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SUSTAINING RURAL WATER SERVICES IN ETHIOPIA: A LIFE-CYCLE COSTS ANALYSIS

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

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This report on the Life-Cycle Costs of rural water supply services in Mile, Afar region and South Ari, SNNPR, is a joint report produced by the USAID Sustainable WASH Systems (SWS) Learning Partnership and the USAID Lowland WASH Activity. It is one of a series of SWS baseline studies and systems analyses. The report examines the status and value of WASH infrastructure assets in these woredas, the costs and sources of financing to deliver services and financing gaps identified with respect to sustaining services.

CONTENTS

ABBREVIATIONS

AMREF	African Medical and Research Foundation
CapEx	Capital Expenditure
CapManEx	Capital Maintenance Expenditure
CBOs	Community Based Organizations
DA	Development Association
EFY	Ethiopian Fiscal Year
GTP	Growth and Transformation Plan
ExpDS	Expenditure on direct support
LCC	Life-Cycle Costs
LCCA	Life-Cycle Cost Analysis
MoWIE	Ministry of Water, Irrigation and Electricity
NGO	Non-Governmental Organization
O&M	Operation and Maintenance
OpEx	Operation and Maintenance expenditure
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

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EXECUTIVE SUMMARY

Concerned about sustainability and particularly the problem of maintenance, the USAID Lowland WASH Activity and USAID Sustainable WASH Services Learning Partnership collaborated on a study of Life-Cycle Costs (LCC) for rural water supply in Ethiopia. Life-Cycle Costs, as used in this report, describe the aggregate costs of ensuring delivery of adequate, equitable and sustainable Water, Sanitation and Hygiene (WASH) services to a population in a specified area (Fonseca et al., 2011). In two study *woredas* (districts) representing very different rural water supply contexts, the following questions were investigated:

1. What is the status and value of the current water supply infrastructure?
2. How much does it cost to provide services at current levels, and what are the sources of finance?
3. What are the financing gaps to sustain services from current infrastructure?

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. The study did not investigate the costs of extending or improving service levels, e.g. to provide universal access and levels of service that meet Growth and Transformation Plan (GTP) 2 or SDG standards.

Figure 1: Location of South Ari and Mile woredas.

STATUS AND VALUE OF THE CURRENT WATER SUPPLY INFRASTRUCTURE

This study finds that the estimated value of water supply infrastructure, based on current replacement costs, in South Ari is 4.3 million USD (or 15 USD per capita) and in Mile is 3.5 million USD (or 30 USD per capita)[1]. These assets reflect the combined investment over recent years by government and development partners. However, some of the existing infrastructure is not functional which represents a substantial loss of benefit from previous capital investments. In South Ari, 31% of water supply schemes are non-functional and a further 16% are only partially functional. In Mile, 13% of schemes are non-functional and 6% are partially functional. Extrapolating from these results, it is estimated that between 0.7 and 2 million USD in infrastructure capital lies idle or is underutilized in South Ari and Mile respectively. This is a substantial proportion and amount of investment. Rehabilitation, and even more critically, improved operations and maintenance, are required to minimize such underperformance and ensure that capital investments do lead to sustainability of ongoing water supply services.

COSTS AND FINANCING OF SUSTAINED WATER SERVICES

The current cost of providing rural water services is covered by a combination of government budgets at the woreda and regional levels, non-governmental organizations (NGOs) and development partner contributions, and by users through tariffs.

The total annual expenditure[2] (combining contributions of the woreda, region, NGOs and development partners) in South Ari was estimated at approximately 2.36 million ETB (87,400 USD) during the 2006-2008 Ethiopian Financial Year (EFY) (2013/14 - 2015/16). The equivalent annual budget in Mile is several times greater, at 14.58 million ETB (539,000 USD per year) during the 2009 EFY (2016/17) and is dominated by NGOs (64%). This is equivalent to 0.3 USD per capita in South Ari and 4.6 USD per capita in Mile.

In South Ari, no maintenance funding could be identified in budgets at the woreda and zonal levels for the 2006-2008 Ethiopian Financial Year (EFY) (2013/14 – 2015/16). In Mile, where data was more limited, there was some limited expenditure on 'medium' and 'major'[3] maintenance and for spare parts purchased during the 2008-2009 EFY (2015/16 – 2016/17) even though much of the maintenance was done from the regional level. Combined financing (including all government, NGO and other donor contributions) is found to be dominated by capital investment in new water schemes and the expansion of existing ones to reach nearby communities. Maintenance expenditures prove hard to identify as they often do not come from budgets that are explicitly earmarked for maintenance, and data is hard to find and compile. However, it seems clear that financing for maintenance is insufficient to ensure sustainable water services. Limited financing of maintenance and repairs may be indicative of the low priority placed on sustaining services over recent years and the limited capacities of systems[4] to provide maintenance and repairs of all types - from preventative to minor and major corrective repairs. Based on this study and other assessments by the USAID Lowland WASH Activity in Afar, Somali, and SNNP regions, WASHCOs generally only operate water facilities and do not maintain them. In regards to the motorized boreholes, the WASHCOs typically only fuel the diesel generators and seldom perform routine maintenance.

Tariff collection by WASHCOs and Water User Associations (WUAs) is also revealed to be limited. Surveys of water users at schemes and later triangulation with household surveys show that in South Ari there is no tariff payment by water users at 55% of the schemes, and in Mile between 35% and 54% of schemes do not

[1] With the projected population of 279,574 in South Ari, and 117,960 in Mile (CSA, 2013).
[2] Only expenditure data was available.
[3] It is unclear how the woredas define these, but they are likely similar to OpEx and CapManex. See Annex 2 for their definitions.
[4] The term systems is used to mean the social, technical, institutional, environmental and financial factors, actors and interactions that influence WASH service delivery in a given context.

have tariffs according to surveys done at the scheme and user levels, respectively. For those that use the water for livestock there is no tariff payment in either woreda. A cash flow analysis in two communities looking at WASHCO income and expenditure indicates that in theory, where tariffs are collected, the rates should be high enough to cover minor maintenance costs. However, based on the two WASHCOs and WUAs that were collecting tariffs, tariffs represented about 10-13% of average household income. This is a high amount compared to a common affordability benchmark of 5% of poorest household incomes for both water and sanitation. Tariffs in two case study communities are not affordable even for average households and even less affordable for the poorest. These cases do not allow for generalization to the entire woreda, but it suggests that in some communities tariffs may need to be reduced to be affordable for the poor, but would need to increase to generate more funds for more than minor maintenance.

While there are opportunities to make improvements, such as supporting WASHCOs and WUAs more in improved tariff setting, collection, and management, the analysis casts doubt on the viability of requiring communities to cover all operations and maintenance costs (and perform the maintenance). In practice they generally choose not do this, focusing only on operations and neglecting maintenance. There is little incentive for communities to raise tariffs and pay more for preventative and corrective maintenance when they can wait for the problem to get worse and let the government step in with its support and financing. It is recommended that the policy of not subsidizing maintenance explicitly (it happens in practice when the government supports the communities) is revisited, along with examination of opportunities to re-orientate incentives for doing maintenance. Though not necessarily conclusive, our observations seem to indicate that significant improvements could be made in water service delivery with increased maintenance and repair budgets and more focus on sustaining existing water facilities.

As a step towards further addressing funding gaps in maintenance, the practice of regularly compiling and maintaining financial data on budgets and expenditures for maintenance at all levels need to be improved. This is currently difficult and costly to identify which contributes to a key problem (lack of maintenance) remaining hidden.

FINANCING GAPS

In both woredas there is a critical gap in funding support by service authorities to service providers. Under the community management model, this includes support from government institutions that ensure that communities are able to maintain and repair their water schemes. Smits et al. (2011) finds that the expenditure for direct support (ExpDS) needed to achieve reasonable levels of support is likely in the order of magnitude of more than 1 USD per capita per year. Direct support (the expenditure on directly supporting service providers, which are WASHCOs in this case) in both South Ari and Mile is much lower than this rough benchmark. It is less than 30,000 USD in each woreda (roughly 0.11 USD per capita in South Ari and 0.25 USD in Mile) whereas the 1 USD per capita minimal benchmark would suggest 280,000 USD be spent in South Ari, and 118,000 USD per year in Mile according to population levels. These low levels of funding for the institutions (mainly WWOs) supporting service delivery would likely contribute to the low levels of water scheme functionality that is being observed in these two woredas.

Expenditure on direct support (ExpDS) includes pre- and post-construction support activities directed to local service providers (e.g. monitoring performance, technical advice on operation and maintenance, handling complaints etc.). Expenditure on indirect support (ExpIDS) encompasses macro-level policy making, planning, regulation, sector-level monitoring and contributing to general sector working capacity.[5]

There are substantial staffing capacities in government. The effectiveness of government staff is, however,

[5] For more information see Smits et al. (2011) or Fonseca et al. (2011).

limited by insufficient budgets meant to cover transportation and per diems for technical staff, as well as issues that could likely to be related to motivation and leadership factors. A scenario analysis for South Ari indicates how a small increase in district maintenance budgets (covering per diems and transport costs) could improve water services. An increase of little more than 10% in the combined budget and investment in maintenance, suggests that sustainability of the water facilities could be strongly improved.

