

# Life-cycle costs approach for WASH services that last



## Life-Cycle Costs in Ghana

Briefing Note 10: Case Study of Oyibi multi-village  
water schemes

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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), 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. This briefing note presents findings on cost drivers of capital investment of small towns piped water schemes and draws out the implications for policy and practice in 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](http://www.washcost.info)).

# Life cycle costs in Ghana:

## Case Study of Oyibi multi-village water schemes

WASHCost briefing note 10 reports on findings of water service delivery to Oyibi, a peri-urban community using the Oyibi water scheme, a multi-village water supply piped scheme (MVS). It examines the cost of providing water and sanitation services by the service provider, household expenditure on water and sanitation service, water revenue generated from the water facility and service levels received by the inhabitants.

### Introduction

The Community Water and Sanitation Agency (CWSA) water coverage for 2008 was 62% for small towns and 56% for rural areas (CWSA, 2009). The small towns' water schemes (both single and multi-village types) are becoming more popular especially in the small towns and peri-urban areas where the main utility provider is not able to serve. Increasingly, piped schemes serving a number of communities (multi-village schemes) are being used for communities with difficulties in getting raw water. It is believed that the use of small town water supply has tremendous potential for community water coverage. The cost of providing sustainable water services from multi-villages schemes is not sufficiently understood. Therefore this note uses the Oyibi small town water supply scheme, serving a number of communities, as a case study to provide understanding on the cost of providing water and sanitation services. The findings in this note come from analysis of data collected using surveys covering water system management and households served under the Oyibi small town water supply scheme in the Tema Municipality and Greater Accra region of Ghana (see Figure 1 below).

