Life-cycle costs approach for WASH services that last

Life-cycle costs in Ghana

Briefing Note 2: Post-construction costs of water point-systems

August 2011

WASHCost project partners have developed a methodology for costing sustainable water, sanitation and hygiene (WASH) services by assessing life-cycle costs and comparing them against levels of service provided. The approach has been tested in Ghana, Burkina Faso, Mozambique and Andhra Pradesh (India) and Mozambique. The aim of the life-cycle costs approach is to catalyse learning to improve the quality, targeting and cost effectiveness of service delivery.

In Ghana, Kwame Nkrumah University of Science and Technology (KNUST), International Water and Sanitation Centre (IRC), and Community Water and Sanitation Agency (CWSA) are using the WASHCost Life-Cycle Cost Approach to identify the true costs of providing sustainable Water, Sanitation and Hygiene costs in rural and peri-urban areas. These series of briefing notes have been developed to explain the methodology, share the findings, and draw out the implications for policy and practice in the Ghana's WASH sector.

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Front page photo
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WASHCost is a five year action research project investigating the cost of providing water, sanitation and hygiene services to rural and peri-urban communities in Ghana, Burkina-Faso, Mozambique and India (Andhra Pradesh). The objectives of collecting and disaggregating the cost data over the full life-cycle of WASH services are able to analyse cost per infrastructure and service level, and to better understand the cost drivers and through this understanding to enable more cost effective and equitable service delivery. WASHCost is focused on exploring and sharing an understanding of the true cost of sustainable services (see www.washcost.info).

Life cycle costs in Ghana:
Post-construction costs of water point-systems

This briefing note no. 2 focuses on findings from WASHCost research relating to the recurrent or post-construction costs of providing rural water services based on boreholes fitted with hand-pumps. It is part of a series of notes drawing on research work carried out by the WASHCost project that used the life-cycle costs approach (LCCA) to quantify the magnitude of different cost components for delivering sustainable rural water services in Ghana.

Introduction

The rural point-systems using handpumps remain by far the most common method for rural dwellers in Ghana to access water. In fact, 6,668,484 rural people have been served so far with handpumps as against 1,816,891 people served under small-town piped water systems (CWSA, 2009). The findings presented in this note come from analysis of data collected using surveys of 75 individual rural water point-systems (boreholes with hand-pump and limited mechanised systems) belonging to 31 communities spread over three regions of Ghana (Ashanti, Northern, and Volta). WASHCost Briefing Note No. 1 provides further details on the sampling methodology used. Table 1 below shows the summary of field surveys.

Table 1: Summary of the surveys

Regions	District	No of rural communities	No. of WPS	No. of Households interviewed in rural communities
Ashanti	Bosomtwe	10	26	488
Northern	East Gonja	15	30	153
Volta	Ketu South	6	19	391

Method for cost calculations

The various life cycle cost elements of providing sustainable rural water services (see figure 1, and for more detail WASHCost Briefing Note No. 1) were collected, to the extent possible, for the 84 systems and adjusted to current (2009) Ghana Cedi values using GDP deflators obtained from the World Databank (World Bank Group, 2010) and then to US Dollars using the average 2009 exchange rate. (1USD$=GH¢ 1.4132).

