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Using evidence on life cycle costs to plan for achieving the SDGs in Amhara, Ethiopia

Paper for the WASH systems symposium

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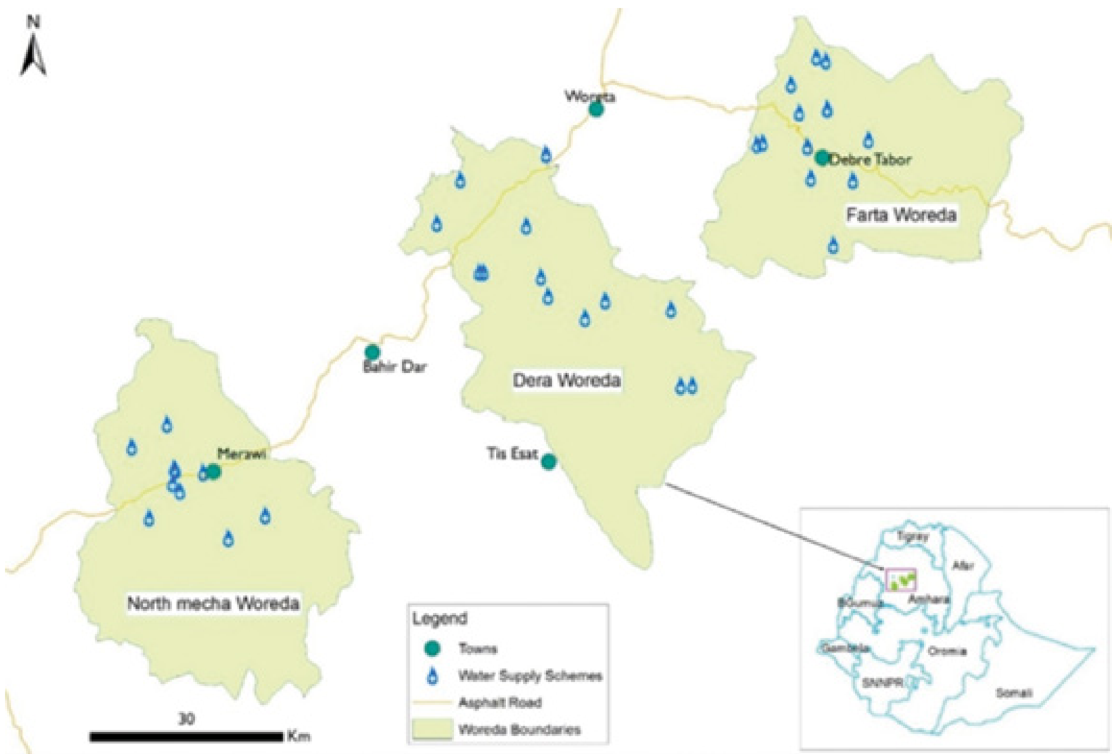
To inform a strategic planning exercise led by woreda (district) governments in Dera, Farta and North Mecha in Amhara Region State - an initiative under the Hilton Foundation's safe water strategy being implemented by the Millennium Water Alliance - a life-cycle costs analysis was undertaken. This involved data collection from a sample of 52 water schemes and communities in May 2018. The study identified up-to-date unit costs that are being used to make projections about the costs of achieving the Sustainable Development Goals (SDGs) in these districts. The budgets for water fell in the range of 1 to 2% of the total woreda budget. Out of the schemes sampled, 53% in North Mecha, 56% in Farta and 18% in Dera lacked any tariff payment system, and actual OpEx investments are estimated as close to zero. Where tariffs were levied they are relatively low, being estimated to fall within 0-1% of household income. There is potential that tariffs might be raised and still be affordable. A regional guideline proposes that 5 to 10% of the water office budget should be allocated for major maintenance and rehabilitation costs (CapManEx) but in the three districts this was below 4%. These findings are being used to improve budgeting for life-cycle costs through the strategic plans and to support advocacy to improve the financing of sustainable services.

Introduction

Life-cycle costs represent the aggregate costs of ensuring delivery of adequate, equitable and sustainable WASH services to a population in a specified area. This includes not only the costs of constructing facilities but also what it costs to maintain facilities in the short and long term. It includes costs to replace, extend and enhance facilities as well as the direct and indirect support costs associated with the enabling environment. The term life-cycle here does not refer to conventional cradle-to-grave analysis, but rather the costs to follow a continuous cycle of service delivery: from initial capital investment, to operation and minor maintenance, to capital maintenance and replacement of infrastructure that has come to the end of its useful life (which may well be extended or renewed with additional capital expenditure).