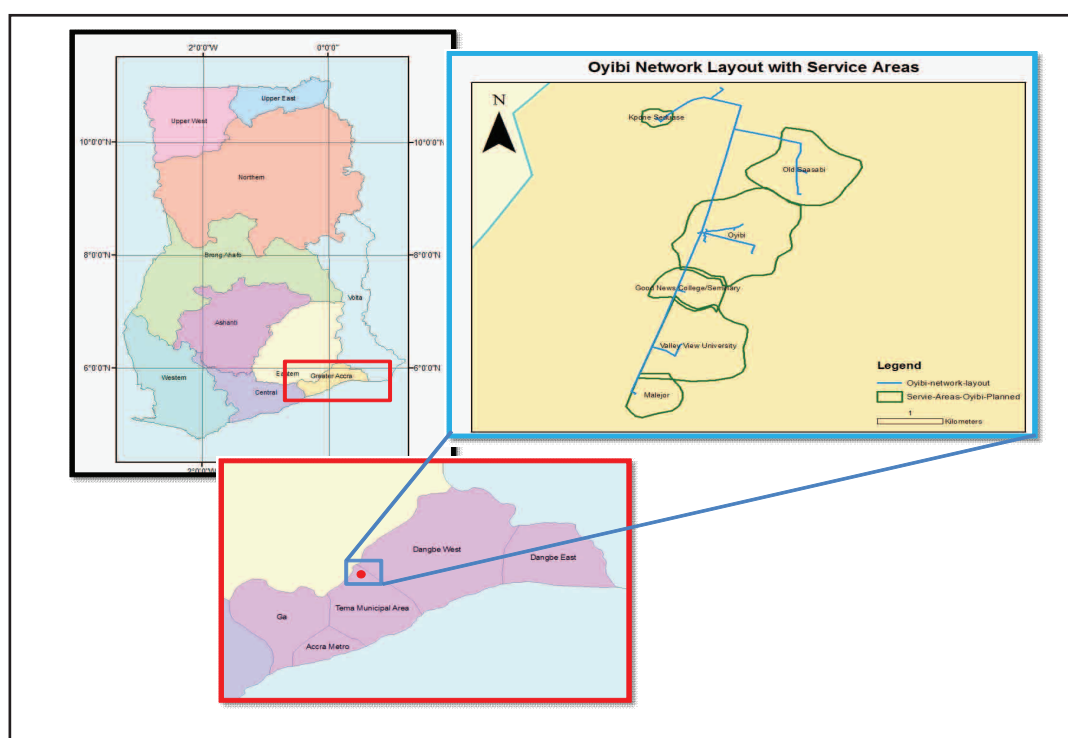


Figure 1: The map of Oyibi area water supply scheme

The Oyibi multi-village water scheme constructed in 2003 serves seven (7) communities and two (2) educational institutions with a designed population of 6,651. The communities which were visited are Kpone Seduase, Old Saasabi and Ayensu River Estate (ARE) with populations of about 514, 130 and 485 respectively. While Kpone Seduase and Old Saasabi are classified as rural, Estate (ARE) and the educational institutions could be classified as peri-urban. The system relies on two (2) boreholes as water sources, each of which is located at Kpone Seduase and Old Saasabi.

### Framework for Analysis

The respondents of the three communities were grouped as poor and non-poor based on their total household cash expenditure. The poverty line was pegged at the 20th percentile of the average household cash expenditure of all respondents within the communities (Kpone Seduase, Old Saasabi and Oyibi Estate), which was GH¢481 per cap/yr based on the year 2009. Those with total expenditure below this figure are the poor and those spending above this figure are the non-poor. The cost and water service analyses were based on the WASHCost framework developed for WASH costing and service levels ladder (see WASHCost briefing notes 1 and 2 for more details). The direct support cost is based on CWSA actual expenditure (from 2004 to 2009) and actual WASH related expenditure of Tema Municipal Assembly, which includes emoluments, monitoring and evaluation and administrative.