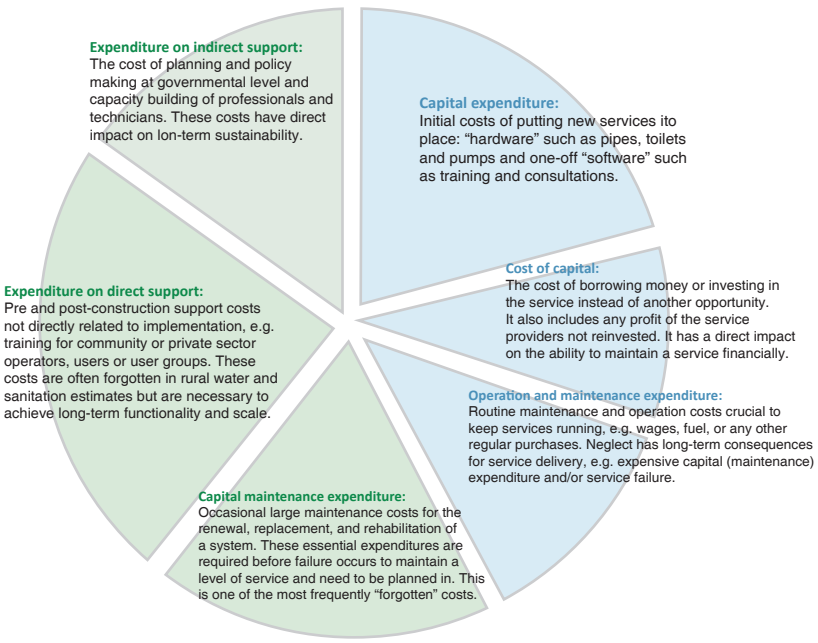

Figure 1: Main components of Life Cycle Costs for Sustainable Services

Average **operational** and **capital maintenance expenditures** were converted to an annual per capita cost using the design population (i.e. 300 persons per facility based on Community Water and Sanitation Agency (CWSA) norms) and the actual population in 2009 from CWSA records.

Direct Support Costs are based on actual WASH related salaries and operational expenditure reported by the CWSA (head and regional offices) and District Water and Sanitation Teams. The cost data were then converted to CWSA and district per-capita figures based on the respective 2009 populations. CWSA expenditure over 6 years (2004 to 2009) was turned into per capita cost based on current (2009) rural population representing 55% of national population.

Indirect Support Costs were based on reported actual expenditure of the Water Resources Commission (WRC) over 3 years (2005 to 2007), and turned into per capita cost based on national population.

Cost of providing Rural Water Services

WASHCost undertook a purposive sampling strategy to work in 3 regions, and three districts within 31 communities and looking at 75 water point-systems. This data is presented for each district. Where it is felt to be acceptable, the data is aggregated to come up with findings for the national level. Identifying capital expenditure data for the identified boreholes in the three study districts was particularly challenging. Many boreholes are old, were constructed by a range of agencies, and no records remain from their construction. There also remain some challenges to obtain data on more recent boreholes. Reliable data on capital investments could only be identified for 15 out of the 75 systems . These problems are now being addressed by a secondary effort to collect capital investment data at the national level.

This note therefore focuses on the post-construction cost elements of operational and minor maintenance, capital maintenance, and support costs (direct and indirect).

Operational and minor maintenance expenditure

Operational and minor maintenance expenditure was measured using actual recorded expenditure from 53 water point-systems. These were the systems for which at least some records existed or WATSANs were confident in stating that no expenditure had been made – for the other 22 systems no records existed. Actual operational expenditure at current cost (2009 year) **ranges from US$ 0 to 102** per facility per year, with a **mean of US $ 40 per year** (median US$ 21). Of the 53 systems, 12 reported spending no money on operational expenditure at all. Annual operational costs per person based on actual (observed) population are from US$ 0 to US$0.72, with a mean US$ 0.15 (median US$ 0.07). It can reasonably be assumed that the generally low expenditure reported on operations and minor maintenance is linked to the high observed levels of non functioning systems (29% - for more details see Briefing Note No. 6). Table 2 shows the range, mean and upper quartile figures recorded for facilities in each of the three districts.

Two very high values of US$ 200 and US$ 365 per facility per year were removed while making these calculations. However, given the very low reported operational expenditure, which is likely to also reflect poor record keeping, it is likely that these two ‘outliers’ actually provide the most realistic indication of the level of community expenditure on operation and maintenance necessary to ensure sustainable services. This is because these facilities were amongst the most stressed visited and therefore suffered frequent breakdowns and repairs. One of them is the only facility in a community of over 1000 users, with frequent visits by tourists, religious groups etc. while the other is the most patronised in its locality because of perceived better taste and quality.

Table 2: Operations and minor maintenance cost of rural water point-systems

District (Region)	Number of WPS	Cost per facility per year (US$)			
		Min	Max	Mean	Upper quartile
Bosomtwe (Ashanti)	23	0	102	40	63
East Gonja (Northern)	23	0	85	15	19
Ketu South (Volta)	7	0	49	18	27

Capital Maintenance Expenditure

Capital maintenance expenditure refers to money spent on asset renewal or replacement and general rehabilitation of the water system. For boreholes with handpumps, capital maintenance was taken as being a hand-pump replacement or hydro-fracturing. Only 14 out of the 75 water point-systems visited had undergone hand-pump replacement since construction and of these, costs were identified for 3. These three cost 800 US$ in 2005, and over the 25-26 years of their service life gives an average capital maintenance cost of approximately 83US$/year when cost deflators are used.

The age at which handpumps were replaced (useful life) are shown in Figure 2 below, and range from 2 to 23 years, with a mean age at replacement of 17 years.