South Ari has already started to address some of the identified financial gaps as indicated in its 2010 EFY (2017/18) budget, but the changes are still limited. The water department *budget* increased by almost 1.7 million ETB (65,000 USD) as compared to the 2006-2008 EFY *expenditure,*[6] including 30,000 USD allocated for maintenance, while there were no maintenance costs budgeted in the 2006-2008 EFY. This happened following the presentation of the draft findings of the asset inventory and a discussion on budgets for water with political leaders at woreda and zonal level. This is viewed as a positive development but only a relatively small change. The biggest budget line is still new water schemes and extensions (50% down from 65%). The current utilization of maintenance budgets is in practice only expected to support major rehabilitation, and not to be used for preventative or corrective maintenance.

RECOMMENDATIONS

Without further and more substantial shifts to not only address the maintenance backlog through rehabilitation but actually to improve maintenance regimes going forwards, the current capital investment of government and development partners in new water systems and extensions is unsustainable. High capital spending may also not be seen as justifiable if adequate and appropriately proportional funding is not allocated to preventative maintenance and repairs. Both woredas (and their zones and regions) need to find ways to regularly do more maintenance and repairs, and to finance these costs. The following recommendations are made to improve rural water financing in both woredas:

- Supporting[7] Mile and South Ari WWOs in advocacy work towards convincing local politicians and decision makers at the woreda, zonal and regional levels, to seek increased budgets for rural water supply as well as a better/fair balance in funding using evidence (data/results from this LCC study and other sources) as advocacy tools for better impacts towards ensuring sustainable rural water supply services; [8]
- Support advocacy work towards decision makers at national level. this may focus on:
    - Measures towards ensuring availability of improved/quality data on key cost components related to water supply at all levels, especially explicit budgeting and data collection on maintenance expenditures.
    - Review of national policies (including their underlying assumptions) that still require "all maintenance to be financed by user communities" despite plenty of evidence that this is virtually not possible beyond minor maintenance.
    - At both the national and regional levels, existing expectations and roles regarding the ability of rural WASHCOs and WUA to properly maintain their water facilities need to be reassessed, and the actual role of both woreda and regional water agencies to perform maintenance support of rural water infrastructure need to be redefined to reflect realities on the ground.
- Support WASHCOs and WUAs (both new and existing ones) to build their capacity, especially in relation to improving tariff collection, and strengthening their financial management systems; and

[6] Note that this is a comparison between budget and expenditure. This was an attempt to indirectly estimate the 'missing' budget by the amount of expenditure made in the year in question; no reliable information about the 2006-2008 EFY South Ari *budget* could be found at the time of study and comparisons could not be made between that fiscal year and the 2010 EFY budget.
[7] USAID Lowland WASH and SWS-LP can provide support in this type of advocacy work and follow-up measures.
[8] This should be timed appropriately, e.g. could be done when the Woreda Cabinets make decisions on fiscal budget amount and/or allocation among priority sectors every year.

- Piloting of improvements in the systems for maintenance and wider post-construction support that are led by government to address substantial gaps in capacity and performance.

Partners in the USAID Sustainable WASH Systems Learning Partnership and USAID Lowland WASH Activity, aim to continue to collaborate and work in these two woredas to address these priorities and build much needed capacity for sustainability at the woreda level, including working in coordination with the government and other development partners.

INTRODUCTION

This report summarizes the results of the Life Cycle Costs Analysis (LCCA) of rural water supply in two woredas in Ethiopia. It was prepared as an input to the Sustainable WASH Systems Learning Partnership which is focused on testing approaches to strengthen WASH systems and improve WASH services delivery, and the USAID Lowland WASH Activity which seeks to ensure sustainability of improved water drinking supply in its targeted areas. In this case, systems are referred to not just 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 National Rural Water Supply O&M Management Strategic Framework (MoWIE, 2016) aims to ensure 93% of rural water supply schemes are functioning by 2020 as per the 2nd Growth and Transformation Plan (GTP-2). Reflecting long-standing policies, the framework re-states that operation and maintenance (O&M) is primarily the responsibility of communities through WASHCOs[9] and rural Water Boards (for regional piped schemes). Community management is one of the fundamental principles in the framework.

Performing maintenance is challenging for WASHCOs with respect to both needed skills, spare parts and finance. Communities often neglect maintenance and at best may deal with minor repairs. Support for routine and major maintenance is currently minimally provided by the government and there is a range of budgetary, technical, and managerial challenges that need to be addressed. It is typically unclear how minor, medium or major maintenance are defined and different types of maintenance such as preventive and corrective maintenance are usually not acknowledged nor performed.

Recent data on non-functionality of water schemes across Ethiopia is limited, and the rates from detailed surveys are often much higher than reported aggregated data. Local government authorities (woredas, zones and regions) are mandated to monitor ongoing service delivery and step in to cover major maintenance but the budgets made available are typically not sufficient and, in some cases, rarely cover more than the salaries of government staff. The provision of sustainable services in Ethiopia would benefit from more informed assessments of financing gaps, for example, with respect to maintenance, and ideas on how to address these critical gaps.

Concerned about sustainability, and particularly the problem of finance for maintenance, the USAID Lowland WASH Activity and the USAID Sustainable WASH Systems Learning Partnership collaborated in a study of LCC for rural water supply. Between March and June 2017, asset inventory and service level assessments were conducted in two woredas in two regions of Ethiopia: South Ari in SNNP Region and Mile in Afar Region. The asset inventory performed in these two woredas provided a basis for a detailed financial analysis examining the LCC of rural water supply.

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. In Uganda and Ethiopia, SWS activities (known as concept one) are led by IRC WASH, working with Tetra Tech and LINC to develop and test a structured and replicable approach to understanding, engaging with and strengthening decentralized *woredas* (district) and small-town level systems for water and sanitation service delivery. The expected outcomes are stronger service delivery systems in the targeted woredas and small towns, with strengthened building blocks and institutional arrangements for service delivery models, financing, capacity and monitoring contributing to better services delivery.

[9] In Southern Nations, Nationalities, and Peoples' Region (SNNPR), legalized WASHCOs are known as Water User Associations (WUAs).

USAID LOWLAND WASH ACTIVITY

The USAID Lowland WASH Activity contributes to USAID's goal to save lives by expanding sustainable drinking water, sanitation, and hygiene and promoting agricultural livelihoods in Ethiopia's lowland areas (Afar, Somali and SNNPR). The purpose of the Activity is to accelerate the expansion of improved, sustainable drinking water supply and sanitation access and to catalyze enhanced hygiene behaviors, while also expanding sustainable water use for agriculture in the Somali, Afar and Southern Nations, Nationalities and Peoples (SNNP) regions of Ethiopia with lowland populations vulnerable to drought and climate change. The USAID Lowland WASH Activity works with national and regional GoE institutions and stakeholders and provides technical services, small-scale infrastructure, and related resources. Technical activities are grouped under four integrated components:

1. Increased access to improved drinking water supply sources on a sustainable basis;
2. Increased adoption of key hygiene behaviors and increased access to improved sanitation;
3. Improved efficiency and sustainability of food production from irrigated and rain-fed agricultural systems;
4. Improved water resource governance and data management.

From the beginning of both projects, USAID encouraged the leadership of these projects to look for opportunities to collaborate and partner and the joint LCCA study was the first example. This was an opportunity to find synergies between the systems strengthening activities and research within USAID SWS Learning Partnership and the implementation of a package of new construction, rehabilitation and improved maintenance and water management systems and services for rural water supply schemes (component 1) and improved water resource governance and data management (component 4) through the USAID Lowland WASH Activity.

THIS REPORT

The USAID Lowland WASH Activity and USAID Sustainable WASH Systems Learning partnership collaborated in piloting a LCCA to understand:

1. What is the status and value of the current water supply infrastructure?
2. How much does it cost to provide services at current levels, and what are the sources of finance?
3. What are the financing gaps to sustain services from current infrastructure?

The USAID SWS Learning Partnership and USAID Lowland WASH Activity conducted an asset inventory and a life-cycle cost analysis in two woredas in two regions: South Ari in SNNP Region and Mile in Afar Region. The asset inventory can be found in a separate sub-report (Pearce et al., 2018) and there is a further report on service levels (Adank et al., 2018). This report builds on the asset inventory, but focuses on financial assessment using the LCC approach.

METHODOLOGY

The LCCA is used in this report to describe the aggregate costs of ensuring delivery of adequate, equitable and sustainable WASH services to a population in a specified area (Fonseca et al., 2011, p.6). This includes "… not only the costs of constructing systems but also what it costs to maintain them in the short and long term, to replace, extend and enhance them as well as the indirect support costs of the enabling environment; that is capacity-building, planning and monitoring" (Fonseca et al., 2011, p. 6).

A LCCA can help decision-makers involved in service planning, budgeting and delivery to make informed decisions between different types, levels and models of WASH services. A short definition of the purpose of the LCCA is that it "… seeks to raise awareness of the importance of LCC in achieving adequate, equitable and sustainable WASH services, to make reliable cost information readily available and to mainstream the use of LCC in WASH governance processes at every level" (Fonseca et al., 2011, p. 6).

The two woredas selected for this study (South Ari in SNNP Region and Mile in Afar Region) were selected as relatively accessible woredas with stronger local government capacities, large populations and a mix of scheme technologies (springs, hand pumps, motorized boreholes, etc.), and both are target woredas for both the USAID Lowland WASH Activity and SWS-LP projects.

Rural water services in both woredas depend on voluntary WASHCOs managing facilities under a community management model. In South Ari, springs and wells tap shallow groundwater relying on hand pumps and gravity fed flow, whereas in Mile there are more complex facilities often tapping deep groundwater and relying on motorized pumping.