The data collected in the study covered the cost (life-cycle cost components) of water service delivery and this was compared against the water service received by the users through a household survey. The cost data were obtained from the Community Water and Sanitation Agency<sup>1</sup> (CWSA), Tema Municipal Water and Sanitation Team (TMWST), and System management team (technical) employed by the water board. A total of 66 household surveys were conducted, 47 from two rural communities and 19 from Ayensu River Estate – a peri-urban community.

### Poverty Profile

Most of the rural respondents (74%) were found to be poor based on the 20th percentile of household expenditure analysis whereas no poor was found among the peri-urban (Estate) respondents. The average household sizes for the rural and peri-urban communities are 6 and 4 respectively though sample sizes differ. However, the average household sizes for the poor and non-poor are 8 and 5 respectively.

The average annual household cash expenditure per capita in the rural communities is US\$ 575 and ranges from US\$ 355 to US\$ 936 while that of the peri-urban community is US\$ 1,273 and which ranges from US\$ 413 to US\$ 1,967 (see Figure 2). Average household cash expenditure by the peri-urban community is therefore about two times that of the rural communities.

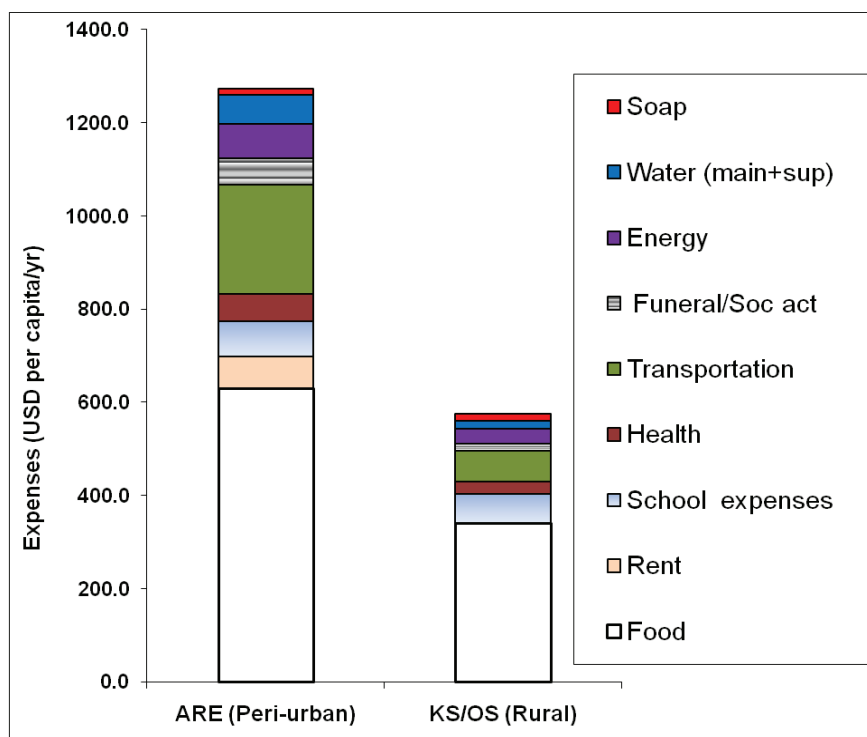


Figure 2: Peri-urban and rural household respondents cash expenditure

<sup>1</sup> CWSA is the government agency responsible for facilitating community water and sanitation service delivery

