CONDUCTING COST RECOVERY ANALYSIS

A practical guide

Jan Faltus, People in Need

May 2016

What is cost recovery analysis?

It is a way to measure financial **sustainability** level of a water source. Cost recovery is directly connected with sustainability. Only when management, operation and financing issues are solved, water sources will be functional in long term.

Cost recovery measures the extent that service charges and other mechanisms are adequate to meet service costs i.e. measures to what extent the service is self-financeable.

Service costs (expenditure) include the range of expenses incurred in providing water services – investment costs (referred to as **CapEx**); routine operation and maintenance costs (**OpEx**), costs of replacement/rehabilitation of major assets (**CapManEx**).

Service charges (income) include any payments made by beneficiaries which are incurred because the service is provided – these include direct payments for actual service (e.g. charges per cubic meter of water delivered); fixed charges (e.g. a charge for being connected to a water supply or drainage service, or an increased land tax because irrigation services are available).

Why conduct cost recovery analysis?

Development organizations struggle with the sustainability of their WASH sector investments. Over the last 20 years, failed hand pumps in Africa represent a total lost investment of between $1.2 and $1.5 billion, with **30-40% of rural water systems failing prematurely**, and more than half of all subsidized toilets are unused, misused or abandoned. Fewer than 5% of WASH projects are visited after project conclusion.

To avoid such scenario, before each construction or rehabilitation the analysis must be carried out and steps drawn as conclusions must be taken. These include:

- Understanding of water source management, operation and maintenance process
- Understanding of tariff (service charge) setting process
- Setting the tariff
- Setting information flow between water source (committee) and management (owner)
- Dividing responsibilities
- Training

KEY STEPS

1. Decide which cost model you will use (Cost model A or C)
2. Collect data (Income & expenditure (CapEx, CapManEx, OpEx)
3. Carry out calculations to determine financial sustainability status
4. Draw conclusions, recommendations, set or revise tariff level

Introduction

For people in the rural settings investing in, operating and maintaining WASH technologies is a major challenge. Communities cannot afford to purchase or to properly maintain infrastructures for WASH services.

Frequently, issues around affordability, subsidies and sustainability have been neglected in the design of WASH programs. Therefore, the approach to introducing WASH technologies needs careful design and follow up to ensure success and to avoid exclusion of parts of the target population. A wide range of approaches have been followed to introduce WASH technologies and to provide lasting services. These service delivery approaches apply different cost models. So far, there is no clear evidence and no general rule on how to link the introduction of specific WASH technologies with a particular cost model. Different context conditions (e.g. socio-economic context, cultural preferences, institutional capacities in place, available funds) might ask for different cost models.

Financing of full life cycle costs should be effectively covered through a combination of tariffs, taxes and transfers. Financial and funding framework defines who will pay for the life cycle-cost components, especially for the investment costs (CapEx) and which actor will bear or contribute to the costs for operation and maintenance (OpEx) or the costs for major repairs (CapManEx).[1]