This report builds on the results of an asset inventory that identified all existing water supply infrastructure in these two woredas. Additional data collection for this report consisted of:

- Key informant interviews at the woreda and regional administration level (and zonal in South Ari) and with NGOs to gather budget and expenditure information.
- Surveys on tariffs at the water schemes for the first 10 people in line at each scheme (chosen sampling method). A total of 360 surveys were performed in South Ari and 256 in Mile, reaching approximately 1% of the population.
- A cash-flow and affordability analysis in the rural communities of Weylahamer (South Ari) and Bekeli-de'ar (Mile).
- Expert interviews with woreda technical staff to obtain current replacement costs on water supply scheme components.

Key informant interviews with woreda staff in South Ari took place in March 2017, while interviews in Mile were taken between May-June 2017. Results were presented and validated with local stakeholders in May and July 2017 respectively. Woreda budget and expenditure data was collected by interviewing woreda staff and reviewing official records on salaries and maintenance expenditures. The same information was also obtained from regional-level and NGO staff through expert interviews. The assessment also captured how much households are contributing to the operation and maintenance of the water schemes through the cash flow analysis. This was only done for a few communities as an example of how the cash flow tool (see more details in Annex 2) can be used to plan for an adequate tariff (one that meets the minor operation expenses of schemes and that is still affordable).

It is important to stress that the values of current replacement costs of water supply schemes are estimates. They are not actual costs, which are difficult to obtain. The yearly water expenditure for South Ari was derived from the two-year expenditure of 2006-2008 EFY (2013/14 - 2015/16).

Government entities do not always spend the entire budget that is allocated to them, with funds often being indicated in a budget document that are not actually available to be spent. It is therefore important to remember that budget and actual expenditure in the same financial year may differ. This study was not always able to collect both budget and expenditure for the same year and source.

This report uses EFY, which is 7 years behind the Gregorian calendar and starts in September (e.g. 2010 EFY runs from September 2017 to September 2018).

The woredas use the terms minor, medium, and major maintenance in their budgets. It was not entirely clear how this was locally defined, but based on discussions with the woredas it appears that minor and medium were more or less similar to Operational Expenditures and major to Capital Maintenance Expenditures (see Annex 2 for the definition of OpEx and CapManEx).

RESULTS

EXISTING INFRASTRUCTURE VALUE

Much of the capital in rural water supply is invested in physical infrastructure. In the LCCA, this component is called Capital Expenditure (CapEx) and is defined as "the capital invested in constructing or purchasing fixed assets such as concrete structures, pumps, pipes and latrines to develop or extend a service" (Fonseca et al., 2011). This analysis used estimates of current replacement costs of infrastructure identified in the asset inventory to estimate the value of infrastructure. Current replacement costs are what it would cost to replace the infrastructure now as opposed to the actual original cost. Estimates were made by local experts together with woreda staff. Estimated values are specific to each woreda since costs vary between locations. The values are general indications of the scale of CapEx, and should not be taken as the actual past expenditure.

In South Ari and Mile there are a total of 245 and 31 schemes respectively serving 280,000 and 118,000 people. The details can be found in the "Baseline assessment: rural water asset inventory report" by Pearce et al. (2018). Using rates specified in Tables 1 and 2, the estimated total current replacement cost of water supply schemes in South Ari and in Mile is 4.3 million (USD) and 3.5 million (USD) respectively. Although rather similar across the two woredas, in South Ari there is a much larger number of low cost schemes tapping shallow groundwater and in Mile a smaller number of more costly motorized schemes given the deeper available groundwater reserves.

Some of the infrastructure is non- or partially functional. This represents a large loss of returns from the capital investments. In South Ari, 76 schemes out of 245 (31%) are non-functional and 39 (16%) are only partially functional. In Mile, 6 schemes (13%) are non-functional and 2 (6%) are only partially functional. Partially functional means that the scheme does not provide services as it should according to its design, for example with lower or unreliable flow.

Table 1: Current replacement costs of water supply schemes in South Ari[10] (data based on estimates by woreda, zonal and regional government staff)

South Ari	Single Unit cost (ETB)	Single Unit cost (USD)	Count	Total current replacement cost (ETB / USD)	Notes
Hand dug well, Afridev hand pump	115,000	4,255	64	7,360,000 ETB / 272,320 USD	New construction including digging, concrete ring lining, hand pump and headworks, based on contracting out.
Shallow well, Afridev hand pump	260,000	9,620	46	11,960,000 ETB / 442,520 USD	New drilling of shallow wells 40 depth (drilling, casing & well head as well as Afridev hand pump supply and installation)
Shallow well, India MkII	600,000	22,200	10	6,000,000 ETB / 222,000 USD	New construction, drilling, casing, headworks, and pump supply and installation. 60 m depth.
Spring on spot	50,000	1,850	103	5,150,000 ETB / 190,550 USD	Spring box/capping, retaining wall, collection chamber
Deep well with distribution network					
Deep well	800,000	29,600	5	4,000,000 ETB / 148,000 USD	Drilling, casing (115 m depth)
Distribution network	500,000	18,500	17.1 km total length	8,550,000 ETB / 316,350 USD	GS pipe. Total network length is 17.1 km.
Storage facilities (for deep wells)	1,100,000	40,700	5	5,500,000 ETB / 1,017,500 USD	Assumed to be a 50m3 concrete masonry ground reservoir
Water points	25,000	925	12	300,000 ETB / 55,500 USD	Assumed to be 6 faucet tap stands
Springs with distribution					
Spring with protection (on spot)	50,000	1,850	17	850,000 ETB / 31,450 USD	
Distribution network (per km)	550,000	20,350	2.8 km average length	26,180,000 ETB / 968,660 USD	GS pipe. Average distribution network length is 2.8.
Water points	25,000	925	25	625,000 ETB / 23,125 USD	Assumed 6 faucet tap stand
Storage facilities (for springs)	1,100,000	40,700	15	16,500,000 ETB / 610,500 USD	Assumption: price of a 50m3 concrete masonry ground reservoir
			Total (USD)	**116,175,000 ETB / 4,298,475 USD**	

[10] USD conversion was taken at 0.037.

Table 2: Current replacement costs of water supply schemes in Mile[11]. The data is based on local technical expert estimations.

Mile	Single Unit cost (ETB)	Single Unit cost (USD)	Count	Total current replacement cost (ETB / USD)	Notes
Hand dug well with Afridev hand pump	100,000	3,700	1	100,000 ETB / 3,700 USD	Well digging, lining, headworks, hand pump supply and installation; depth 35m
Hand dug well with India MkII hand pump	130,000	4,810	1	130,000 ETB / 4,810 USD	Hand dug well: 80.000 Birr. India MK II 50.000 Birr. Includes well head.
Shallow well with India MkII	1,050,000	38,850	12	12,600,000 ETB / 466,200 USD	Drilling to 100 m, casing, headworks, India mKII
Shallow well without pump	800,000	29,600	2	1,600,000 ETB / 59,200 USD	Drilling to 100 m, casing, headworks
Shallow well with motorized pump					
Shallow well	800,000	29,600	3	2,400,000 ETB/ 88,800 USD	Drilling to 100 m, head works
Generator, pump set, switchboard, house	1,400,000	51,800	3	4,200,000 ETB / 155,400 USD	
Storage facilities (for shallow wells)	1,100,000	40,700	2	2,200,000 ETB / 81,400 USD	Assumption: price of a 50m3 concrete ground reservoir
Distribution network	550,000	20,350	3 km average length	3,300,000 ETB / 122,100 USD	Based on 2 distribution networks and assumed average pipeline length of 3 km.
Water points	60,000	2,220	6	360,000 ETB / 13,320 USD	Assumed to be 6 faucet tap stands
Deep well with distribution					
Deep well	1,170,000	43,290	12	14,040,000 ETB / 519,480 USD	Drilling, casing (117 m depth)
Solar pumping installation	1,400,000	51,800	2	2,800,000 ETB / 103,600 USD	Check assumed cost. Now it is assumed to be equal to the cell below.
Generator, pump set, switchboard, house	1,400,000	51,800	10	14,000,000 ETB / 518,000 USD	including installation 18kW pump, 80 kVA generator set
Storage facilities (for deep wells)	1,100,000	40,700	12	13,200,000 ETB / 488,400 USD	Assumption: price of a 50m3 concrete masonry ground reservoir
Distribution network	600,000	22,200	3 km average length	21,600,000 ETB / 799,200 USD	GS pipe with fittings, diameter 21/2 inch, trench excavation and pipe lying, and assumed average pipeline length of 3km.
Water points	60,000	2,220	40	2,400,000 ETB / 88,800 USD	Assuming a 6 faucet tap stand
Cattle troughs	40,000	1,480	7	280,000 ETB / 10,360 USD	Concrete structures
Total (USD)				**95,210,000 ETB / 3,522,770 USD**	

[11] USD conversion was taken at 0.037.

WATER BUDGETS AND EXPENDITURE

'Combined' budgets and expenditure estimates were based on inputs from all relevant parties in addition to the woreda office, including the regional level and NGOs. Combined data for the same years in South Ari was only available for actual expenditure. This may differ from the formal budget. In Mile, at the woreda level there is budget and expenditure data, but for the region and NGOs only budgets were available.