### Sanitation service

Most rural inhabitants (70%) do not have access to toilet facilities while all respondents (100%) in the peri-urban settlement have access to improved sanitation service. The un-served rural inhabitants access sanitation by various means including public toilet, sharing neighbours' latrine and also open defecation (about 10% practice this as well). All peri-urban respondents use water closets which were provided as part of the initial construction of the house and claim that they have not incurred any maintenance costs yet.

The expenditure of hygiene related activities (soap usage) are shown in Figure 3 below.

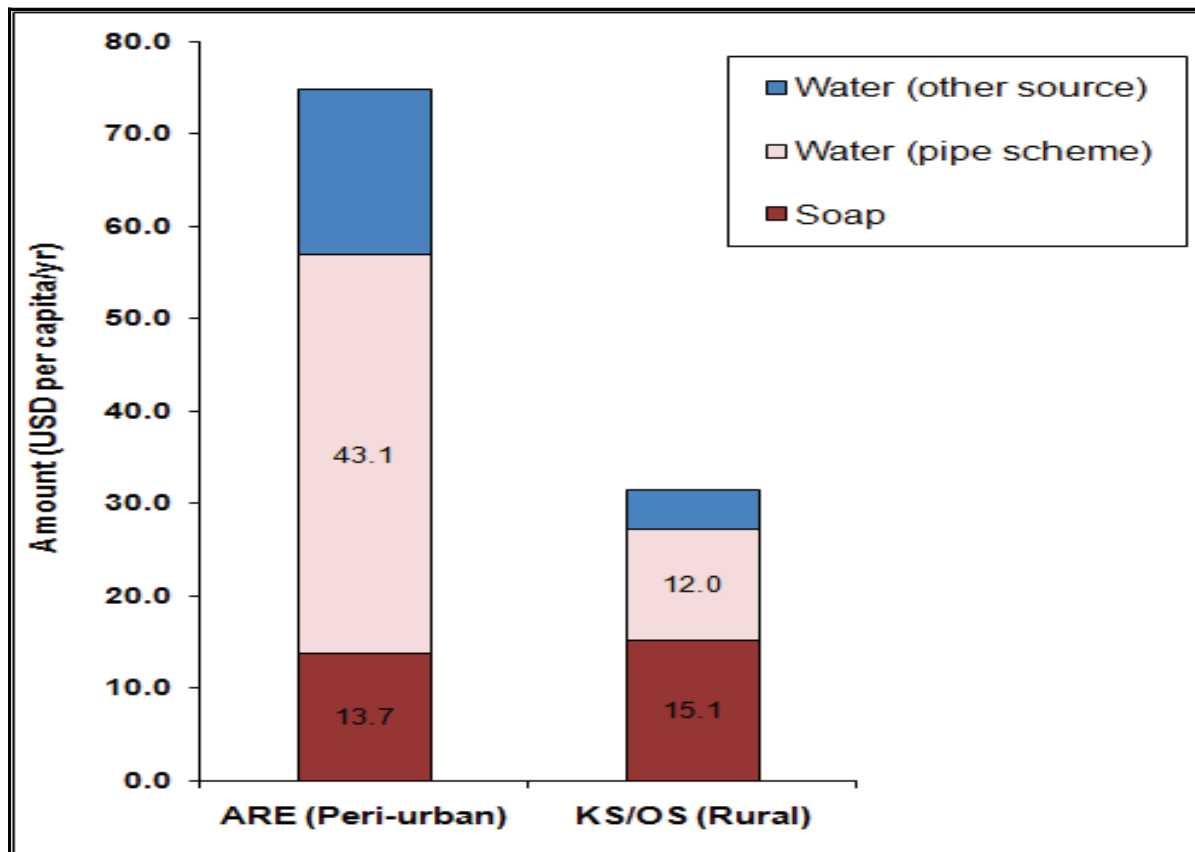


Figure 3: Household expenditure on water and soap

The percentage of household expenditure on water is 3% of the household expenditure for both the poor and non-poor households. The expenditure on “soap” refers to the aggregate cost of detergents and normal soap (used in homes) since respondents could not give separate cost figures for the two. The percentage of expenditure on “soap” by the poor is twice that of the non-poor (i.e. 4% and 2% respectively). Also the poor households (all rural users) pay more for soap than the non-poor households. The cost is likely to come from the predominant use of normal soap (by the rural users) instead of detergents required by the hard-water (as was their claim) from the system, especially laundry activities.

### Water service

The data collected from the households on water service levels were matched with the WASHCost service level matrix which was developed based on CWSA norms (see Briefing Note 1). The Table 1 below shows the percentage of respondents falling above and below the CWSA norms.

Table 1: Water service levels received by user groups

	Groups	Service level	Percentage of respondents (%)		
			quantity	Distance	crowding-with-reliability
<b>All</b>	All users	Acceptable (basic or better)	74	100	100
		Limited	26	0	0
		no service	0	0	0
<b>Settlement type</b>	Rural	Acceptable (basic or better)	56	100	100
		Limited	44	0	0
		no service	0	0	0
	peri-urban	Acceptable (basic or better)	100	100	100
		Limited	0	0	0
		no service	0	0	0
<b>Poverty status</b>	Poor	Acceptable (basic or better)	46	100	100
		Limited	54	0	0
		no service	0	0	0
	non poor	Acceptable (basic or better)	80	100	100
		Limited	20	0	0
		no service	0	0	0

The results show that a little over half of the rural population (56%) receive acceptable (basic or better) service level with respect to quantity of water, while 44% receive sub-acceptable service (limited or no service), thus water quantity less than 20l/c/d. All the respondents in the peri-urban community receive acceptable (basic or better) service. The poverty analysis reveals that 46% of the poor and 80% of the non-poor households access more than 20 l/c/d of water which gives an acceptable (basic or better) service. This means that majority of the non-poor are able to access adequate water quantities for their daily activities.

There was 100% of acceptable service with respect to crowding of water facilities in both rural and the peri-urban communities because the population per water point (stand pipe) was less than the 300 as stipulated by the CWSA norm. Thus, service level by crowding was acceptable (basic or better) in the rural and peri-urban communities. The service reliability was also acceptable (basic or better), which means, the system works 95% most of the time. However, while all the rural respondents (100%) said that water is available more than 95% of the time, the peri-urban users (70%) indicated occasional interruptions with water flow.

The rural communities access water over a distance which is less than 500 meters from the stand pipes giving a service level which is acceptable (basic or better). The service level is also acceptable (basic or better) for the peri-urban area as water was accessed through house connections.

Since all the indicators are treated as equally important, the overall service level is therefore influenced by the service in terms of quantity as shown in Figure 4 below. Thus, all peri-urban respondents are receiving acceptable service compared to 60% of their rural counterparts. From the economic groupings, less than 50% of the poor are receiving acceptable service compared to the 80% among non-poor users. Also 74% of all respondents are receiving acceptable (basic or better) service.

