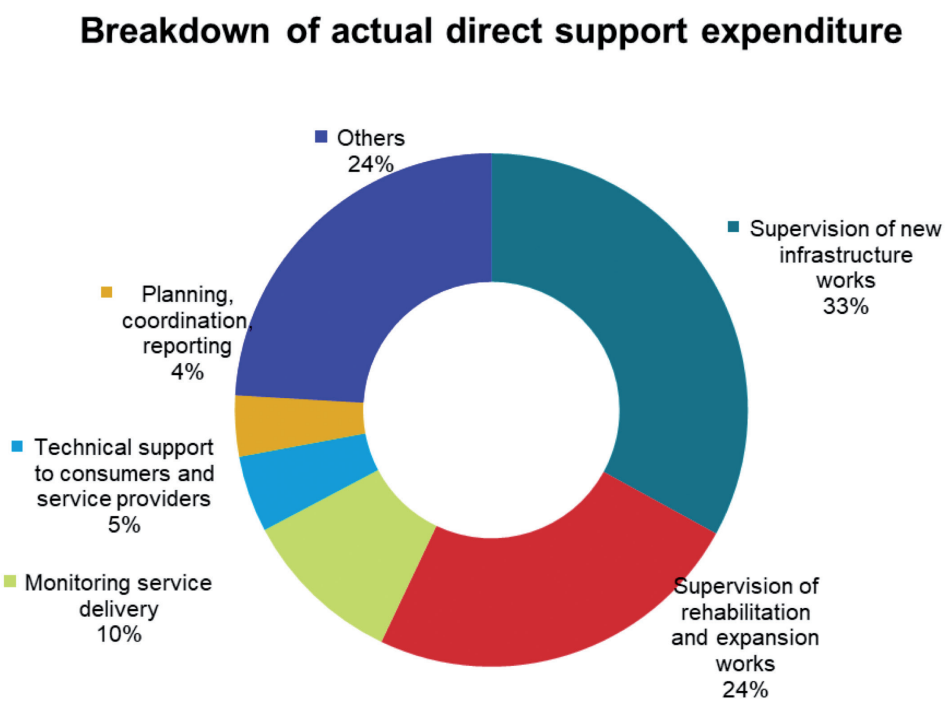
6.2 TOOLS FOR DISPLAYING RESULTS

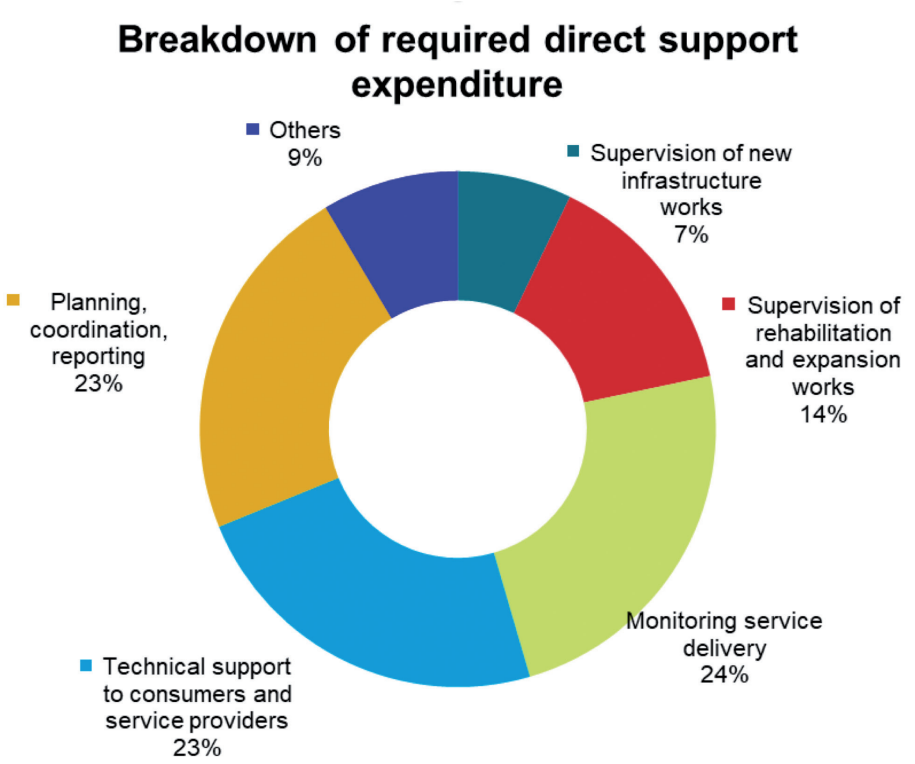
After the data have been uploaded into mWater, you can use the software's Direct Support and Cash Flow Analysis tools to generate insightful graphs. The following examples are based on hypothetical data.