1. Select cost model

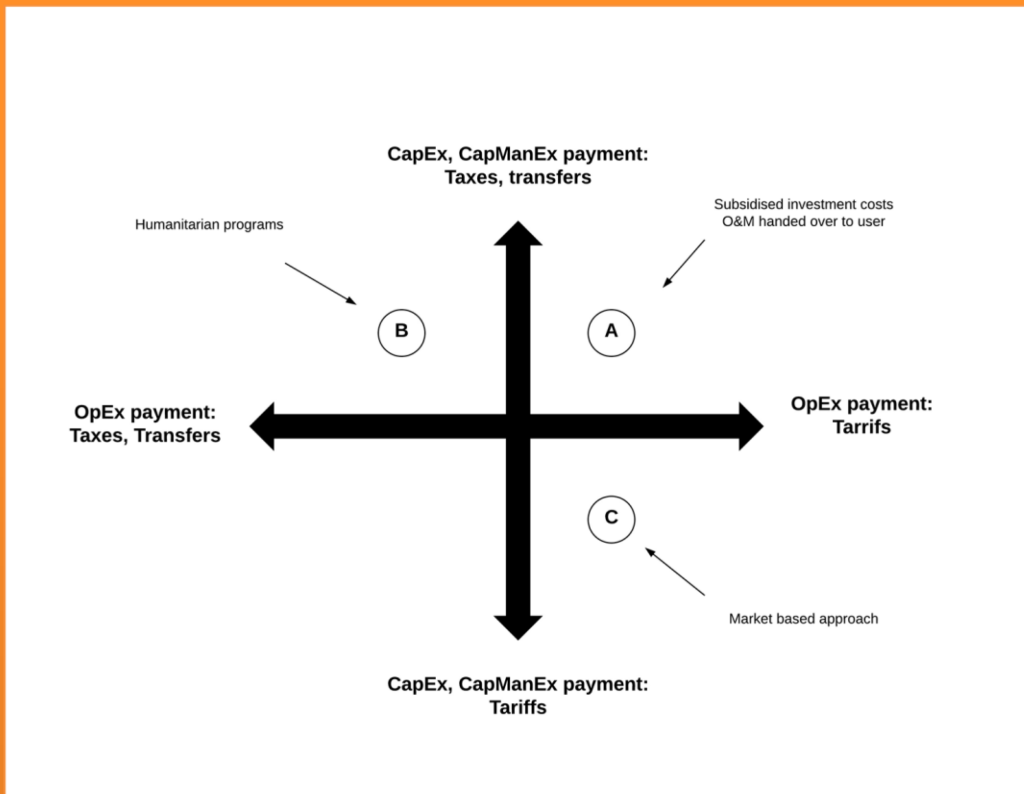
Many different cost models are used for the introduction of WASH technologies. Three often used models are described below:[2]

---

[1] *Life-cycle cost components include six different types of costs. For full glossary and description see: http://www.ircwash.org/sites/default/files/Fonseca-2010-Life.pdf*

[2] *Source: IRC WASHCOST. For more details on the life cycle costs and definition of cost components, please see: http://www.washcost.org*

Cost models used for WASH technology introduction



A) Capital-Subsidy Model

In this model, almost all capital investment costs for WASH infrastructures are subsidized, but the costs for operation and maintenance should be covered by the users themselves. Subsidies go to the buyers of a technology, but not to the producer. This is a common model for capital-intensive infrastructure that is, impossible or highly improbable, for the end user to afford, but where on-going operations and maintenance costs are covered wholly or partially by the end user through an on-demand purchase or a regular tariff. While this approach reduces the drain on public funds, tariffs for water and sanitation services rarely cover the full lifecycle costs (including Capital Maintenance Expenditure (CapManEx) and direct and indirect support costs.

B) 100% Subsidy Model

In this model, it is the public sector or the donors that assume full responsibility for the technology introduction, its upfront capital costs, on-going minor (OpEx) and major maintenance costs (CapManEx) and support costs. Long-term sustainability of this model has to be assessed carefully. Nowadays, cost model B should not be used, except in situations which are pure emergency.