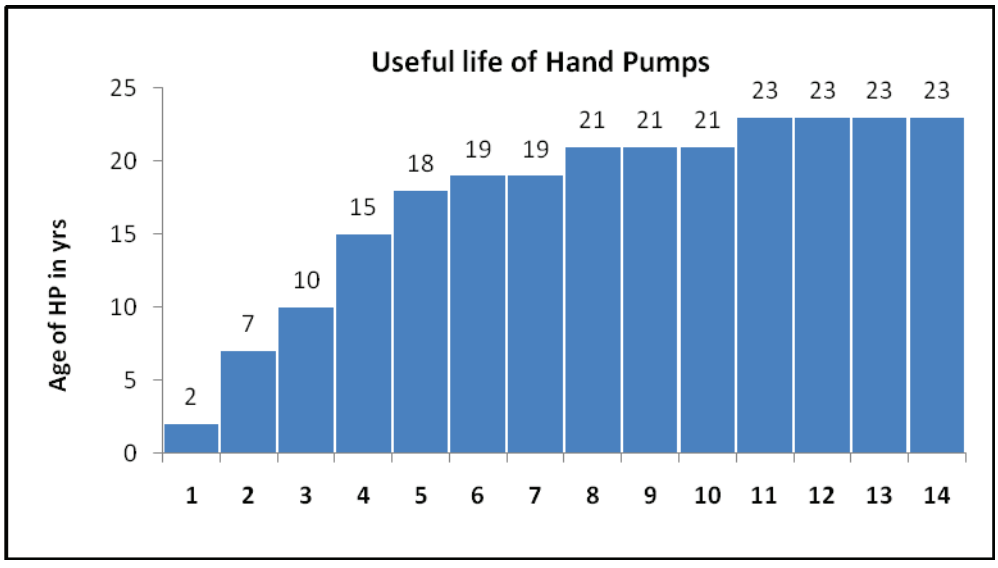

Figure 2: Useful life of handpumps

Figure 3 shows the age distribution of all the pumps in the study area. Looking at this it is clear that replacement is ad-hoc and not preventative. In other words, handpumps are only replaced if they fail completely.

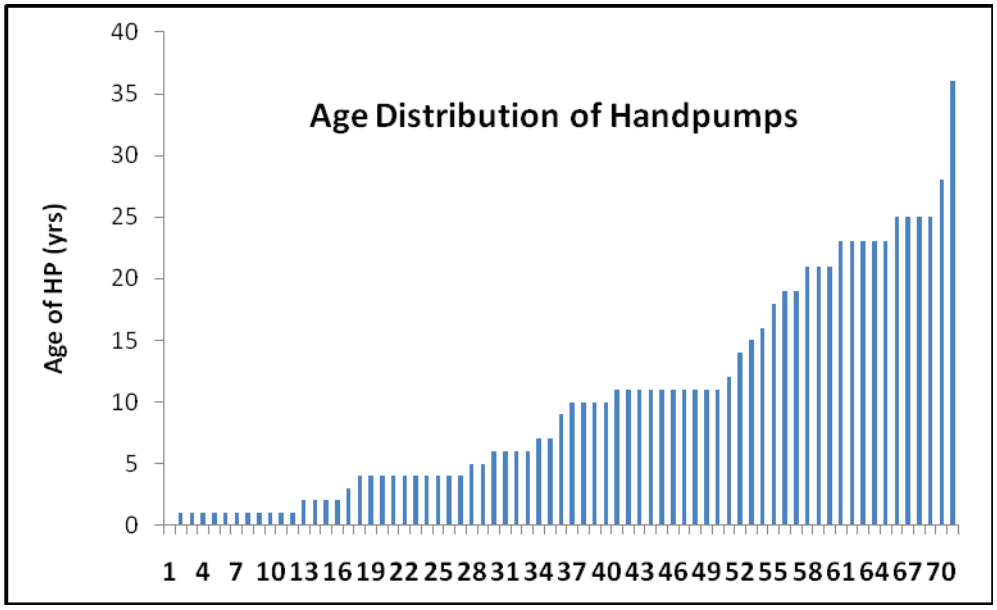

Figure 3: Age distribution of handpumps

Direct and Indirect Support Costs

Direct support costs refer to the costs of supporting service providers: in the case of rural point-systems, the WATSANs. In theory, this should be provided almost exclusively by District Assemblies (DAs) through their District Water and Sanitation Teams (DWSTs) and District Works Department (DWDs). However, in practice given the important role of CWSA, the costs of regional CWSA offices have also been included in calculating direct support costs. The data used to calculate this comes from CWSA and DAs' (DWSTs) annual reports. It is likely that it significantly under-reported project linked spending that does not go through the Agency's books. Total per-capita investment in direct costs was calculated by dividing the costs of CWSA offices by the national rural population, and district WASH expenditure by the district population.