For South Ari, data on combined actual expenditure (woreda, NGOs, and the Development Association (DA[12])) covering 2006-2008 EFY (2013/14 - 2015/16) was provided by the woreda Water, Mine and Energy Office. The expenditure was converted to yearly numbers for easier comparison, and can be seen in Table A1 in Annex 1. Total combined expenditure was approximately 2.36 million ETB or 87,400 USD. With a population of around 280,000 this is 0.30 USD per capita. As can be seen in Figure 4, it came primarily from NGOs (47%),[13] followed by the woredas (38%) and the DAs (15%). This excludes regional data because that was unavailable. Most of the combined expenditure was in new water schemes and extensions (65%), but no budgets for maintenance and repairs were identified at the woreda and zonal level.

The South Ari woreda office expenditure during 2006-2008 EFY (2013/14 – 2015/16) was roughly 0.9 million ETB or 33.500 USD. It covered only salary and running costs (56%) and new water schemes and extensions (44%). NGOs provided a total of roughly 0.78 million ETB or 41,000 USD, allocated to new water schemes and extensions (71%), rehabilitations (9%), and water user association establishment (20%). The DA dedicated all of its 0.35 million ETB or roughly 13,000 USD budget to new water schemes and extensions. In South Ari, no budget was explicitly allocated for maintenance and repairs in 2006-2008 EFY (2013/14 – 2015/16).

In Mile, the total woreda office budget and expenditure was 1,682,784 ETB in 2008 (2015/16) and 1,676,137 ETB in 2009 (2016/17). This comes down to 1,679,460 ETB or roughly 62,000 USD per year. The region and NGOs together provided 3.5 million ETB and 9.4 million ETB respectively in the 2009 EFY (2016/17). Combined funding for water in Mile is therefore assumed to have been about 14.58 million ETB or 539,000 USD per year. For simplicity's sake this is henceforth referred to as combined '*budget.*' As in South Ari, and as can be seen in Figure 4, NGOs and other donor funded contributions were the biggest contributors to the combined water budget[14]. Most of it was in new water schemes and extension (88%).

Most of Mile's woreda water office budget went to staff salaries and running costs, totaling 64% and 52% in 2008 and 2009 EFY respectively (2015/16 – 2016/17). Contrary to South Ari's woreda office in 2006-2008 EFY though, there was a budget allocated for medium (8 % and 4%) and major maintenance (11% and 7%). This included budget for spare parts purchase (200,000 ETB in 2008 EFY and 300,000 ETB in 2009 EFY) and spare parts store construction (200,000 ETB in 2009 EFY) that is related to a pilot project by the Ministry of Water, Irrigation and Electricity (though fund dispersal was delayed and only occurred in 2018). The regional government contributed 3.5 million ETB or about 130,000 USD, split over construction of new water schemes and extensions (97%), and maintenance (3%). Motorized schemes are in practice, repaired by the Afar Water Resources Bureau while hand pump schemes are repaired with support of the Woreda Water Resources Office. NGOs and other donor led projects contributed a total of 9.4 million ETB or about 348,000 USD for construction of new water schemes and extension. Table A2 in Annex 1 provides more details.

An important note must be made regarding the data for South Ari. As mentioned, actual expenditures may differ from formal budgets. This is a particular problem for maintenance which is rarely explicitly budgeted for and in practice may come out of a range of diverse budgets. Expenditure by the South Ari woreda was approximately

[12] A regional Community-Based Organization (CBO) with separate branches in multiple regions.
[13] This does not capture work done by USAID contractors.
[14] The following NGOs are known to have contributed over the past few years in Mile; Save the Children, Care Ethiopia, AMREF, and the Development Association (DA). The latter however, most recently financed an intervention 3 years ago and is therefore excluded from this analysis. The same goes for UNICEF which last intervened 8 years ago.

904,510 ETB or 33,500 USD per year during the 2006-2008 EFY (2013/14 - 2015/16). Comparison of the woreda-level expenditure to (later known) *budgets* shows some differences. South Ari woreda-level budget in 2009 EFY (2016/17) was 2,189,313 ETB or 81,000 USD, and in 2010 EFY (2017/18) this was 2,652,057 ETB or 98,000 USD. There is a large difference between the approximate yearly expenditure of 33,500 USD during the 2006-2008 EFY, and the 81,000 USD in 2009 EFY and 98,000 USD in 2010 EFY.

The Sankey diagrams (Figure 4 and 5) provide an overview of combined expenditure/budgets. In South Ari, combined expenditure was estimated as 2.36 million ETB or approximately 87,400 USD per year. In Mile the combined funding was estimated as 14.6 million ETB or 540,000 USD per year. This is roughly 0.3 USD and 4.6 USD per capita for South Ari and Mile respectively, revealing a difference in investment between the two woredas. This difference already reflects government policies under Climate Resilient WASH that seek to promote major investments in arid lowlands like Mile that often depend on emergency trucking. It should also be noted that the combined expenditure for South Ari excludes the regional expenditure which would increase the figure if included.

The capital being invested in building new infrastructure makes up a very high proportion of combined annual budgets from all government levels and NGOs. Whether the total capital invested in new infrastructure (as presented in the earlier section) is properly utilized to deliver good services depends on these much smaller annual budgets.

Key findings show that there were no expenditures on maintenance in South Ari and very limited expenditures in Mile, with a very strong emphasis on the construction of new water schemes and extensions in both woredas. This might reflect the government's priorities, which focus on extending access from existing improved sources and construction of new water systems versus maintaining and repairing existing systems.

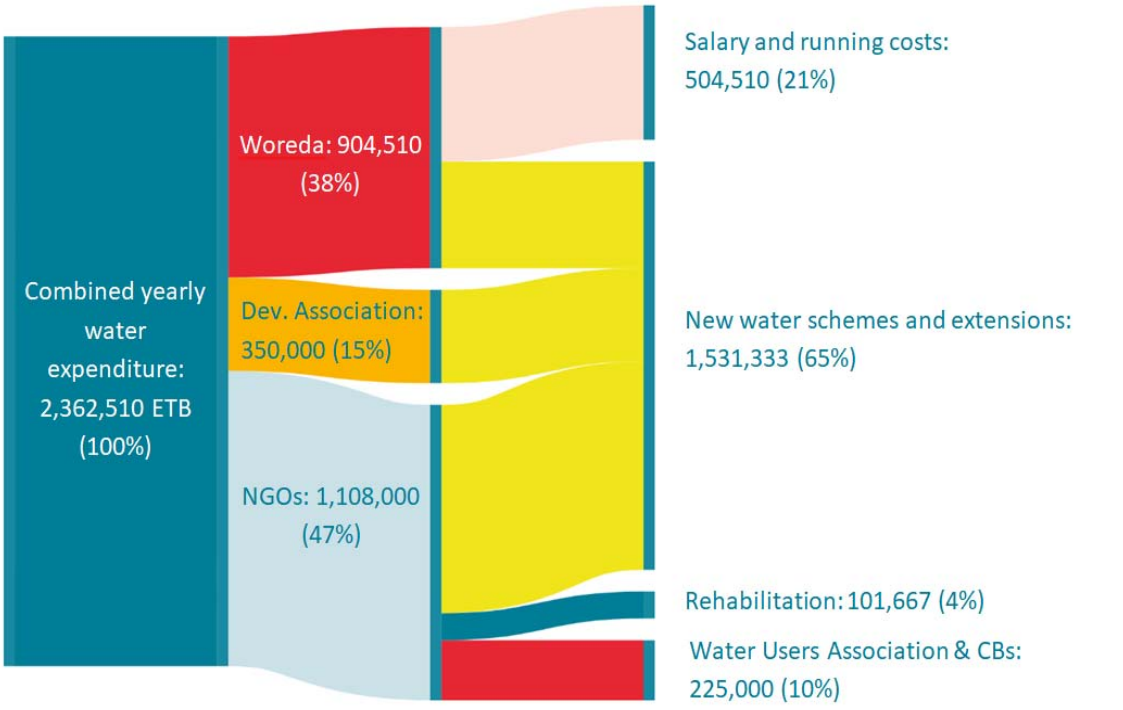

Figure 2: Sankey diagram of estimated combined yearly water expenditures in South Ari, excluding regional expenditures. Data covers 2006-2008 EFY (2013/14 – 2015/16) and was converted a yearly estimate. Numbers are in ETB and percentages are rounded off.