C) Zero Subsidy

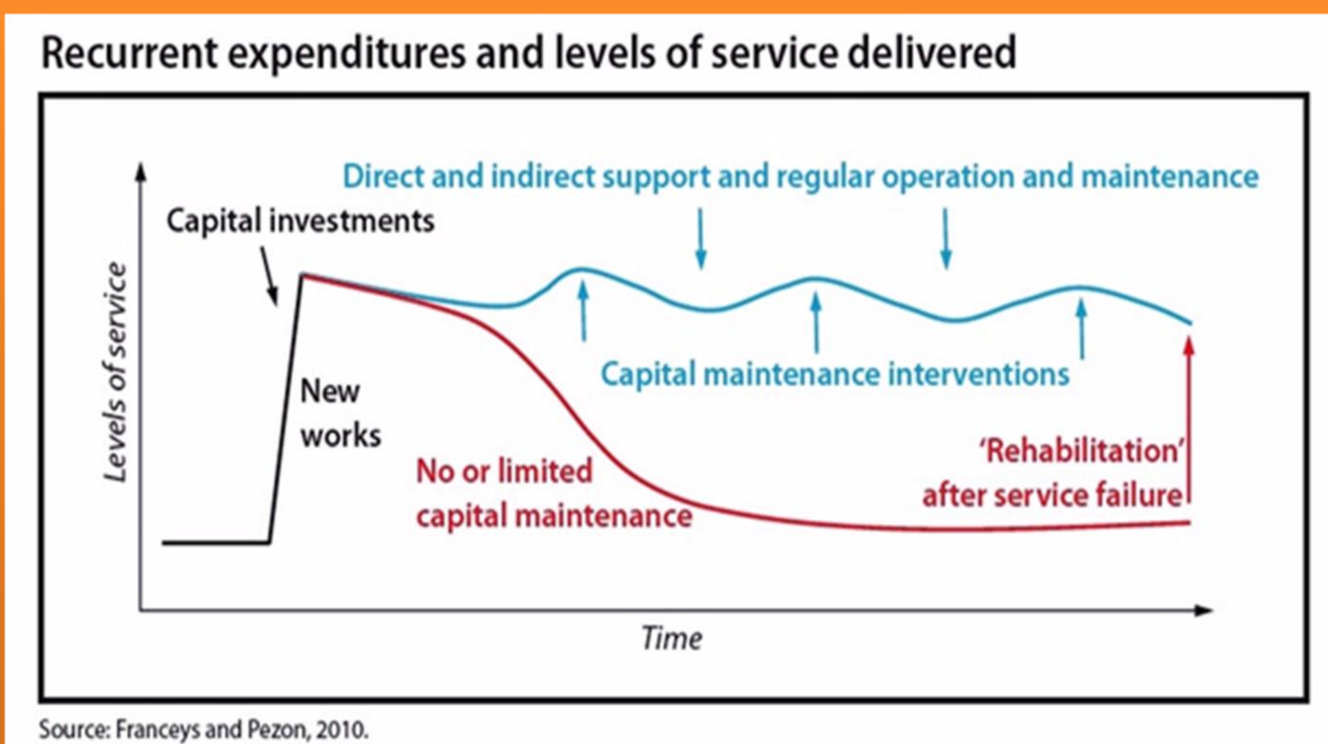
In a zero-subsidy approach, all costs are covered by the users. This approach bears the hope of increasing ownership and accountability, to avoid the problems associated with donor-dependence, weak public finances or institutions and sustainability issues. Here, the role of the state is mainly focused on creating a suitable environment for market creation, e.g. through stimulation of demand and developing capacities of local business, but also through monitoring and controlling quality of products and level of services. In the so-called market-based approach, the technologies and services are provided through the private sector on a commercial basis. The users are clients and not beneficiaries. All products are provided through a private sector-based supply chain.

In reality, all cost models can be found, although models A and C are prominent. No cost recovery analysis is necessary if model B is selected. For model A charges usually covered by subsidies (taxes or transfers - investment costs to finance CapEx) need to be combined by charges paid by users (tariffs).

Cost model	Type of action
A	Proper analysis of reliability of income covered by subsidies needs to be done and included in the analysis
B	No analysis
C	Full cost recovery analysis to be done

Recurrent expenditure: keeping services going

Timely rehabilitation ensures limited interruption and prevents a return to unsafe water sources and the environmental risks of open defecation. Maintaining service levels also depends on qualities and capacities of the people and institutions that provide the services: all of which have costs attached. By understanding how each component affects overall costs and budgeting, we can plan for sustainable and appropriate levels of service delivery (blue line in the figure). For example it is clearly more cost effective to replace a US$ 500 hand pump every five to ten years, than to wait for it to fail and then develop a new US$ 10,000 borehole.



As described above, not always we need information about full cost recovery. Sometimes we only need to know running costs (OpEx) that is expenditure and compare it with income generated or secured from other sources (CapEx and CapManEx are covered by taxes and transfers). In other cases no subsidies are envisaged (especially for small local sources like shallow hand dug wells) and we need to calculate full cost to be covered by users.

3Ts

In order to achieve sustainable water delivery service we must know which types of income called 3Ts (Taxes, transfers and tariffs - if existing) apply in our case and these must be greater than costs.