Direct Support tool

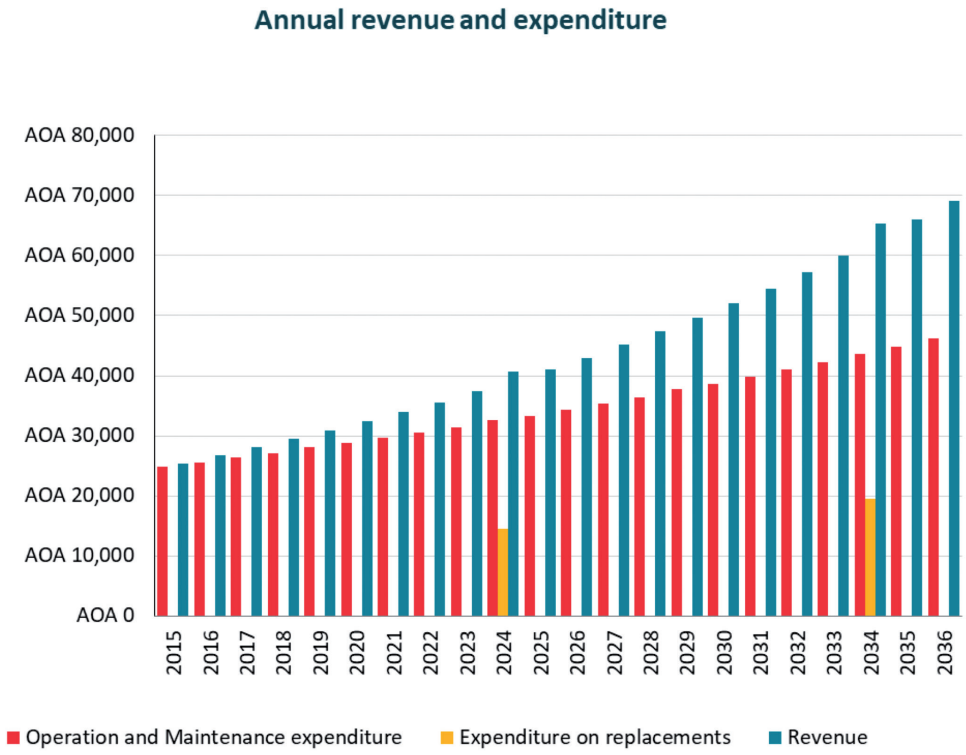


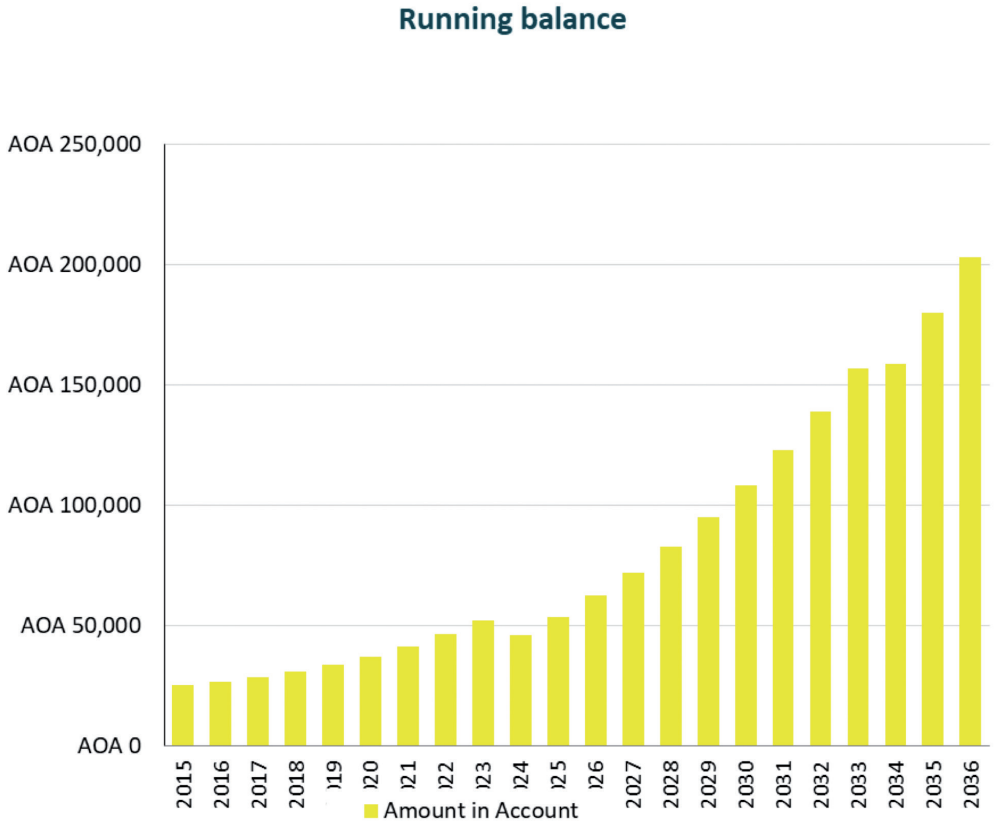


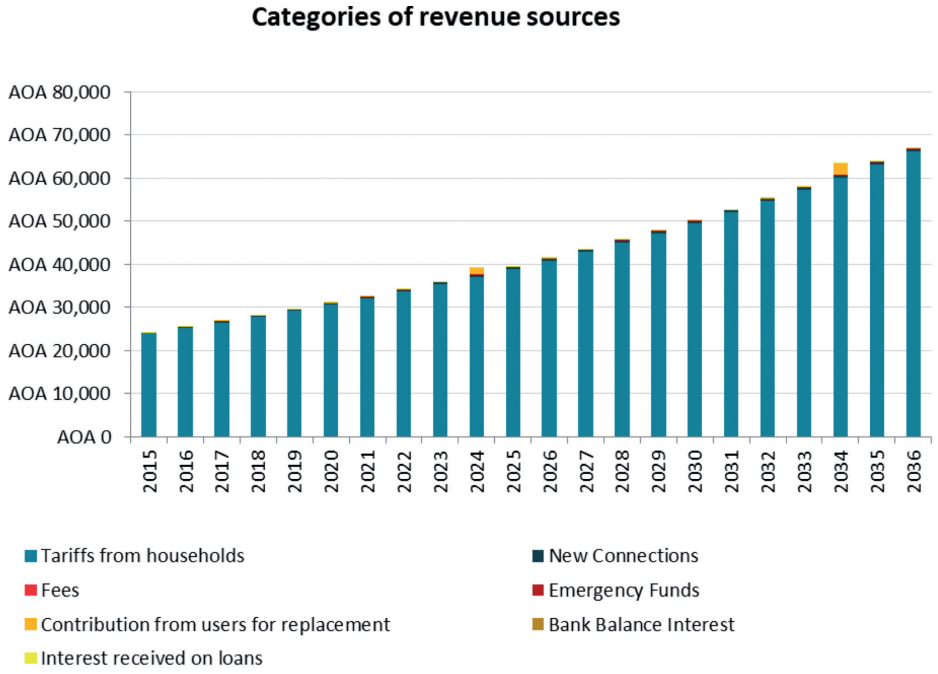

Breakdown of actual direct support expenditure
Others 24%
Supervision of new infrastructure works 33%
Planning, coordination, reporting 4%
Technical support to consumers and service providers 5%
Monitoring service delivery 10%