The life-cycle costs approach (LCCA) is useful to help decision makers (those involved in service planning, budgeting and delivery) and users to make informed and relevant choices between different types, levels and models of WASH services. LCCA seeks to assess the different cost components involved in service delivery: capital expenditure (CapEx), operating and minor maintenance expenditure (OpEx), capital maintenance expenditure (CapManEx), and cost of capital (CoC), expenditure on direct support (ExpDS) and expenditure on indirect support.

Figure 1. Location of focus districts (woredas)



SOURCE: AUTHORS

An alliance of NGOs - the Millennium Water Alliance - is working in Amhara region to strengthen WASH service delivery systems in three pilot districts (woredas): Dera, Farta and North Mecha (see Figure 1). This initiative under the Conrad N Hilton Foundation's (CNHF) safe water strategy includes novel longer-term strategic planning exercises that seek to influence woreda governments and the wider region to do things differently and help raise the finance needed for implementation. An LCCA assessment was undertaken to assess the cost of current water services delivery in the three woredas and to inform planning for achieving higher service levels.

These woredas each have a population size in the range 220,000-290,000 people. Each woreda is subdivided into kebeles (there are 32-39 in these woredas) with an average population of about 8000.

The first section of this paper presents the main cost components and different ways to compare costs: per infrastructure component, per service level and per service delivery model. The second section explores tariff systems, and presents results on income and expenditure per water scheme, average household income and affordability of payments.

Methodology

Qualitative and quantitative assessments were conducted with Woreda water offices, WASH committees and households (HHs) from May 07-18, 2018 at selected water schemes found in three woredas. The data collection included both primary and secondary sources. Data collection was done using focus group discussions with woreda government offices, WASHCOs and HHs.

Three types of interviews were employed. The first was organised with woreda technical experts across different sectors including water, finance and enterprise development. This focused on estimating the current replacement costs of water schemes and collecting annual budgets and expenditure of the woreda water office. The second type of interview was conducted with WASHCOs and water utilities to look at the affordability and adequacy of existing tariffs. The third set of interviews was conducted with households to cross check those responses on tariffs and affordability costs. A total of 104 interviews (with 52 WASHCOs and 52 HHs) were conducted at water schemes across the three woredas. In total, results from 23 hand dug wells, 11 shallow wells, 11 on spot spring, gravitational spring, two rural piped schemes supplied by motorised deep wells, one rural piped scheme supplied from a spring, and three urban deep wells were included in the assessment.

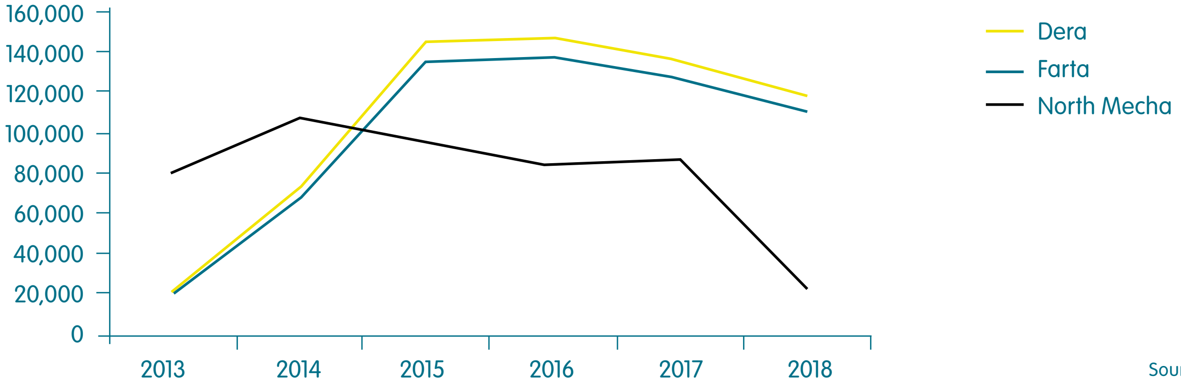
A semi-structured questionnaire was adapted from IRC's life-cycle cost analysis data collection guide. A team of 11 data collectors (with MSc or BSc degrees) was recruited. Three woreda technical experts were involved as supervisors. For two days all data collectors and supervisors were oriented and trained on the guidelines that were developed by World Vision and IRC.

Results

Actual budget allocation by woreda water offices

The budget allocated to water offices was found to be very small in all three of the woredas based on analysis of the secondary data collected from the woreda administrations finance offices. In Farta woreda, out of a total of USD 4.9 million in 2017 only USD 76,000 (1.5%) was allocated to water. In North Mecha, the budget allocated for the water sector was 1.0%. Dera woreda had the highest allocated percentage at 2%.