Taxes – are funds channeled to the sector originating from governments

Transfers – are funds from external sponsors, banks, donors, NGOs

Tariffs – are contributions made by users

This guide will show how to conduct analysis for **Cost model A** (only OpEx are paid by users via tariffs, other costs are paid by subsidies from government – *taxes*- or other actors - *transfers*) as well as **Cost model C** (Zero subsidy i.e. full cost recovery). Model B – 100% subsidy – used only in humanitarian context is not considered here.

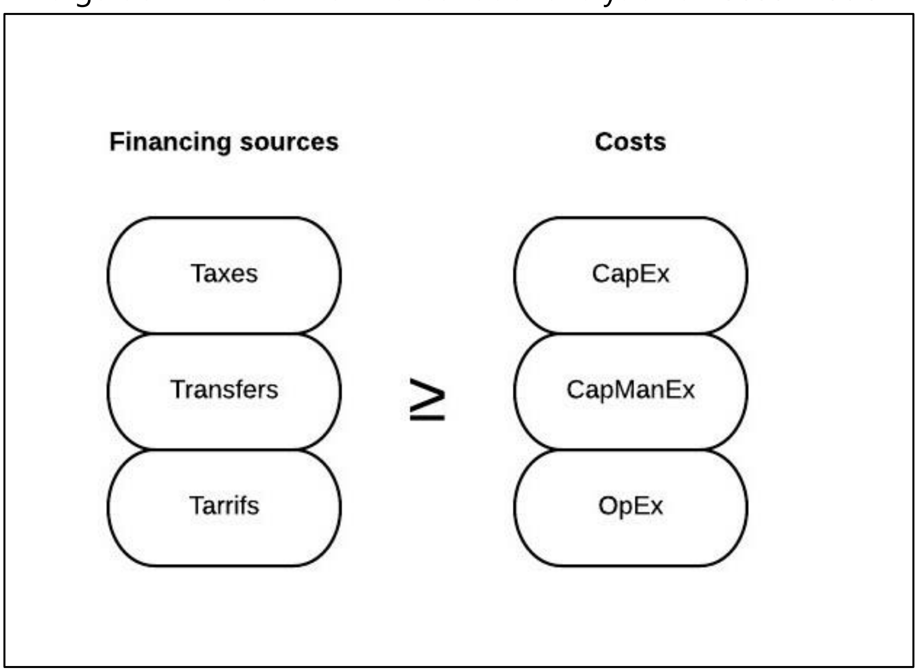


Fig 3 Financing sources and recurrent expenditures for sustainable water service delivery

STEP 1: PLANNING AND DATA COLLECTION

Correct and precise data is essential prerequisite for good cost recovery analysis. Data should be collected from reliable sources. Collected data should be cross checked and verified.

Cost model A

The main purpose of this model can be setting the ***tariff*** to be paid by users at the level that *daily operation* is self-financed thus self-sustainable.[3] It is used for motorized schemes where there is payment for power, minor repairs and salaries.
The calculation built around cost of production and sale of 1 m^3 (1 000 liters) of potable water at the point of delivery (public water point).
The questions to be asked:

- How much time does it take to produce (pump) 1m^3 to the point (elevated accumulation tank) from which the water is distributed by gravity (freely)?
- How much energy does it take to transport water to the elevated point (tank)?
- What is the unit cost of energy (electricity - kWh or fuel - l/hr)?
- What is average power consumption of the pump and fuel consumption of the generator?

Here is the list for data that needs to be collected for model A cost recovery analysis:

Cost type	Type of information (expenditure)	Unit	Where we can get it?
OpEx	Pump power consumption	kWh	Pump specification sheet
	Generator fuel consumption	Lit/h	Generator specificatio sheet/practice
	Price per power unit	ETB	EELPA, petrol station
	Price per 1 h of power	ETB	calculate
	Pump discharge	l/s	Pump specification sheet
	Reservoir volume	m3	WASHCO, administration, own measurement
	Time to produce 1 m^3	second	Measure (time to fill the tank/volume of tank (m^3)
	Sale price 1m^3	ETB	WASHCO
	Salaries (monthly sum)	ETB	WASHCO (salary of operator, guard, tap attendant)
	Per diem/allowances (monthly sum)	ETB	WASHCO (travel costs including per diem)
	Minor repairs (monthly sum)	ETB	WASHCO (small repairs, replacements, oil, battery)
	Other costs	%	WASHCO (estimate how much water is not paid for)