Supervision of rehabilitation and expansion works 24%

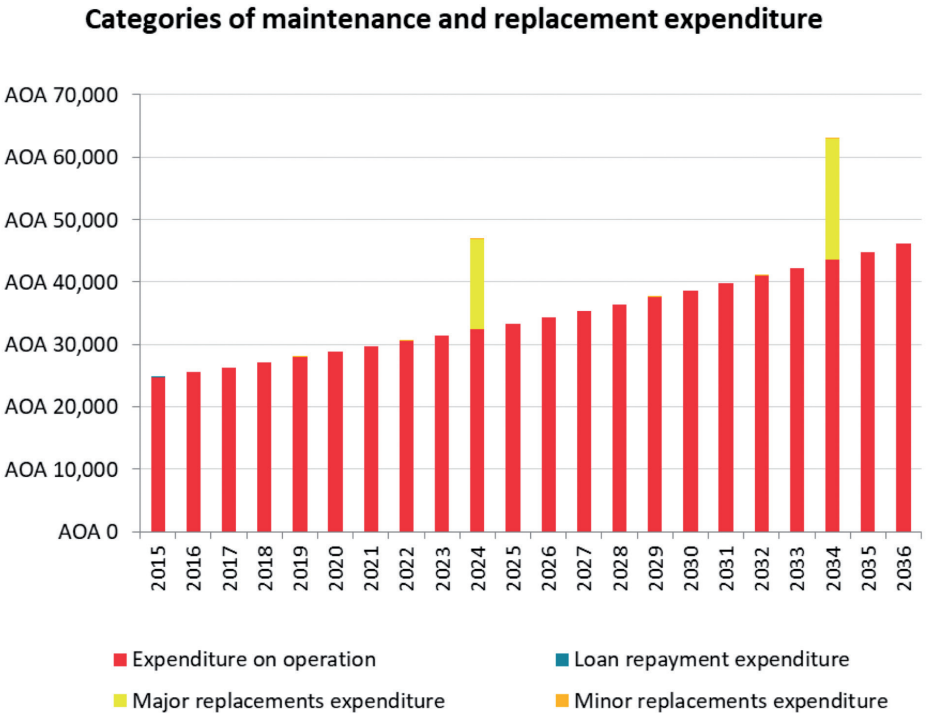

Breakdown of required direct support expenditure
Others 9%
Supervision of new infrastructure works 7%
Planning, coordination, reporting 23%
Supervision of rehabilitation and expansion works 14%
Monitoring service delivery 24%
Technical support to consumers and service providers 23%