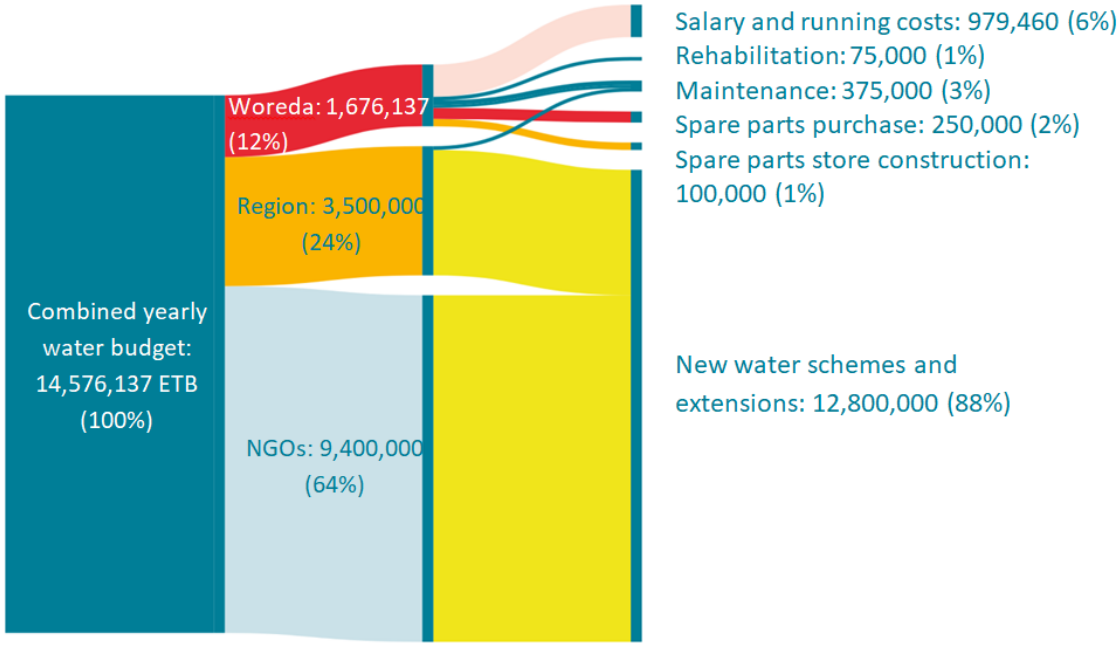

Figure 3: Sankey diagram of combined yearly water budget in Mile 2009 EFY (2016/17). Region and NGO budgets were obtained through expert interviews during a workshop in Afar on 12-19-2017 (GC). The regional budget is allocated to the woreda water office.

DIRECT SUPPORT ANALYSIS

In order to deliver services, a range of pre- and post-construction support activities by the relevant service authorities is needed. These can be grouped together under the heading of direct support (Fonseca et al., 2011). Direct support includes the costs of supporting service providers which are WASHCOs in rural areas and some utilities in small towns. It may include "performance monitoring, technical advice and information, administrative support (e.g. help with tariff setting), organizational support (e.g. to achieve legal status), conflict resolution, identifying capital maintenance needs (including advice on financing), training and refresher courses" (McIntyre and Smits, 2015).

In Ethiopia, maintenance support is sometimes provided directly to service providers by the zones and more commonly, the regions. We were only able to collect direct support costs that have passed through the woreda budget. In South Ari, there are 11 technical officers located in the woreda water office. Their time is spent mostly at the office, reporting, planning and providing ad-hoc support to the communities that reach out to the woreda with maintenance issues (see Figure 2). In Mile, woreda staffing also consists of 11 people that are mostly involved in the supervision of water systems that are being rehabilitated and new infrastructure constructions with little time dedicated to performing monitoring and maintenance of existing schemes (see Figure 3).

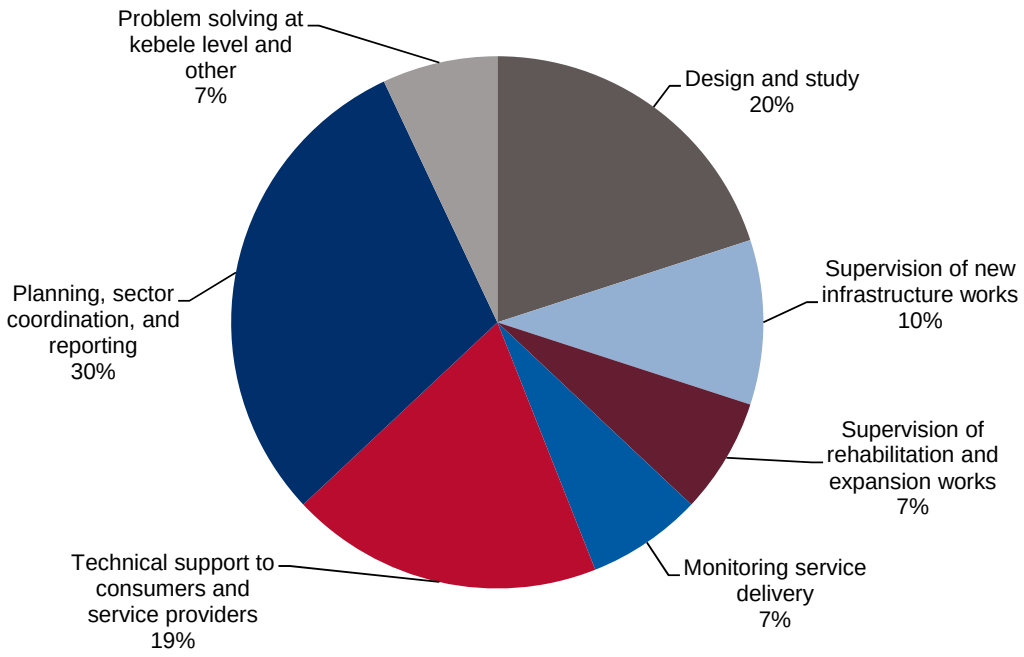

Figure 4: Assessment of time spending by technical officers in South Ari.

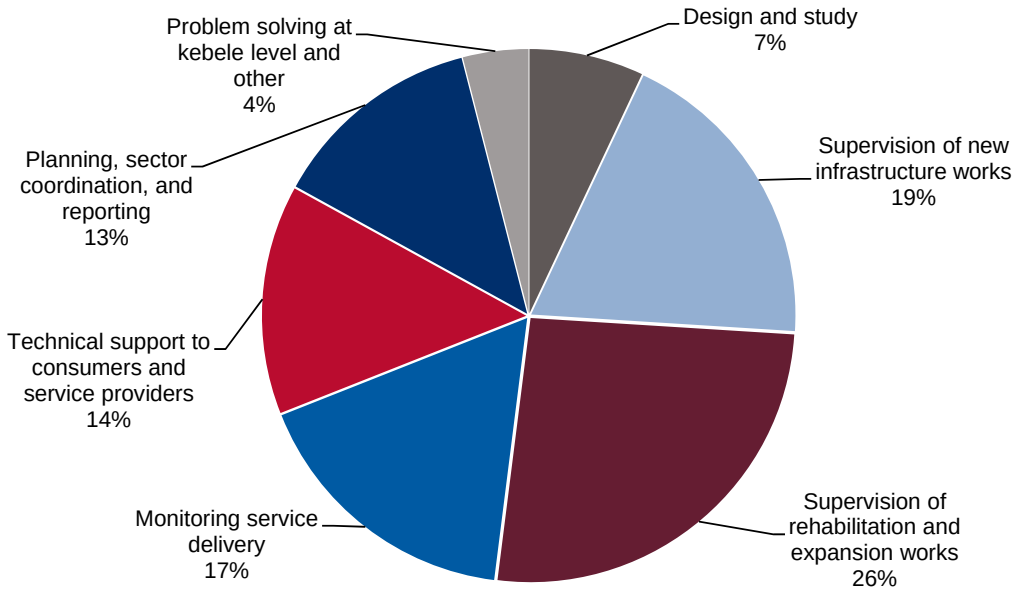

Figure 5: Assessment of time spending by technical officers in Mile

In both woredas, there was no locally available or detailed asset inventory before the one created as part of the USAID Lowland WASH Activity/SWS partnership activity, with also no preventive maintenance and no scheduled support to communities nor agreed targets for reducing non-functionality. Furthermore, on the ground, it was unclear who has formal responsibility for maintenance and monitoring of water services, even though the draft (at that time) National Rural Water Supply O&M Management Strategic Framework (MoWIE, 2016) places maintenance responsibility with communities through the WASHCOs and local water boards,

and regulatory and monitoring roles with the government through regional water bureaus. Based on field level observations made by USAID Lowland WASH Activity during multiple visits (in relation to their project related work on other water schemes in Afar, Somali and SNNP regions) it is widely observed that most WASHCOs only operate their water systems and do not maintain them.

The South Ari woreda has only one motorcycle to monitor and follow up on services provided to over 263,000 people from 245 water schemes spread over 46 rural kebeles and 4 small towns. However, the motorcycle is mainly used for management purposes and not readily available for technicians. The 11 full-time technical staff are very constrained in providing maintenance and monitoring services because of the shortage of transport and operational funds.

In both South Ari and Mile, direct support mostly falls under the woreda budget for salaries and running costs, amounting to roughly 0.5 million ETB or 19,000 USD (2006-2008 EFY (2013/14 – 2015/16)) in South Ari, and 1.08 million ETB or 40,000 USD (2008 EFY (20015/16)) and 0.9 million ETB or 32,400 USD (2009 EFY (2016/17)) in Mile. Further details are provided in Table A1 and A2 in Annex 1. In South Ari, NGOs also provided some finance for WUA establishment in 2006-2008 EFY (2013/14 – 2015/16), which qualifies as indirect support. This led to the establishment of legalized WUAs and federations that provide a mechanism to group and connect WUAs. These kebele level federations could potentially provide important roles in monitoring and maintenance but they do not currently do this and are rather inactive. No direct or indirect support finance appears to have been available in either woreda from other sources.