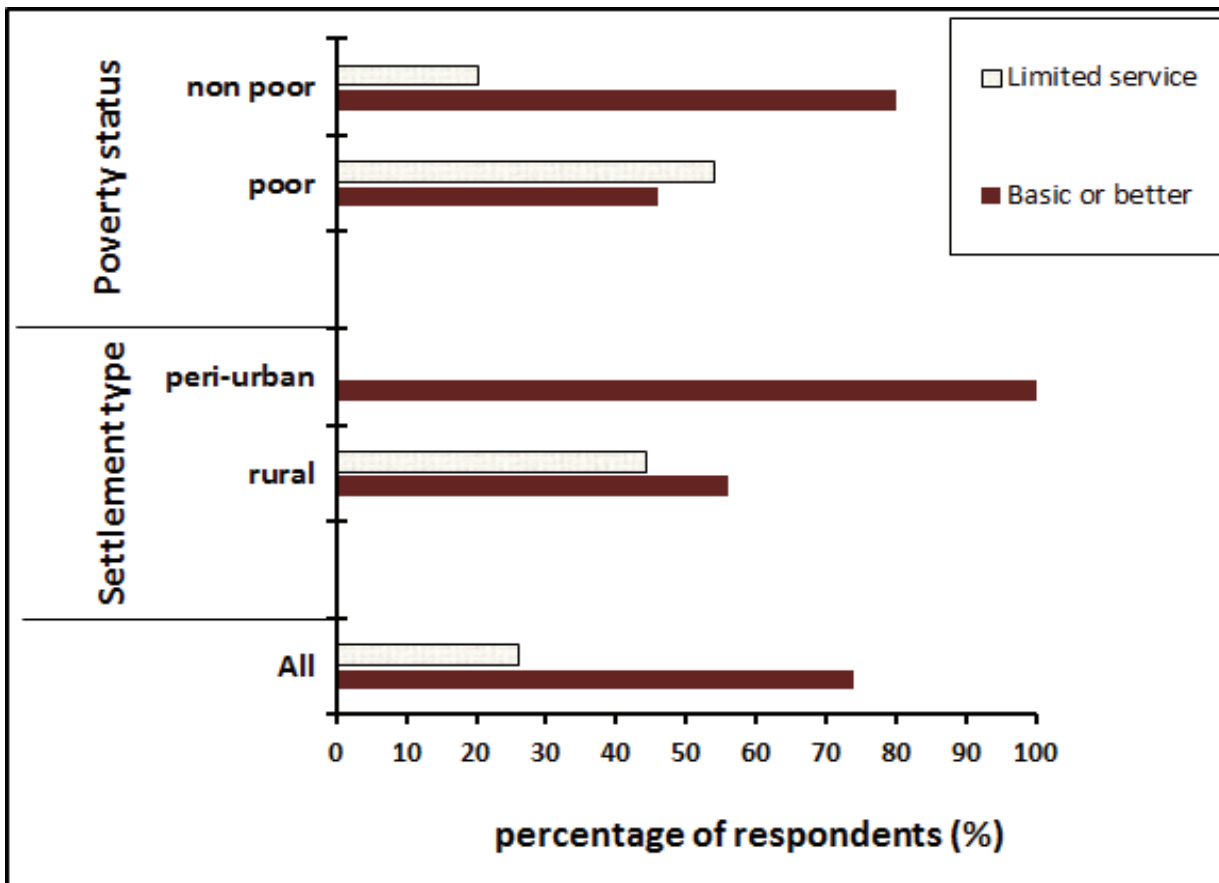


Figure 4: Overall water service levels for user groups

Water from the multi-village pipe scheme is used for various domestic and productive activities like drinking, washing, bathing, including use in canteens, hair saloons etc. Water use for the respondents in the rural areas is as follows: 46 % use the water for drinking and 24% use it for productive activities. In case of the peri-urban dwellers only 9% use the water for drinking and 2% use it for productive activities. Moreover, users access supplementary water sources which are rainwater, sachet water and water from ponds (limited to the rural dwellers).

### Cost of water service

The water schemes has 474 metered connections, a total length of transmission mains is 8.6 km, a total length of distribution main is 4.5 km and concrete tank of capacity 120m<sup>3</sup>. The initial capital expenditure (CapEx) of the water system at current cost (2009) is US\$ 1,216,809 (US\$ 186 per capita). This is the cost for water source development, pipe networks, storage tanks, mechanical components, public standpipes, power sources, water board office and other installations. However, after 5 years of operation, the management of the water system has been able to connect the system to the national power grid and has also initiated water board offices expansion, all at a cost of US\$ 9,968 (US\$ 1.5 per capita) as CapEx enhancement (CapExnh).

The total recurring cost which in this case includes operation and minor maintenance expenditure (OpEx), capital maintenance expenditure (CapManEx), and expenditure on direct support (ExpDS) at current cost is approximately US\$ 11 per capita/yr as shown in Figure 5 below.