ash Flow Analysis tool






Categories of revenue sources
AOA 80,000
AOA 70,000
AOA 60,000
AOA 50,000
AOA 40,000
AOA 30,000
AOA 20,000
AOA 10,000
AOA 0
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030
2031
2032
2033
2034
2035
2036
Tariffs from households
New Connections
Fees
Emergency Funds
Contribution from users for replacement
Bank Balance Interest
Interest received on loans


Categories of maintenance and replacement expenditure
AOA 70,000
AOA 60,000
AOA 50,000
AOA 40,000
AOA 30,000
AOA 20,000
AOA 10,000
AOA 0
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030
2031
2032
2033
2034
2035
2036
Expenditure on operation
Loan repayment expenditure
Major replacements expenditure
Minor replacements expenditure

7. References

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Veenkant, M., Fonseca, C., Kebede, A., Desta, D., Butterworth, J., 2018. *Sustaining rural water services in Ethiopia: A Life-Cycle Costs Analysis. USAID Sustainable WASH Systems Learning Partnership Concept 1 (Ethiopia)/ USAID Lowland WASH Activity.* Addis Ababa: IRC International Water and Sanitation Centre.

Annex 1 – Identifying types of infrastructure

The photos below illustrate representative lifting devices and other infrastructure in Ethiopia. Infrastructure may look different in other countries; obtain photos appropriate to you situation before training enumerators.

FIGURE 3 HANDPUMP (PROTECTED HAND-DUG WELL OR SHALLOW WELL)

FIGURE 4 ROPE PUMP (PROTECTED HAND-DUG WELL)

FIGURE 5 PROTECTED SPRING (NO LIFTING DEVICE)

FIGURE 6 UNPROTECTED SPRING

FIGURE 7 DEEP WELL

FIGURE 8 SOLAR WATER PUMP

FIGURE 9 TAP STAND

FIGURE 10 WATER STORAGE TANK

FIGURE 11 TREATMENT PLANT

FIGURE 12 A FORM OF WATER STORAGE

FIGURE 13 CATTLE TROUGH

FIGURE 14 GENERATOR AND PUMP HOUSE

FIGURE 15 ELECTRICAL EQUIPMENT AND GENERATOR HOUSE

Annex 2 – Using mWater

Enumerators must have mobile devices (smartphones or tablets) that will run the software for two surveys– the asset inventory and the water quality tests. All devices used for the asset inventory should have mWater installed.

To add a new device, establish a wifi or internet connection and download the mWater surveyor app from Google Play store.

Before you start data collection, set up the enumerators as users. The data collector must register as a user. Open the app, click on '+ User' and enter the data collector's name.

User permissions on the dashboard are divided into two levels: User and Admin. All users can complete the core workflow, but only Admin users can delete items (using the Actions column) and have access to the Users tab to view, add and manage other users. The Users tab contains a table that displays the user name, email and permission level for all current Admin and User users.

The first page you see after you log in is the dashboard home page. The dashboard contains the following tabs:

- *Surveys.* Surveys can be created, edited and published from the Surveys tab. (See Section 3 for an overview of the surveys used for asset inventory data collection.) Each survey contains a series of questions organised into sets ('question groups'). Each group appears in a separate tab on the phone screen. The surveys have different question types: free text, options, numbers, geo-location, photo and date.
- *Devices.* The Devices tab is mission central for managing all the devices connected with your mWater dashboard.
- *Reports.* The Reports tab in mWater gives you several options for viewing and exporting data and results from your surveys. We mainly use Excel for data processing, analysis and visualisation.
- *Maps.* The Maps tab on your dashboard shows the surveys collected with a GPS location as points on a map.
- *Messages.* The Messages tab lists messages on your dashboard related to surveys and data processing activities. The table lists the date and time of message, the survey ID, the survey, the message type, the contents of the message and the user performing the activity that generated the message. You can sort the table by clicking the arrows in the column headings.

Annex 3 – Testing water quality

SURVEY QUESTIONS

The following questions should be included in the survey if you are using the compartment bag test. The answers to these questions will be provided through the data collections strategy outlined in the next paragraph. Include these questions in your survey before you begin the fieldwork.