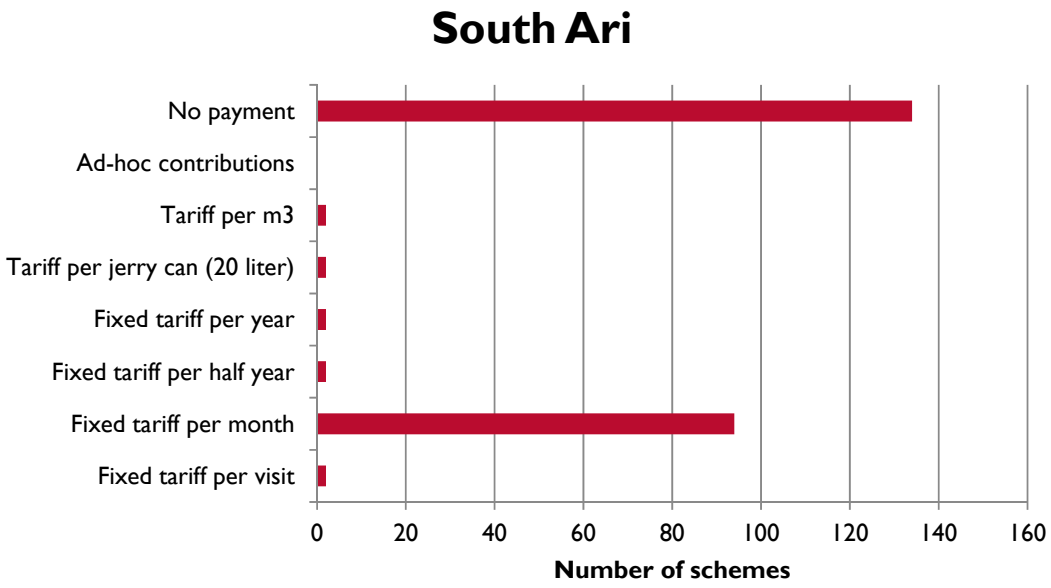

Figure 6: Tariff payment in South Ari based on scheme questionnaire

TARIFF COLLECTION AND CASH FLOW ANALYSIS

According to surveys conducted at the schemes (Figure 6), in South Ari there is no tariff payment in 55% of the schemes (134) and in Mile there is none at 35% of schemes (11). User surveys present the same picture for South Ari and a slightly less optimistic one for Mile. In South Ari, 55% (197) of the households surveyed reported not paying any tariff and in Mile, 54% of the households surveyed mentioned they were not paying any tariff for hand pump schemes. For those that use the water for livestock there is no tariff payment in either woreda. The lack of tariff collection represents a significant lost opportunity for collecting funds that could be used for maintenance and repairs of existing water facilities.

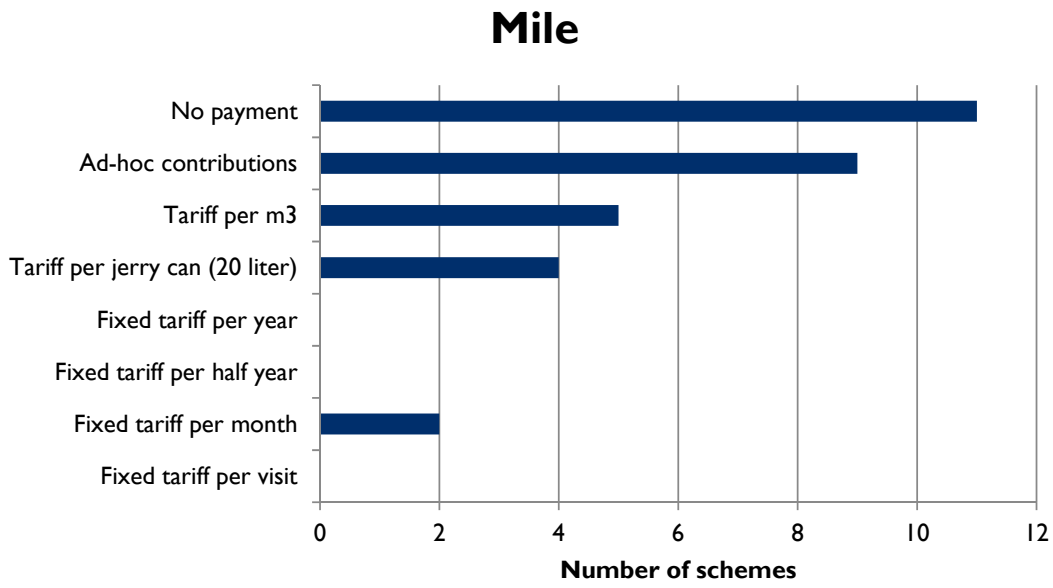

Figure 7: Tariff payment in Mile based on scheme questionnaire

According to the National Rural Water Supply O&M Management Strategic Framework (MoWIE, 2016), day-to-day O&M are primarily the responsibility of communities (in particular WASHCOs). The purpose of the cash flow analysis is to understand how communities arrange their finances and collect and spend funds for O&M (or OpEx). Minor maintenance, which is part of OpEx, is defined here as routine, recurrent maintenance needed to keep systems running at design performance.

In South Ari, a cash flow analysis was conducted in Weylahamer Kebele (see Table 3). The community may contact local private sector artisans for minor maintenance but often directly report the problem to the woreda water office seeking support when maintenance requires larger replacements. However, the response time of the woreda water office is reportedly long. Most of the time, when maintenance is required, ad hoc contributions take place to raise the necessary funds to pay for transport, per diems, or spare parts. Sometimes this fund collection can take months. Details on OpEx for 2009 EFY can be seen in Table 3.

In Mile, the cash flow analysis was done for the Bekeli-de'ar kebele where there are service problems because of fuel shortages and problems with the generator battery[15]. The Regional Water Resource Bureau reportedly takes care of major and minor maintenance, while the woreda has a limited role in this. The community contribution from tariffs and/or one-time collections covers mostly fuel and generally does not cover minor maintenance. Since many of Mile's systems are motorized, the communities reportedly often spend roughly 400 birr (14.80 USD) per month just on transport and generator fuel.

Interviews with technical staff at the woreda and zone level, as well as community associations indicate that situations in other localities are similar. There is no formal book keeping, costs and income are not recorded, there are no formal bylaws for Community Based Organizations (CBOs), WASHCOs and tariff setting, and payment and follow-up is ad-hoc. Communities manage to collect funds on an ad-hoc basis for minor maintenance of schemes when required, but access to technicians from the woreda or the private sector is problematic.

In Weylahamer kebele, the funds raised through tariffs were substantial but little was spent on OpEx during the 2009 EFY. The collected tariffs amounted to approximately 9,850 ETB (364.50 USD) in 2009 EFY,

[15] Since the beginning of 2018, this site has been rehabilitated and became solar powered through support by the USAID Lowland WASH Activity and the community is no longer using the generator.

compared to actual OpEx costs of 800 ETB (29.60 USD). The percentage of users paying their tariffs in Weylahamer is reportedly 90%. The percentage for Bekeli-de'ar is unknown, as is the number of households (estimated here at 380). Therefore, the same calculation could not be made for Bekeli-de'ar. In Weylahamer expenditure on OpEx is small compared to tariffs collected. The WASHCO should be able to pay for OpEx.

In Weylahamer, tariff affordability measured as percentage of average monthly household income (for two 20L jerry cans per day) is about 10%. Affordability in Bekeli-de'ar is even lower than in Weylahamer with the tariff representing 13% of average monthly income. This even excludes ad-hoc contributions that would raise the cost even further. An international benchmark for tariffs and affordability is a maximum 5%[16] to be spent on both water and sanitation against the income of the poorest households. Against this measure the water tariffs cannot be considered affordable in the two sampled communities. This is compared to average reported household income so affordability for the poorest may be even lower. The sample does not allow for generalization to the entire woreda, but it suggests that in some communities tariffs may need to be reduced to be affordable for the poor but would need to increase to generate more funds for more than minor maintenance.

Table 3: Yearly OpEx actual expenditure in Weylahamer (South Ari) and Bekeli-de'ar (Mile) (ETB, 2009 EFY). Data was obtained through field surveys.

Scheme details	Weylahamer (South Ari)	Bekeli-de'ar (Mile)
Type of system	Shallow well with stand post	Deep well with stand post
Age	1 year	15 years
Population in the community	150	1750
Households	30	380[17]-
OpEx		
Faucet/taps (ETB)	120	720
Transport of district staff to community (ETB)	450	4,800
Fuel for generator (ETB)	N/A	27,600
Battery (ETB)	N/A	2,800
Tap attendant (pump maintenance) (ETB)	100	No payment since he is the school guard and is paid by the school
Technician (ETB)	130	From the Region, no payment
Total OpEx costs 2009 (EFY) (ETB)	**800**	**35,920**
OpEx per person (ETB) per year	5.3	21
Savings (ETB)	2,600	2,000
Tariff (ETB)	0.5 ETB per jerry can	1 ETB per jerry can + ad-hoc fuel contributions
Income from tariffs (at two 20l jerry cans per household per day) (ETB), with 90% of households paying tariffs[18]	9,855	-
Average monthly household income (ETB)	300	480
Household expenditure of water or 'affordability'[19]	10%	13% (excluding ad hoc contributions)

SCENARIOS FOR IMPROVED SUSTAINABILITY

Two scenarios were developed for South Ari to illustrate how functionality might be improved. These are based on utilizing 8 of the 11 woreda technical staff for maintenance. There is a low- and a high end

[16] See www.ircwash.org/blog/affordability-wash-services-rules-thumb-and-why-it%E2%80%99s-difficult-measure.
[17] Calculated based on population and average household size of 4.6 (source: population.un.org/Household/index.html#/countries, based on the Demographic and Health Surveys Program 2011 data).
[18] Calculated as 2 jerry cans per household per day x tariff per jerry can x 365 days per year x (number of households x 0.90 tariff payment compliance).
[19] Calculated as ((2 jerry cans per household per day * tariff per jerry can x 30.5 days)) / average monthly household income) x 100.

maintenance scenario. The two scenarios are defined by the number of scheme visits per month per each of the 8 technical staff members. Under low end maintenance each staff visits 2 schemes and under high-end maintenance each staff visits 3 schemes per month. This is equivalent to 192 and 288 schemes visited per year under the low and high maintenance scenarios respectively. Under the high-end scenario this means that all 245 existing schemes plus any new schemes could be covered.