Figure 2. Woreda water office budgets



Source: Authors

Estimated value of existing infrastructure

The capital expenditure costs of simple rural water facilities such as hand dug wells, shallow wells and on-spot springs were collected from the woreda water offices based on bid prices from actual projects awarded to private companies. Costs of piped water schemes, deep wells and springs with distribution were collected from the regional bureau of construction and design, again based on the actual contracts awarded to private companies.

Based on the sample scheme cost that the government and implementer NGO used currently, the average cost of each technology were estimated (Tables 1 and 2). Table 1 deals with investment for small scale water supply technology and Table 2 deals with the cost of media and large-scale water technology options existing in the woreda. Greater costs for infrastructure construction was in Farta woreda with lower prices in Dera Woreda. Different factors were due to access of local materials for construction, such as sand and stone. Additionally, Dera topography is more accessible for construction than the Farta woreda.

Operation and minor maintenance expenditure (OpEx)

The cost of operation and minor maintenance expenditures (OpEx) are required every year and this is spent on tap attendants as salary, covering costs associated with committee meetings, purchase of minor spare parts and cost of water technicians. Rural communities are supposed to pay for the day to day management of water facilities and should be strong as they are expected to ensure sustainability. However, out of the schemes sampled, 53% in North Mecha, 56% in Farta and 18% in Dera lacked any tariff payment system and actual OpEx investments are estimated as close to zero. This indicated that most of the constructed schemes do not have operation and maintenance systems. From life-cycle cost system analysis USD 475 should be allocated on average for small scale water supply schemes like hand dug wells and spring development schemes. However, for the medium and large-scale water supply schemes (deep well, shallow wells and spring development with distribution systems) greater costs should be allocated for operation and minor maintenance. From the life-cycle cost analysis 5-10% of the investment costs should be allocated per scheme as operation expenditure.

Table 1. Estimation of initial or capital expenditure (CapEx) cost of water schemes by woreda in 2018 in Ethiopian Birr (ETB)

Type of water scheme	North Mecha	Farta	Dera	Notes
Hand dug well with Afridev hand pump	82,500	83,300	80,250	New construction including digging, concrete ring lining, hand pump and headworks, based on contracting out. Average depth 21 metres.
Shallow well, Afridev hand pump	275,000	285,000	265,0000	New drilling of shallow wells 40m depth (drilling, casing and well head as well as Afridev hand pump supply and installation).
Shallow well, India Mark II	285,000	305,000	_	New construction, drilling, casing, headworks, and pump supply and installation. 60 m depth.
On spot spring	79,230	84,320	80,320	Spring water source capped or developed with onsite public tap.
Roof harvesting system	150,000	163,000	143,000	
Self-supply acceleration at HH (Hand dug well, Afridev hand pump)	-	45,000	-	
Self-supply acceleration at HH (Rope pump)	14,500	15,200	13,500	

Table 2. Actual initial or capital expenditure (CapEx) cost for piped water schemes by woreda taken from 2018 outsource projects in Ethiopian Birr (ETB)

Type of water scheme	North Mecha	Farta	Dera	Notes
Deep well (large)	5,297,358	5,565,404	5,456,279	A mechanized water supply system fitted with submersible pump, using a generator/transformer/ solar power source with a pressure line greater than 2 km. Galvanized Steel pipe for 5 water points with an average distribution network length of 2.8km. With a more than 100m3 concrete ground reservoir and more than 10 water points.
Deep well (medium)	3,131,906	3,290,380	3,225,863	A mechanized water supply system fitted with submersible pump, using a generator/transformer/ solar power source with a pressure line greater than 1 km and less than 2 km. Galvanized Steel pipe for 5 water points with an average distribution network length of between 1 and 2.8km, an average of between 50m3 and 100m3 concrete ground reservoir, assumed between 5 and 10 water points.
Deep well (small)	1,805,511	1,896,870	1,859,676	A mechanized water supply system fitted with submersible pump, using a generator/transformer/ solar power source with a pressure line less than 1 km, Galvanized Steel pipe for 5 water points with an average distribution network length less than 1km, with an average of 50 m3 and less concrete ground reservoir and assumed 5 and less water points.
Structural spring (large)	4,409,341	4,632,453	4,541,621	A mechanized water supply system fitted with submersible pump, using a generator/transformer/ solar power source with a pressure line greater than 2 km. Galvanized Steel pipe for 5 water points with an average distribution network length of 2.8km. With more than 100m3 concrete ground reservoir and more than 10 water points.
Structural spring (medium)	1,509,505	1,585,886	1,554,790	A mechanized water supply system fitted with submersible pump, using a generator/transformer/ solar power source with a pressure line greater than 1 km and less than 2 km. Galvanized Steel pipe for 5 water points with an average distribution network length of between 1 and 2.8km, an average of between 50m3 and 100 m3 concrete ground reservoir, assumed between 5 and 10 water points.
Structural spring (small)	1,237,468	1,300,084	1,274,592	A mechanized water supply system fitted with submersible pump, using a generator/transformer/ solar power source with a pressure line less than 1 km, Galvanized Steel pipe for 5 water points with an average distribution network length less than 1km, with an average of 50 m3 and less concrete ground reservoir and assumed 5 and less water points.