1. Date of water quality test result
2. Water quality sample number
3. Result of compartment 1
   a. Yellow or yellow-brown
   b. Blue or blue-green
4. Result of compartment 2
   a. Yellow or yellow-brown
   b. Blue or blue-green
5. Result of compartment 3
   a. Yellow or yellow-brown
   b. Blue or blue-green
6. Result of compartment 4
   a. Yellow or yellow-brown
   b. Blue or blue-green
7. Result of compartment 5
   a. Yellow or yellow-brown
   b. Blue or blue-green

SAMPLING AND ANALYSIS

Randomly selected water points representing different technology types for both rural and urban water schemes can be tested for E. coli using the compartment bag test. Follow the general sampling procedure outlined here. Begin by determining the appropriate sample size for your sample area and substitute that number for 'X' below..

TESTING PROCEDURE

This procedure assumes you are working with mWater as your digital data collection and management platform.

Step 1. Collect a water sample.

- Use a waterproof marker to record the code of the scheme or water point, date and time on the sample bag.
- Wash your hands using soap; rinse and dry.
- Clean the tap or pump outlet. Remove from the tap any attachments that may cause splashing. Using a clean cloth, wipe the outlet to remove any dirt.
- Open the tap or pump. For taps, turn on the water at maximum flow and let it run for 1–2 minutes. For pumped supplies (e.g., handpump), pump continuously until water flows and keep pumping for 1–2 minutes before sampling.
- Take the sample. Fill the sample bag, taking care not to contaminate the water.

Step 2. Complete the water quality survey.

- Record the name of the water point sample on the sampling bag. Register the correct water point name.
- If samples are collected at the same time as the water point data, label the sampling bag with the same name as in the water point survey.
- If samples are not collected at the same time as the water point data, make sure all water points have been synchronised on your device. In this way, you will have access to a list with all submitted water point data. The list gives you the name and code of each point and the distance to the point. Click on 'map' to see your current location and the location of the water points. Use the water point map and the list to identify the right water point and record the name as used on the sampling bag.

	SAMPLING PROCEDURE
URBAN	List all functional stand posts connected to town piped water supply system. If number of stand posts is equal to or exceeds X, randomly select X water points by lottery (write numbers representing all water points on scraps of paper and put them in hat, and draw X) . If system consists of non-interconnected subcomponents, distribute sample across the sub-systems. Sample randomly within these sub-systems. If town has fewer than X stand posts, sample all and also take X samples from randomly selected private connections.
RURAL	For rural water quality, you have three options. 1. Use national water quality surveys if available. 2. Use standard WHO methodology for sanitary surveillance. 3. Directly measure water quality using compartment bag test or other field test. Randomly collect samples from sources, points of supply, or household water storage.

Step 3. Testing the samples.

- Start testing within six hours of collecting the water sample.
- Follow instructions at Aquagenx CBT Instructions v3.pdf.
- For further information, see http://www.aquagenx.com/how-to-use-the-cbt/.
- Incubate samples for 20 to 24 hours at 35–44.5 degrees C.
- Record the results (yellow or yellow-brown, or blue or blue-green) for compartments 1, 2, 3, 4, and 5.

Step 4. Record water quality test results.

- In your database, look up the water point with the same name as the name recorded on the analysed sample.
- Tip: you can order the water points by name, date and distance by using the 'sort' button.
- Select the relevant water point.
- You can review the water point data by going to the history tab and clicking on the submitted and synced water point.
- Submit the water quality data by going to the forms tab. Click on 'water quality test results' and enter the data.

The data will be submitted and sorted by water point name.

Annex 4 – Collecting asset inventory data

This section lists questions for the asset inventory survey. Using your preferred data collection platform, enter the questions on infrastructure, then the management questions.

GENERAL INFORMATION

Collect general information to identify the scheme and relevant contact persons.

1. Region, zone, district
2. Village
3. Is the scheme rural or urban?
4. Name of water supply scheme
5. Location: longitude and latitude
6. Describe where GPS location is recorded
7. Contact details
    a. Contact 1
        i. Name
        ii. Position: water user association chairperson or member, operator, other
        iii. Telephone number
    b. Contact 2
        i. Name
        ii. Position: water user association chairperson or member, operator, other
        iii. Telephone number

INFRASTRUCTURE

Scheme age and sources

Identify the scheme's age, number of sources supplying it, and connections.

1. Year of water scheme construction (or most recent rehabilitation)
   If the scheme has been rehabilitated, give year of rehabilitation, not original construction.
2. Total number of water sources of all types supplying the scheme
3. Type of scheme
    a. Point
    b. Distribution

Answer 4–6 only if the type of scheme is distribution.

4. Total number of tap stands
   A tap stand may have multiple taps.
5. Total number of household connections
   Enter 0 if none.
6. Total number of institutional connections (schools, health facilities)
   Enter 0 if none.