Table 4 shows scenario analysis results for the South Ari woreda. Assuming a budget for per diems of 100 ETB per day and transportation costs of 100 ETB per day, along with 2 days per scheme visit, annual scheme visit costs would be between 76,800 ETB and 115, 200 ETB. In addition, if an assumed 3,000 ETB (approximately $110/year) is allocated per scheme as average maintenance costs (e.g. for spares),[20] than for the 100 schemes that are assumed to require maintenance, this amounts to a total of 300,000 ETB per year.

An additional investment of roughly 380,000 ETB (140,000 USD) or 420,000 ETB (15,500 USD) for low and high maintenance scenarios respectively, equal to 11% and 12% of 2006-2008 EFY (2013/14 – 2015/16) combined budget (which even excludes regional budget), could result in improved functionality. The financial data, including the per diems in this scenario was developed together with the woreda technical staff based on actual costs.

Table 4: Scenario analysis for direct support budget in South Ari ETB as of 2009/2010 EFY (2015/16 - 2017/18).

	Lower-end maintenance budget	Higher-end maintenance budget
Average number of days per scheme visit	2	3
Schemes visited per year, with 8 staff members	192	288
Per diem (ETB)	100	100
Transport cost (ETB)	100	100
Total cost per scheme visit per day (ETB)	400	400
Total costs of scheme visits per year (ETB)	76,800	115,200
Maintenance and spare parts cost, assuming about 3,000 ETB per scheme, and that a total of 100 about schemes require actual maintenance annually.	300,000	300,000
Total costs (ETB)	**376,800**	**415,200**

"We know that there is a lot of investment for construction and a lot of functionality problems that could be solved with limited budget"

DANIEL, PLANNING OFFICER AT SOUTH OMO ZONE WATER, MINE AND ENERGY DEPARTMENT

Budgetary changes (increases) are not the only things that could have a positive impact. Regularly planned preventative maintenance inspections could be a quick win at low cost but it would require staff performance (including leadership) to be improved, regularly monitored, and properly supported with the appropriate operational guidelines and funds in place (e.g. availing transportation, per diem, etc. and monitoring that each staff conducts the planned maintenance visits to each scheme). Perhaps, the most critical aspect to ensuring the sustainability of existing systems includes the woreda (and zone) staff to have clear job descriptions and responsibilities for the technical staff, and ensuring accountability for different areas for service delivery, including solid and realistic plans for scheduled maintenance. Actively seeking support for maintenance and rehabilitation from various sources (e.g. NGOs working in the area, private sector), and working in cooperation and collaboration with other relevant organizations in the woreda would be beneficial. The asset inventory completed as part of this study can be used for further planning with other stakeholders.

[20] This approximate amount of 3,000 ETB for maintenance was estimated based on information obtained from discussions with woreda technical staff and their experiences.

CONCLUSIONS AND RECOMMENDATIONS

The objectives of this study were to determine the status and value of water supply infrastructure in two representative woredas, investigate the costs of providing services currently and see how these are financed, and identify financing gaps with respect to sustaining services.

STATUS AND VALUE OF WATER SUPPLY INFRASTRUCTURE

The results show that infrastructure capital (CapEx) already invested, based on current replacement costs, is equivalent to 4.3 million USD (or 15 USD per capita) in South Ari and 3.5 million USD (or 30 USD per capita) in Mile. These assets reflect the combined investment over recent years by government and development partners. However, some of the existing infrastructure is not functional which represents a substantial loss on the capital investments. In South Ari, 31% water supply schemes are non-functional and a further 16% are only partially functional. In Mile, 13% schemes are non-functional and 6% partially functional. Extrapolating from these results, it is estimated that between 0.7 and 2 million USD in infrastructure capital lies idle or is underutilized in South Ari and Mile respectively. Rehabilitation, and even more critically, improved operations and maintenance, are required to minimize such underperformance and ensure that capital investments do lead to ongoing services.

COSTS AND FINANCING OF SUSTAINED WATER SERVICES

The current cost of providing rural water services is covered by a combination of government budgets at the woreda and regional level, NGOs and development partner contributions, and by users through tariffs.

The total annual expenditure in South Ari was estimated at approximately 2.36 million (ETB 87,400 USD) in 2006-2008 EFY (2013/14 - 2015/16). The annual budget in Mile is several times greater, at 14.58 million ETB (539,000 USD per year) in 2008-2009 EFY (2015/16 – 2016/17). The annual budget in Mile is several times greater, at 14.58 million ETB (539,000 USD per year) in 2009 EFY (2016/17) and dominated by NGOs (64%). With populations of around 280,000 and 118,000 this comes down to 0.3 USD per capita in South Ari and 4.6 USD per capita in Mile.

In South Ari, no maintenance funding could be identified in expenditures at the woreda and zonal levels for the 2006-2008 Ethiopian Financial Year (EFY) (2013/14 – 2015/16). In Mile, where data were more limited, there was some limited expenditure on medium and major maintenance and for spare parts purchase during the 2008-2009 EFY (2015/16 – 2016/17) even though much of that maintenance is done from the regional level. Combined financing (including all government, NGO and other donor contributions) is found to be dominated by capital investment and used for new water schemes and extensions. Maintenance expenditures prove hard to identify as they often come from various, flexible, not explicitly maintenance budget lines. However, it seems clear that financing for maintenance is insufficient to ensure sustainable water services. Limited financing for maintenance and repairs is indicative of the low priority placed on sustaining services over recent years and the limited capacities of systems to provide maintenance and repairs of all types from preventative to minor and major corrective repairs.

Tariff collection by WASHCOs and WUAs is also revealed to be limited. In South Ari there is no tariff payment at 55% of the schemes and in Mile no tariff payment for between 35-54% schemes. A cash flow analysis indicates that in theory, where tariffs are collected, the rates should be high enough to cover minor maintenance costs. However, such tariffs still lead to a large proportion of average household income being spent on water at around 10-13%. Comparing this to an international benchmark for tariff affordability of maximum 5% of household income spending on both water and sanitation among the poorest households, tariffs in two sampled communities in both woredas are unaffordable. Tariffs should be lowered here to improve equity especially for the poor e.g. through subsidies.

While there are opportunities to make improvements, such as supporting WASHCOs and WUAs, more training in improved tariff setting, collection, and management, the results cast doubt on the viability of requiring communities to cover all operations and maintenance costs (and perform the maintenance). In practice they generally choose not to do this, focusing only on operations and neglecting maintenance. There is little incentive for communities to raise tariffs and pay more for preventative and corrective maintenance when they can wait for the problem to get worse and let the government step in with its support and financing. It is recommended that the policy of not explicitly subsidizing maintenance (it happens in practice when the government supports communities) is revisited, along with examination of opportunities to re-orientate incentives for doing maintenance. It is projected that significant improvements could be made in service delivery with an increased maintenance budgets.

As a step towards further addressing funding gaps in maintenance, data on budgets and expenditure for maintenance needs to be improved. This is currently difficult and costly to identify which contributes to a key problem (lack of maintenance) remaining hidden.

FINANCING GAPS

In both woredas there is a critical gap in funding support by service authorities (regional, zonal and woreda water bureaus) to service providers (WASHCOs). Under the community management model, this includes the support from government institutions that ensures that communities are able to maintain and repair their own water schemes. It is difficult to say what the ideal amount of ExpDS is. Costs cannot be easily compared across cases due to accounting differences and intensity and quality of provided support (McIntyre and Smits, 2015). McIntyre and Smits (2015) based on data from Smits et al. (2011) find that based on cases in Africa, Latin America and Asia, in most instances where ExpDS is less than 1 USD per capita, service providers are unable to fulfil their responsibilities. In several cases (South Africa, Brazil and Chile) where ExpDS is roughly 2 or 3 USD per capita or more, reasonable levels of institutional functioning are reported. Although this does not allow for firm conclusions, meaningful levels of direct support is likely more than 1 USD per capita per year (McIntyre and Smits, 2015; Smits et al., 2011).

Direct support in both South Ari and Mile is much lower than the minimum rough benchmark of 1 USD per capita. It is less than 30,000 USD in each woreda (roughly 0.11 USD per capita in South Ari and 0.25 USD in Mile) and that is even counting all salary and running costs towards direct support. The 1 USD per capita minimal benchmark would suggest more than 280,000 USD be spent in South Ari, and 118,000 USD per year in Mile according to population levels. These low levels of funding for the institutions supporting service delivery would likely contribute to the low levels of system functionality that is being observed in these two woredas.

There are substantial existing capacities in government to support communities further. Mobilizing available government staff needs better operational costs support to include transportation and per diem for the technical staff as well as increased motivation and leadership. A scenario analysis for South Ari indicates how a small increase in the district maintenance budgets (per diems and transport costs) could improve water services. An increase of little more than 10% in the combined budget and investment in maintenance, suggests that sustainability of the water facilities could be strongly improved.