[3] *For this model, users are not expected to pay for full cost recovery. The cost of motorized schemes is so high that payment for full cos tis unrealistic. CapEx and CapManEx are paid from different sources*

Cost model C

The purpose of this model is to determine *Life cycle cost* of a particular water source (scheme).[4] That means **all** costs connected with construction and maintenance of the source must be included. These costs are called: Capital Expenditure (CapEx) - Initial costs to develop or extend a service or 'Hardware', Capital maintenance expenditure (CapManEx) - Asset renewal and replacement cost - occasional and lumpy costs and Operating and minor maintenance expenditure (OpEx) - regular expenditure.

We need to collect two types of data, price of each part of the system and its lifespan. Here are the questions to be asked:

- How much a single component costs?
- What is the life span of each component?
- What amount of water will be distributed (sold) daily?

Here is the list for data that needs to be collected for model C cost recovery analysis (OpEx costs are identical as for model A):

Cost type	Type of information (expenditure)	Unit	Where we can get it?
OpEx	*Pump power consumption*	kWh	Pump specification sheet
	Generator fuel consumption	Lit/h	Generator specificatio sheet/practice
	Price per power unit	ETB	EELPA, petrol station
	Price per 1 h of power	ETB	calculate
	Pump discharge	l/s	Pump specification sheet
	Reservoir volume	m3	WASHCO, administration, own measurement
	Time to produce 1 m^3	second	Measure (time to fill the tank/volume of tank (m^3)
	Sale price 1m^3	ETB	WASHCO
	Salaries (monthly sum)	ETB	WASHCO (salary of operator, guard, tap attendant)
	Per diem/allowances (monthly sum)	ETB	WASHCO (travel costs including per diem)
	Minor repairs (monthly sum)	ETB	WASHCO (small repairs, replacements, oil, battery)
	Other costs	%	WASHCO (estimate how much water is not paid for)
CapEx[5]	*Each component cost (drilling, pump, reservoir, distribution*	ETB	BoQs, invoices, budgets, sale, work and supply contracts

[4] *In reality, full cost of life cycle cost can be paid by user fees only in case of simple sources like hand dug/shallow wells or gravity schemes*

[5] *For non-exhaustive list pls refer to relevant table in Calculation chapter bellow.*

	system…)		
CapManEx[6]	*Each component´s annual repair and replacement cost (pump, reservoir, distribution system…)*	ETB/year	Experience, calculation based on average life span of each component

Type of information (income)	Unit	Where we can get it?
Source users	Number	Own data collection, WASHCO, administration
Daily water needs per person	litres	Household survey, own data
Amount of water distributed daily	litres	WASHCO, water meter readings
Current price per unit	Litre, jerry can, m3	WASHCO, users
Daily income real	ETB	WASHCO accountancy, record books

STEP 2: CALCULATION

Cost model A

After we have all data together, we need to calculate how much it costs to produce 1 m^3 of water.

Bellow is an example of data filled in the table:

Item	*Electricity*	*Diesel generator*
Pump power consumption per 1 h	10 kW	12 lit
Price per power unit	0,27 ETB/kW	16,25 ETB/liter
Price per 1 h of power	2,7 ETB	195 ETB
Pump discharge	5 l/s	5 l/s
Time to produce 1 m^3	200 sec (0,055 h – 3,3 mins)	200 sec (0,055 h – 3,3 mins)
Price to produce 1 m^3	0,15 ETB	10,7 ETB
Price of water 1 m^3 (users)	10,- ETB	20,- ETB

Now, we know that it costs 0,15 ETB for schemes powered by electricity to produce 1 m^3 and 10,7 ETB per generator powered schemes. But at this stage only cost of power is included. Now we need to include other expenditures and those are:

- Salaries
- Per diem/allowances
- Minor repairs

[6] Ibid.