Source type

Identify the sources by type and location, and establish whether they are metered.

7. Type of water source
    a. Hand-dug well
    b. Shallow well (borehole)
    c. Deep well (borehole)
    d. Protected spring
    e. Surface water intake
8. Location of water source: longitude and latitude
9. Is there a water meter at the water source? Yes / No
   If yes:
10. Is the water meter working? Yes / No
    If yes:
11. What is the current reading of the water meter?

Functionality

It is very important to establish the scheme's level of functionality.

12. Is the water scheme currently functional?
    a. Functional
    b. Partially functional
    c. Non-functional

Answer questions 13– 16 only if you responded Partially functional or Non-functional to 12.

13. Take a picture illustrating the non-functionality.
14. Determine the main cause of non- or partial functionality. For example,
    a. Insufficient water at source
    b. Breakdown of hand pump
    c. Distribution pipeline failure
    d. Taps broken
    e. Generator failure
    f. Grid power failure
    g. Submersible pump failure
    h. Switchboard failure
    i. Solar power failure
15. Describe the non-functionality problem
16. Number of months that the scheme has been non-functional

Answer 17 only if you responded Functional to 12

17. Does this functional scheme have any emerging problems that might lead to non-functionality? Yes / No
    Answer 18 and 19 only if you responded yes to 17.
18. Describe the problem that might lead to non-functionality in the near future.

19. Take a picture illustrating the problem that might lead to non-functionality in the near future.
20. Was the water scheme out of service for one or more days in the previous month? Yes / No
    Answer 21 only if you responded yes to 20.
21. Number of days the scheme was out of service in the previous month
    Answer 22 only if you responded Functional to 12
22. Production of system (i.e., yield or discharge) (in litres per second)
    Answer 23 only if you responded Functional / Partially functional to 12.
23. How many hours a day is the water source productive?
24. Is this a seasonal water scheme that commonly fails in the dry season? Yes / No

Schemes with boreholes and wells

If the scheme has a borehole or well, proceed to the following questions.

Answer 25 and 26 only if you responded Hand-dug well / Shallow well (borehole) / Deep well (borehole) to 7

25. Construction year of the well or borehole (or the year of rehabilitation)
26. Borehole or well depth (metres)
    Answer 27 only if you responded Shallow well (borehole) / Deep well (borehole)to 7
27. Borehole or well diameter (inches):
    Answer 28–32 only if you responded Hand-dug well / Shallow well (borehole) / Deep well (borehole) to 7
28. Physical state of well or borehole
    a. Normal
    b. Poor
    c. Doesn't function
    d. Unsure
29. Year of apron or seal construction (or year of most recent repair)
30. Physical state of apron or seal
    a. Normal
    b. Poor
    c. Doesn't function
    d. Unsure
31. Riser pipe depth or pump position (in metres)
32. Riser pipe diameter or pump diameter (in inches)

Schemes with springs

If the scheme has a spring as source, proceed to the following questions.

Answer 33 and 34 only if you responded Protected spring to 7

33. Year of spring construction (or year of most recent repair)
34. Physical state of spring protection
    a. Normal
    b. Poor
    c. Doesn't function
    d. Unsure

Schemes with surface water intake

If the scheme has surface water as source, proceed to the following questions.

Answer 35 and 36 only if you responded Surface water intake to 7

35. Year of surface water intake construction (or year of most recent repair)
36. Physical state of water intake
    a. Normal
    b. Poor
    c. Doesn't function
    d. Unsure

Lifting devices

Identify the type of lifting devices the scheme has (if any).

37. Type of lifting device (power)
    a. Rope pump
    b. Handpump
    c. Solar-powered pump
    d. Motorised pump (fuel)
    e. Motorised pump (grid)
    f. Motorised pump (grid) with standby generator (fuel)
    g. No pump

    Answer 38 and 39 only if you responded Rope pump / Handpump / Solar powered pump / Motorised pump (fuel) / Motorised pump (grid) / Motorised pump (grid) with standby generator (fuel) to 37
38. Year of pump installation (or year of most recent repair or replacement)
39. Physical state of the pump
    a. Normal
    b. Poor
    c. Doesn't function
    d. Unsure

    Answer 40–45 only if you responded Solar powered pump / Motorised pump (fuel) / Motorised pump (grid)/ Motorised pump (grid) with standby generator (fuel) to 37
40. Submersible pump model
41. Submersible pump manufacturer
42. Submersible pump capacity KW
43. Submersible pump serial number
44. Submersible pump diameter (inches or other clearly specified unit)
45. Please take submersible pump picture (if removed)
    Answer 46 only if you responded Hand pump to 37
46. Type of handpump
    a. Afridev
    b. India Mk II
    c. India Mk III

Power supply

Identify the source of power for motorised schemes.