South Ari has already started to address some of the identified financial gaps in its 2010 EFY (2017/18) budget but the changes are limited. The water department *budget* is almost 1.7 million ETB or 65,000 USD higher compared to the 2006-2008 EFY *expenditure*[21] including 30,000 USD allocated for budget maintenance, while there was no maintenance costs budgeted in 2006-2008 EFY. This happened following the presentation of the

[21] Note that this is a comparison between budget and expenditure. The 2006-2008 EFY South Ari *budget* could not be collected. Therefore, no comparison can be made between it and the 2010 EFY budget,

draft findings of the asset inventory and discussion on budgets for water with political leaders at woreda and zonal level. This is viewed as a positive development but only a relatively small change. The biggest budget line is still new water schemes and extensions (50% down from 65%). Utilization of the maintenance budget is also in practice only expected to support rehabilitation, and to be used for preventative or corrective maintenance.

RECOMMENDATIONS

Without further and more substantial shifts to not only address the maintenance backlog through repairs and rehabilitation but actually to improve maintenance regimes going forwards, the current capital investment of government and development partners in new water systems and extensions is unsustainable. High capital spending may also not be sustained or increased if inadequate funding is allocated to maintenance. Both woredas (and their zones and regions) need to find ways to plan, budget and perform more maintenance and repairs. The following recommendations are made to improve rural water financing in both woredas:

- Advocacy towards local politicians at woreda, zonal and regional levels based on this assessment and follow-up supported by USAID Lowland WASH Activity, USAID SWS Learning Partnership, and others to seek improved rural water supply budgets and a better balance in funding towards sustained services.
- Advocating to regional governments that some of their funding previously allocated for Capital Expenditure (CapEx) for new systems, should be shifted to operating and minor maintenance expenditure (OpEx) to better sustain existing water systems.
- Advocacy towards national level decision makers focused on 1) ensuring improved data is available on water facilities (through an asset inventory process) cost components related to water supply, especially explicit budgeting and data collection on maintenance expenditures and 2) review of national policies and their assumption that all maintenance be financed and performed by communities while there is a disincentive to do this.
- Capacity building of existing WASHCOs and WUAs needs to be conducted on an ongoing basis. Where WASHCO or WUAs do not exist for rural water systems, they should be formed and trained. Capacity building needs to address population counting (crude census), tariff setting, collection, basic accounting, savings account basics, basic maintenance procedures, communication and reporting procedures with woreda water offices and the regional water bureau.
- Piloting of improvements in the systems for maintenance and repairs and wider post-construction support, that are currently led by government, to address substantial gaps in capacity and performance and funding.

Partners in the USAID Sustainable WASH Systems Learning Partnership and USAID Lowland WASH Activity, aim to continue work in these two woredas to address these priorities and build much needed capacity for sustainability at woreda level working in coordination with the government and other development partners and to share the lessons from this study with other local, regional and national water officials to increase the awareness of increasing maintenance support of rural water facilities.

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ANNEX 1. WATER BUDGETS AND EXPENDITURE

Table A1: Combined yearly water expenditure in South Ari. Numbers are in ETB. Data comes from the South Ari woreda Water, Mine and Energy Office Expenditure over 2006-2008 EFY (2013/14 - 2015/16), converted to yearly numbers. Regional data is unavailable. Note that this is expenditure, not budget.

	Woreda	NGO	Development Association[22]	Percentage of combined budget
Salary and running costs	504,510	-	-	21%
New water schemes and extensions	400,000	781,330	350,000	65%
Rehabilitation	-	101,670	-	4%
Water user association establishment and CBOs	-	225,000	-	10%
Major maintenance	-	-	-	-
Medium maintenance	-	-	-	-
Minor maintenance	-	-	-	-
Total	904,510	1,108,000	350,000	-
Total combined budget				**2,362,510**

Table A2: Combined yearly water budget in Mile woreda. Numbers are in ETB. Woreda Water Office data includes budget and expenditure for 2008 and 2009 EFY (2015/16 – 2016/17). Region and NGO budgets were obtained for 2009 EFY through expert interviews during a workshop in Afar on 12-19-2017 (GC). The regional budget is allocated to the woreda water office.

Budget item	Woreda			Region	NGO	Rounded percentage of combined budget (2009 EFY)
	2008	2009		2009	2009	
	Budget and expenditure	Budget	Expenditure			
Salary and Running cost	1,082,784	876,137	Idem	-	-	6%
New water schemes and Extension	-	-	-	3,400,000	9,400,000[23]	88%
Rehabilitation	75,000	100,000.	75,000	-	-	1%
Major Maintenance	187,500	125,000	Idem	100,000	-	2%
Medium Maintenance	137,500	75,000	100,000		-	1%
Minor Maintenance	-	-	-		-	0%
Spare part purchase	200,000	300,000	Idem	-	-	2%
Spare part Store construction	-	200,000	Idem	-	-	1%
Total	1,682,784	1,676,137	Idem	3,500,000	9,400,000	100
Total combined budget 2009	14,576,137					

Table A3: Water budget of the South Ari woreda Water, Mine and Energy Office in 2010 EFY (2017/18). Numbers are in ETB.

	Salary	Running costs	New water schemes and extension	Rehabilitation	Medium maintenance
Budget (ETB)	887,057	165,000	730,649	69,351	800,000
Total (ETB)	2,652,057				

[22] A regional Community-Based Organization (CBO) with separate branches in multiple regions.

[23] This includes 4,000,000 by AMREF, and 3,200,000 by Care Ethiopia for new construction., and several one-time emergency interventions worth 2,200,000 in total by Save the Children. These emergency interventions resulted in 2 km of pipelines, 7 hand pumps, and some support to maintenance and WASHCO training in 3 kebeles.

ANNEX 2. METHODOLOGY AND TOOLS

INTRODUCTION TO THE TOOLS

This set of Excel tools[24] was developed to support district authorities in planning and budgeting for sustainable water services in their district or municipality. To provide sustainable water services for the entire population in districts, it is important that all costs related to service delivery are taken into account. This includes costs for implementation of infrastructure, costs for operation and maintenance, costs related to administration and costs to replace the infrastructure. All these costs need to be financed. And the finances need to be planned. These tools help you to analyze costs related to each category and create a financial overview for your district.

The **Asset Registry Assessment Tool** helps you to plan for rehabilitation and other capital maintenance expenditure, based on the data you enter on the state of the infrastructure in your district or woreda. It tells you which water systems are at risk and which components you should consider replacing or maintaining.

The **Cash Flow Analysis Tool** can be used to analyze cash flows of service providers. This tool helps you to create an overview of your income and expenditure for the coming years and to analyze if you have enough resources to cover your costs and, if not, which elements in your planning you should adapt.

With the **Direct Support Cost Tool** you can calculate i) the actual direct support expenditure per person, ii) the required direct support costs per person, and iii) the gap between the actual and required direct support expenditure per person in your district.

LIFE-CYCLE COSTS AND ASSET MANAGEMENT

The set of tools is based on two key conceptual frameworks: 1) LCC and 2) infrastructure asset management.

Life-Cycle Costs (LCC) refers to all the costs that are incurred in the various phases in the life-cycle of a water services; from the implementation of the infrastructure, to its operation and maintenance, and eventual replacement. If certain costs are left out, this is sooner or later reflected in a reduced level of service and poor sustainability. The different cost-components we take into account in costing water and sanitation services are:

Capital expenditure – hardware and software (CapEx): the initial investment in the development of a water or sanitation system, referring to both the investment costs into infrastructure as well as costs related to the mobilization of the community.

Operating and minor maintenance expenditure (OpEx): recurrent (regular, ongoing) expenditure on labor (salary for staff), costs for management (transport, fuel), energy and chemicals, materials, and minor repairs of the infrastructure.

Capital maintenance expenditure (**CapManEx):** expenditure on asset renewal, replacement and rehabilitation of the infrastructure.

Expenditure on direct support (ExpDS): expenditure on both pre- and post-construction support activities directed to local-level stakeholders, users or user groups.

[24] https://nl.ircwash.org/node/82272 Note: The sheets are locked to protect the formula in the sheets. If you want to unlock the sheets to view or change the formula, you can do that by going to File > Info > and then click on "Unprotect" for the sheet you want to unlock. The password for unlocking sheets is "cbt16".

Expenditure on indirect support (ExpIDS): expenditure on macro-level support, capacity-building, policy, planning, and monitoring that contributes to sector working capacity and regulation but which is not part of a particular program or project.

The other two cost category - Cost of Capital – is not further explained here, as it is normally assumed at national level, and therefore not considered in these tools. Click here for more information about the **life-cycle cost approach**.

CASH FLOW ANALYSIS TOOL

This tool can be used to analyze cash flows of both service providers as well as service authorities (in case they are also the service provider). This tool helps you to create an overview of your income and expenditure for the coming years. You can analyze if you have enough resources to cover your costs and, if not, which elements in your planning you should adapt. To use this tool you will need general information about the community, revenue and expenses, costs of investment in the system, and information regarding the expected contribution from the community. This tool can also be used to set tariffs and to check affordability levels both for the communities as well as the service provider.

DIRECT SUPPORT COST TOOL

Direct support includes staff time, transport costs, office costs, costs of meetings and workshops, etc. In this tool we only look at direct support provided by the service authority and by NGOs. The direct support provided by users is not included. For more information about direct support have a look at IRC's direct support cost website[25]. There you can also find the benchmarks for direct support expenditure.

[25] https://www.ircwash.org/news/direct-support-rural-water-service-providers

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