Table 3: Direct support cost for WASH services

District (region)	**Direct Support Costs per capita/yr (US$)**		
	National (CWSA offices)	District (DWSTs)	Total
Bosomtwe (Ashanti)	0.32	0.24	0.56
East Gonja (Northern)	0.32	0.07	0.39
Volta (Ketu South)	0.32	0.15	0.47

The total expenditure per capita on direct support costs in the three districts is low but comparatively high for Bosomtwe. This reflects the generally very low level of post construction support activities from District Assemblies (DAs) levels in particular. It seems likely that this has a direct bearing on the lack of investment in operation and maintenance as communities are left to fend for themselves without any effective technical or institutional support. CWSAs budget is also not adequate to provide the needed post construction support to either districts or communities while DAs are not monitoring the activities of the WATSANs or the functionality of systems – as they are supposed to do.

Experience from other countries suggests that costs of providing the needed technical assistance could be expensive compared to current levels of spending. A step in addressing this challenge could be the incorporation of the life cycle costing approach in the District Water and Sanitation Plan (DWSP), with a particular focus on budgeting for operational costs of providing direct support to service providers.

Conclusion

WASHCost's survey of 75 water point-systems belonging to 31 communities in 3 districts in three regions representing Ghana's main physico-socio regions has shown a number of important findings. These include:

- Expenditure on operation and maintenance is low, likely contributing to high observed rates of non-functionality in the areas covered by the research.
- Not enough is being spent on direct support costs (at approximately US$ 0.5 per person per year).
- Capital maintenance is not being undertaken in a systematic manner, and expenditure on capital maintenance is very low.
- In terms of the methodology, the approach produced robust findings on different post-construction life-cycle expenditure, even if much of this was negative (in that expenditure had not taken place). However, because of the high number of old systems and other challenges, initial capital investment data was lacking.

In summary, it can be said that direct post-construction support from CWSA (regional) and DAs is poorly funded and WATSANs are therefore not getting the needed technical assistance or oversight to ensure effective service delivery. At the same time, and likely related to the lack of oversight, many communities are not undertaking expenditure on operations, maintenance, repairs and rehabilitation.

It is important to underline that the lack of investment in post-construction support and subsequent high levels of non-functionality and sub-standard service delivery represents wastage of scarce financing for capital investment (see briefing note no. 4)

Recommendations for policy and practice

District Assemblies are owners of rural water supply assets, and are formally responsible for their rehabilitation. They are also expected to provide backstopping technical support to communities (WATSANs) in terms of technical support, monitoring, and financial oversight. Yet they are unable to fulfil this role, largely due to lack of funds for field related activities. To address this it is recommended that:

- More effort needs to be put into making DAs aware of their roles and responsibilities and DAs operational budgets need to be adequately financed.
- District Water and Sanitation Plans (DWSP) should clearly include the entire life cycle cost related to rural water service provision using point-systems
    - In particular, post construction support to WATSANs and mechanisms to address capital maintenance when required are critical.
- Planned systematic replacement of handpumps every ten years would cost in the region of US$ 150 per facility per year (or US$ 75 per facility per year if replaced every twenty years) and could be a good way to address the problem

The Community Water and Sanitation Agency has an essential role to play in providing post-construction support and regulation to District Assemblies, as well as ensuring monitoring is carried out. As with DAs they are currently not financed sufficiently to fulfil this role. It is therefore recommended that CWSA's operational financing for post-construction support services be increased. In addition, CWSA should provide guidance to DAs on the routine replacement of hand pumps as a key part of capital maintenance expenditure for rural water service delivery.

WASHCost briefing note series

Briefing notes relating to survey based work in Bosomtwe, Ketu South and East Gonja

Briefing note 1: Background and Methodology

Briefing note 2: Post-construction costs of water point-systems

Briefing note 3: Costs of rural and small town sanitation services

Briefing note 4: Access to services in rural areas and small towns

Briefing note 5: Access to sanitation services

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Briefing note 8: Uses and sources of water in rural areas

Briefing notes from desk or case study based work:

Briefing note 9: Case study of twelve small towns in the Central Region

Briefing note 10: Case study of Oyibi multi-village scheme

Briefing note 11: Cost drivers capital investment in small-town pipe schemes

Briefing note 12: Direct support costs to rural WASH service provision

Plate 1: Abandoned rural water point-system

Plate 2: A typical rural water point-system under repairs

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