Answer 47–60 only if you responded Motorised pump (fuel) / Motorised pump (grid) with standby generator (fuel) to 37

47. Generator capacity (in KVA)
48. Generator brand
    a. Perkins
    b. Lister Petter
    c. Cummins
    d. Caterpillar
    e. Coelmo
    f. Green Power
    g. Iveco
    h. Isuzu
    i. Lovol
    j. Stamford
49. Generator model
50. Generator serial number
51. Generator fuel
    a. Benzene
    b. Diesel
52. Generator KVA
53. Generator max amps (starting amps)
54. Generator last service date
55. Generator alternator manufacturer
56. Generator alternator model
57. Generator alternator serial number
58. Year of generator installation (or year of re-installation)
59. Physical state of generator
    a. Normal
    b. Poor
    c. Doesn't function
    d. Unsure
60. Take a picture of the generator.

    Answer 61–72 only if you responded Solar powered pump / Motorised pump (fuel) / Motorised pump (grid) to 37
61. Switchboard type
    a. Direct online
    b. Star or Delta starter
    c. Soft starter
    d. Impedance
    e. Other: Describe the switchboard type
62. Switchboard manufacturer
63. Switchboard capacity (in kW)
64. Switchboard voltage
65. Switchboard amps
66. Physical state of switchboard
    a. Normal
    b. Poor
    c. Doesn't function
    d. Unsure
67. Take a picture of the switchboard.

    Answer 68–72 only if you responded Solar-powered pump to 37
68. Year of solar installation (or year of re-installation)
69. Physical state of the solar installation
    a. Normal
    b. Poor
    c. Doesn't function
    d. Unsure
70. Name of contractor that installed the system
71. Take a picture of the solar installation.
72. Type voltage of submersible pump
    a. A/C
    b. D/C

Answer 73–77 only if you responded A/C to 72.

73. D/C to A/C voltage inverter manufacturer
74. D/C to A/C voltage inverter model
75. D/C to A/C voltage inverter rate power (watts)
76. D/C to A/C voltage inverter peak power (watts)
77. D/C to A/C voltage inverter: A/C current charging range (amps)
78. Pump controller manufacturer
79. Pump controller model
80. Pump controller serial number
81. Maximum power (kW)
82. Pump controller input current (amps)
83. PV panels manufacturer or brand
84. PV panels model number
85. PV panel type
    a. Polycrystalline
    b. Monocrystalline
86. PV panels size (longest side of one panel, in metres)
87. PV panel wattage (per panel)
88. Total number of PV panels
89. Are the PV panels in a fenced area? Yes / No
90. Determine whether the following components of the installation are present:
    a. Lightning (grounding system)
    b. SunSwitch (Lorentz)
    c. Automatic control for full-tank shutoff
    d. Well (borehole) low-water probe or switch

Sensor

91. Is a sensor installed? Yes / No

    If yes:
92. Type of sensor installed
    a. Satellite
    b. GSM (cellular)
93. Date of installation of sensor
94. Sensor serial number

    Answer 95–97 only if you responded GSM cellular to 92.
95. Sensor telephone number
96. Take a picture of the sensor installation.
97. Sensor installation notes

Water reservoir

Determine whether the scheme has a reservoir.

Answer only if you responded Distribution to 3.

98. Are there any water reservoirs? Yes / No
    If yes, answer 99–105.
99. Location of the reservoir (longitude and latitude)
100. Take a picture of the reservoir.
101. Is the reservoir at ground level or elevated?
    a. Ground
    b. Elevated
102. Reservoir type
    a. Plastic
    b. Concrete
    c. Metal
    d. Fiberglass
    e. Masonry
103. Reservoir capacity (in cubic metres)
104. Year of reservoir construction (or year of rehabilitation)
105. Physical state of reservoir
    a. Normal
    b. Poor
    c. Doesn't function
    d. Unsure

Distribution network

If the scheme is distributed, proceed to the following questions.

Answer 106–109 only if you responded Distribution to 3.

106. Year of main line construction (or year of rehabilitation)
107. Physical state of main line
    a. Normal
    b. Poor
    c. Doesn't function
    d. Unsure
108. Year of construction of the secondary distribution network (or year of rehabilitation)
109. Physical state of secondary distribution network
    a. Normal
    b. Poor
    c. Doesn't function
    d. Unsure

Water treatment

Determine whether the scheme is equipped with a water treatment facility.

110. Is there a treatment plant? Yes / No
    If yes, answer 111–113.
111. Physical state of treatment plant
    a. Normal
    b. Poor
    c. Doesn't function
    d. Unsure
112. Year of treatment plant construction (or year of most recent replacement)
113. Is chlorination practiced? Yes / No
    If yes, answer 114 and 115.
114. Describe chlorination practice.
    a. Well or borehole disinfected
    b. Reservoir disinfected
    c. Chlorination dispenser
115. How often is chlorination practiced?
    a. At least every quarter
    b. At least annually
    c. Only occasionally

Livestock facilities

Some water schemes include facilities for livestock—a very important service, especially in pastoralist areas.