Capital Maintenance Expenditures cost (CapManEx)

Capital maintenance expenditures include costs associated with the renewal and replacement of major parts of the rural water system such as pumps, well head, increasing well depth and well development. This may extend to full replacement of the system after its design period (e.g. 15 years). From the design period, each spare part of the water supply components and major rehabilitation should be conducted at five year intervals and cost about 15% of the total capital maintenance costs.

However, in the actual survey most of the schemes did not include capital maintenance costs, but government and NGOs allocated budget to rehabilitate the schemes at the time of non-functioning.

Direct support: distribution of staff time

Direct support costs take into account monitoring, evaluation and other management costs. This includes the supervision of new and rehabilitated infrastructure, monitoring service delivery, technical support to consumers and service providers, and planning, coordination and reporting. Woreda team technical and admin staff have a key role in providing support to kebele and village level. Direct support refers to expenditures of the technical supports provided to communities by local government and/or the expenditures of zonal water departments in backstopping local governments. This also includes expenditures associated with monitoring and evaluation of rural water services (expenditures such as daily allowances, fuel/vehicle costs and stationery materials consumed by the technical support providers). This expenditure is likely to be financed either by local governments or the zones.

Direct support costs spent per year in woreda has been separately aggregated in terms of urban and rural kebeles, the distance in kilometres, frequency of visits, number of staff involved per visit and the per diem per staff including transport. In 2017-2018, Dera woreda allocated USD 7,285 for direct support cost. However, from the life-cycle cost analysis it requires USD 12,430. Which means the allocated budget was 40% less than the required amount. Similarly, in Farta the required budget exceeded 40.4% and in North Mecha the required budget exceeded 40.6% from the actual budget that the woreda government allocated. This indicated that their government allocated only 60% of the required direct support cost.

Conclusions

In the development process of access to safe drinking water programmes, more attention was given to allocate budget for capital investment instead of allocating budget for other costs that are critically important for the sustainability of the water schemes. The life-cycle costing analysis for the selected woreda clearly indicated that there was information and practice of allocating budget for capital expenditure. However, costs like operation expenditure and capital maintenance expenditure was not considered in the development programme. Costs like direct supports were allocated by the government but the amount of allocation is very low.

The three woredas (Farta, Dera and North Mecha) allocated very limited budget which is not more than 2% of the total woreda budget for the water resources development office. As a result, all the costs related to the sustainability of the schemes are not fully covered. This will result in an increasing trend of non-functionality. Additionally, capital maintenance and direct support costs are not widely understood by local governments and are not separately considered during budgeting. Capital maintenance costs relate to major maintenance of rural water services. But generally there is poor planning for capital maintenance at water offices in both zones and regions.

Table 3. Farta estimation of direct costs provided and required (2018 Support provided by the woreda (actual/sample)

Direct support now (estimates without salaries)	Frequency of visits	Average number of staff per visit	Number of days per visit	Per diem per staff including transport	Total cost for supervision and follow up maintenance per month	Total cost per year
Actual expense of support provided						
Urban = 0 and Rural = 5 for kebeles less than 5km radius	4 days/ month	4	4	100	1600	19,200
Urban = 3 and Rural = 16 for kebeles 10-20kms radius	9 days/ month	8	9	100	7200	86,400
Urban = 0 and Rural = 11 with kebeles >20 km radius	8 days/ month	5	8	100	4000	48,000
Total = 35 kebeles						153,600
Required expense of support that will be need						
Urban = 0 and Rural = 5 kebeles less than 5km radius	6 days/ month	5	6	100	3000	36,000
Urban = 3 and Rural = 16for kebeles 10-20kms radius	12 days/ month	8	12	100	9600	115,200
Urban = 0 and Rural = 11 with kebeles >20 km radius	11 days/ month	8	11	100	8800	105,600
Total = 35 kebeles						256,800

This study showed the budget gaps for the sustainability of WASH (focus on water supply). Therefore, to insure the sustainability of the implemented water programmes in the region, as well as in the country, the government should conduct further studies on current levels of WASH expenditure and identify gaps, carry out annual financial tracking of the woreda and other partners' contribution to the WASH plan implementation. They should also review the management and financial schemes of water facilities, conduct periodic training on financial and facility management, increase funding of WASH activities and increase community contribution in-kind and cash.

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Keywords

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