Life-cycle costs approach for WASH services that last

Life-cycle costs in Ghana

Briefing Note 6: Functionality of rural water systems in Ghana

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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). 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), IRC International Water and Sanitation Centre, and Community Water and Sanitation Agency (CWSA) are using the WASHCost Life-Cycle Costs Approach (LCCA) to identify the true costs of providing sustainable WASH services 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 Ghana's WASH sector.

This Briefing Note No. 6 discusses the ***functionality of rural water point systems*** specifically boreholes fitted with handpumps in rural communities in Ghana.

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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:
Functionality of rural water systems in Ghana

Introduction

Rural water coverage has been increasing steadily but there are concerns with high levels of non-functional water point systems fitted with handpumps. The definition of coverage does not give any indication as to whether the system is functioning or not. Thus, even though increased coverage means that a lot of rural communities have been provided with water facilities, the reality of high levels of sub-standard functionality, including high frequency and long duration of breakdowns, means that water users experience poor and unreliable services. This is a clear indicator that increased rural water coverage does not necessarily result in an increased proportion of the rural residents enjoying sustainable water services.

The WASHCost research project in Ghana collected data from 75 boreholes fitted with handpumps in three districts, from the Northern, Ashanti and Volta regions, belonging to 31 rural communities. The data was analysed using the Life Cycle Costs Approach (LCCA) to quantify the cost of providing water services, as well as to measure the water service levels received by the 1,273 households surveyed and to examine the functioning of the water systems.

This briefing note focuses on the findings from WASHCost research relating to the ***functionality of boreholes fitted with handpumps***, which is the most common technology for providing rural water services. The briefing note also examines how payment for water services affects the functionality of the water system and resultant effects on water service levels.

Functionality of rural water systems

The functionality of rural water supplies is defined as the percentage of improved water facilities found working or functional over the entire sample at the time of visit. At the time of the visit by the WASHCost team, 71% of the rural water point systems (boreholes fitted with handpumps) were functional over the entire sample. However, functionality at the district level varied from 63 % to 85% of the water systems (see table 1).

Another indicator that was used was reliability. According to the Community Water and Sanitation Agency (CWSA) norm, a water system is reliable if it works at least 95% of the time. Using the definition from CWSA, a water system is considered reliable if it suffered cumulative downtime of less than 18 days in the last 12 months prior to the field visit. The reliability and functionality of the water systems are shown in Table 1 below.

Table 1: Functionality of water point systems (boreholes with handpumps)

District	Number of communities visited	Number of facilities identified	Functionality of the water system (%)	Reliability of the water systems	Percentage (Number) of Communities accessing water for free
Bosomtwe (Ashanti)	10	26	85%	85%	10% (1)
East Gonja (Northern)	15	30	63%	70%	40% (6)
Ketu South (Volta)	6	19	63%	58%	67% (4)
Total	**31**	**75**	**71%**	**72%**	**35% (11)**

Reliability and functionality are closely related. While functionality reports on the status (working or not working at the time of visit) of the facility, reliability reports on delivering of service at least 95% of the time. In theory the reliability criteria should translate into a functionality of 95% of the water systems at any given time.

Link between payment methods and functionality

The relationship between level of functionality and method of paying tariffs reveals some interesting findings that could inform further studies on functionality. The district with the highest levels of system functioning also had the highest proportion of the communities paying for water, with the majority using the "pay as you fetch" method. The two districts (East Gonja and Ketu South) with relatively lower levels of functionality had significant proportions of their communities (40 % and 67 % respectively) not paying for water. Further investigation on a larger sample could explore this trend and examine the exact relationship between payment method, functionality and reliability. The details of payment methods are shown in Table 2.

Table 2: Water functionality and payment method

District (Region)	Functionality (%)	Reliability of water facilities	PAYMENT METHOD (percentage)		
			Pay as you Fetch	Monthly payment	Do not Pay
Bosomtwe (Ashanti)	85%	85%	80%	10%	10%
East Gonja (Northern)	63%	70%	27%	33%	40%
Ketu South (Volta)	63%	58%	33%	0%	67%
Overall	71%	72%	45%	19%	35%

Link with service levels

Water services are considered acceptable if users receive a minimum of a basic service defined as: a quantity of 20 litres per person per day (l/c/d); within 500m walking distance; with the service available for more than 95 % of the time. The functionality of the water system in the district and the water service received by the inhabitants in the district are as shown in Table 3 below. The results show that the districts with high levels of systems functioning also have relatively higher levels of water service delivery (partly because reliability is one of the key indicators for measuring service levels).

Nevertheless, even in Bosomtwe district with its high level of functionality and reliability (both 85%), only 34% of respondents met the norms for a basic level of service as defined by CWSA. The reasons for this are explored in **Briefing Note 4** in this series.

Table 3: Functionality and water service received

District	Functionality (%)	% of the respondents receiving acceptable water service
Bosomtwe District (Ashanti)	85%	34%
East Gonja (Northern)	63%	10%
Ketu South (Volta)	63%	13%
Overall	**71%**	**23%**

Functionality and cost of providing water services

The recurrent cost of providing water services and the levels of functionality in the study districts are shown in Table 4 below. The results show that the district with the highest levels of system functioning is spending more on operational and minor maintenance per facility as well as on direct support costs, particularly at the district level, for monitoring and backstopping the WATSANs.

Table 4: Functionality and actual cost for providing the services

District	Functionality (%)	Mean OpEx per facility per year (US $)	Expenditure on district level direct support - per facility per year (US $)
Bosomtwe District (Ashanti)	85%	40	168
East Gonja (Northern)	63%	15	117
Ketu South (Volta)	63%	18	141

From the study, 14 water point systems had their handpumps replaced as of the time of the visit. Table 5 shows the functionality of water facilities that had their first handpump replaced at the time of the field visit. The average age at which the handpump were replaced was 18 years. Ketu South has the least number of replacements compared to the other two districts.

Table 5: Functionality of facilities with first handpumps replaced

District	No. of HPs replaced	Age of replacement	functionality of facilities
BD	6	2-23	50%
EGD	6	10-21	67%
KSD	2	7 & 18	100%

The replacements were as a result of adhoc project interventions through Non-Governmental Organisations and Government agencies like Community Water and Sanitation Agency. Thus, there are no systematic or planned mechanisms of handpumps replacements of rural water point systems and replacements are also not happening.

Conclusions

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

- The functionality of the rural water systems ranges from 63% to 85% while the reliability of the system ranges from 58% to 85%.
- A district with high levels of systems functioning has better services.
- Users living in the district with the highest functionality (85%) were generally paying for water and more is spent on the recurrent costs of service provision with respect to both (operation and minor maintenance) and (expenditure on direct support costs).

Recommendation

The analyses indicate that higher functionality of systems is important in ensuring that those using the systems have good service. Capital maintenance and operation and minor maintenance, which keep these water point systems with handpumps running, are very important. It is recommended that planning of water point systems with handpumps should be executed with the costs of future maintenance in mind to prevent systems breakdowns. i.e. planning to account for all life-cycle costs.

In relation to the above point, users of the systems with the highest functionality and thus highest service levels were generally paying for water. This is an indication that systems where users have a high willingness and ability to pay are better placed to spend on operations and minor maintenance and hence remain sustainable. It is recommended that more detailed research be made into relationship between the payment method, functionality and reliability. Furthermore research on the efficiency and acceptability of different payment schemes and their effect on revenue generation would provide insights into the level of cost recovery from the users.

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

Briefing note 6: Functionality of rural water point-systems

Briefing note 7: Poverty and access to services

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

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