116. Are there livestock drinking facilities? Yes / No
    If yes, answer 117 and 118.
117. Physical state of livestock drinking facilities
    a. Normal
    b. Poor
    c. Don't function
    d. Unsure
118. Year of livestock watering facility construction (or year of most recent rehabilitation)

Washing basins

Some schemes include washing facilities.

119. Are there clothes-washing basins? Yes / No
    If yes, answer 120 and 121.
120. Physical state of clothes-washing facilities
    a. Normal
    b. Poor
    c. Don't function
    d. Unsure
121. Year of washing basin construction (or year of most recent rehabilitation)

Public tap stands

If the scheme has public tap stands, capture the following information.

122. Location: longitude and latitude
123. Name of the tap stand
124. Take a photo of the tap stand
125. Year of tap stand construction (or year of most recent rehabilitation)
126. Is the public tap stand currently functional?
    a. Functional
    b. Partially functional
    c. Non-functional
    d. Abandoned

Answer 127 and 128 only if you responded Partially functional / Non-functional to 126

127. Number of months that the tap stand has been non-functional / partially functional
128. Determine the main cause of non- or partial functionality. For example,
    e. Distribution pipe broken before reaching tap stand
    f. Taps damaged
    g. Source problem
129. Is there a water meter at the tap stand? Yes / No
    If yes:
130. Is the water meter working? Yes / No
    If yes:
131. What is the current reading on the water meter?
132. Is the water point selected for water quality testing? Yes / No
    If yes:
133. What is the water quality sample number?

MANAGEMENT

This section covers water service management by dedicated management entities as well as the village or town residents who use the water points.

Management entity

134. Determine who is responsible for the scheme's management. For example,
    a. Utility
    b. Water user association
    c. No management organisation
    Answer 135 only if you responded Utility / Water user association to 131.
135. Is the management entity currently active? Yes / No

User management

136. How many households are there in the village?
137. How many households are currently served by the water point?
138. How many of these households are within 1km (if rural) or 250m (if urban) of the water point?
    These distances are based on Ethiopia's national GTP-2 policy. Your country may have different standards.
139. What is the maximum time taken to reach the water point by a regular user (one direction, and in minutes)?
140. Is the water point used for livestock? Yes / No
    If yes, answer 140–142.
141. Estimated number of cattle using the water point per day
142. Estimated number of horses and donkeys using the water point per day
143. Estimated number of goats and sheep using the water point (per day)
144. Is the water point used for water trucking? Yes / No
    If yes:
145. Number of trucks that are filled per day

Tariffs

146. What is type of tariff system is in place?
    a. Single-block rate: a fixed rate for each unit (e.g., jerry can or per visit)
    b. Uniform flat rate: flat rate regardless of how much water is used
    c. Two-part tariff: fixed charge plus charge per unit
    d. Rising block tariff: levels of water consumption are divided in blocks, with higher rates for each subsequent block
147. Please elaborate on:
    e. Other type of tariff system
    f. What is the amount of the tariff, in local currency?
148. How many community members / institutions / other users do not pay the tariff?

A random sample of users should be surveyed regarding the tariff. At each water point, ask 10 households the following questions.

149. Do you pay for water? Yes / No
    If yes, answer 2–4.
150. How do you pay, and what is the amount? For example,
    a. visit
    b. week
    c. month
    d. half year
    e. year
    f. jerry can
    g. cubic meter
    h. animal
    If per animal:
151. What is the tariff per horse, donkey, cow, goat, other?
152. How many jerry cans of water per day do you normally collect for your household from this water point?
153. How many adults (18 years or older) are in your household?
154. How many children (younger than 18 years) are in your household?
155. How long do you usually spend waiting (queuing) at the water point (in minutes)?
156. How long does it take you to walk from your home to this water point (in minutes)?

157. Do you also collect water from this water point for livestock? Yes / No
If yes:
158. Which type of livestock?
    a. Goats, sheep
    b. Horses, donkeys
    c. Cattle
    d. Camels

Water quality

159. Has there been some water quality testing for this water point in the past? Yes / No
If yes, answer 150–152.
160. Year of most recent water quality test
161. What was the result?
    a. Water is safe for drinking
    b. Water is unsafe for drinking
    c. Don't know
162. Are there specific contaminants of concern? For example,
    a. E.coli
    b. Arsenic
    c. Fluoride
    d. Iron
    e. Salt (salinity)
    f. Other: specify
    g. No concerns

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