- Other costs (free water, leakages)

Again bellow is an example of data filled in the table:

Model scheme: 1 000 m^3 of water distributed monthly (generator scheme):

Expenditure:

Item	Sum ETB
Fuel cost (m3 x 10,7)	10 700,-
Salaries (monthly sum)	1 000,-
Per diem/allowances (monthly sum)	500,-
Minor repairs (monthly sum)	500,-
Other costs (2% of water distributed)	214,-
Total Expenditure	**12 914,-**

Income:

Item	Sum
Price per jerry can (ETB)	0,5
Litres in jerry can (liter)	25
Price per 1 000 l (ETB)	20
amount distributed monthly (m^3)	1 000
Monthly income (ETB)	**20 000,-**

As we can see from model scenario above the income is 20 000,- ETB monthly while expenditure is 12 914,- ETB. Clean profit is then 7 086,- ETB monthly (35,4%). Reccomended monthly profit is **30 – 40%.** If the profit is smaller, there is a risk of insufficiend funds to be available for operation. If the profit is higher, there is probably unnecessary burden on users (high cost of water).

Cost model C

As soon as we know life span of each component and capital and /or recurrent cost we can calculate what should be tariff or fee paid by users to ensure 100% cost recovery.

In terms of **costs (expenditure)**, here is an example of components and other data we collected:

Type of cost	Component	Annual frequency of cost (life span)	Total Cost (ETB)	Annual cost
CapEx	Borehole drilling (200m)	30	1 000 000	33 333
	Pump, control panel, discharge pipe purchase and installation	10	400 000	40 000
	Generator/transformer purchase and installation	10	400 000	40 000
	Generator/transformer house	30	200 000	6 667
	Elevated reservoir construction ($20m^3$)	10	120 000	12 000
	Distribution pipeline and water points (3 WPs + 1 000m of HDPE pipe)	30	150 000	5 000
CapManEx	Generator (transformer), Service L1	0,5	2 000	4 000
	Generator (transformer), Service L2	1	10 000	10 000
	Site Maintenance	10	15 000	1 500
	Tap Replacement	0,33	720	2 160
	Check Valve Replacement	0,33	1 600	4 800
	Water Meter Replacement	2	1 300	650
	Gate Valve Replacement	0,50	600	1 200
	Generator Replacement	20	400 000	20 000
	Pump Replacement	15	400 000	26 667
	Reservoir Replacement	5	20 000	4 000
	Pipe Replacement	10	5 000	500
OpEx	All (transport, per diem, fuel...)	1	154 968*	154 968
Total annual cost	**367 445**			

** The figure is based on monthly operation costs multiplied by twelve months. See calculation for model A above.*

We see that we need to collect 367 445,- ETB every year in order to achieve full cost recovery. The next step is to calculate annual **income**:

Daily income needed	1 007
Number of daily users	1 000

Jerry cans per user	2
Calculated Price per jerry can (tariff)	0,5
Daily income calculated	1 000

From the table above we see that WASHCO needs to sell approximately 2 000 jerry cans daily for 0,5 ETB daily to achieve full cost recovery. However in reality, the sources are not functional every single day of the year and not always 2 000 jerry cans are sold.

STEP 3: TARIFF SETTING

There are two possible situations: 1) The scheme is new and we are setting new fee amount for the community or 2) we want to revise running system[7].

For situation Nr. 1) we set tariff that is usual in the area and that is agreed upon by community for testing period (usually 6 months). During testing period all reporting data are collected (see template in annex 1). After testing period we continue as in case of situation Nr 2).

For revising running system (situation Nr 2) we need to collect data recorded in the past (ideally last 24 months – 2 years)

Cost model A

If, after OpEx cost recovery calculation (described above in Step 2) the profit is not within 30 – 40% the tariff needs to be readjusted. Organize community meeting and discuss the issue.

Cost model C

In case we are setting tariff for full cost recovery, we should set up the system of handling the finance (Water User Association accountancy as per government regulation). Money collected will be used in longer time horizon and bank account must be opened. The tariff shall be calculated according to example above and shall be revised every two years. It is necessary to follow functionality of the scheme and amount of water distributed. Usually amount of water varies according to season (tends to be smaller during rainy season).

[7] *Please remember that quite often tariff is a matter of political decision in the area or a matter of custom – usual amount paid in the area that does not have practical justification.*