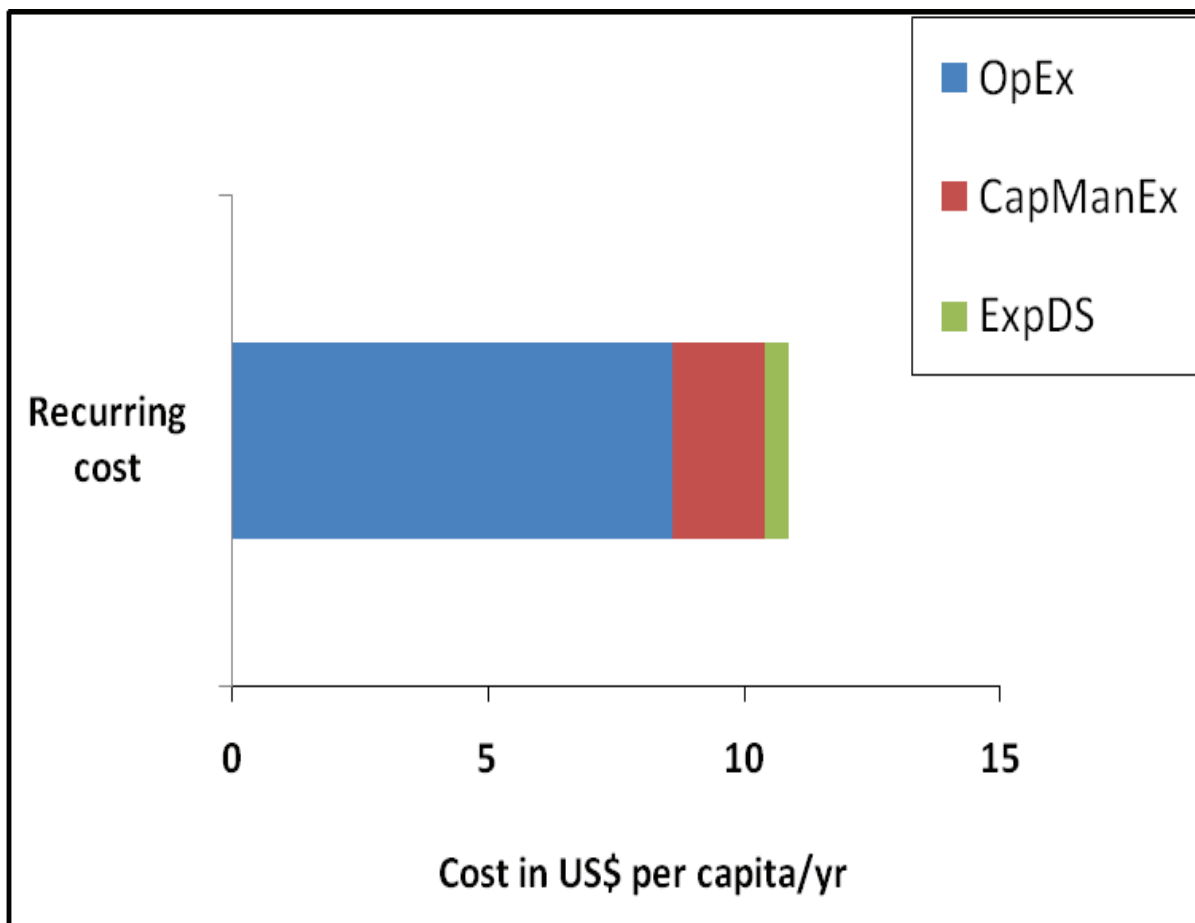


Figure 5: Total recurrent cost

Clearly, the operation and minor expenditure (OpEx) is the most significant recurrent cost which is about five (5) times that of capital maintenance expenditure (CapManEx). The average annual OpEx for the five years is US\$ 56,165 which is the cost of salaries and allowances, energy, minor repairs and maintenance, water quality testing and other administrative activities. The capital maintenance expenditure has been comparatively small with an annual average value of US\$ 11,673, more likely because the system is relatively new and not demanding intensive major repairs. This capital maintenance cost is from generator set servicing, meter replacements, and other major repairs. The inadequate direct support cost (approximately US\$ 0.5 per cap/yr) is made of the expenditure from CWSA and the District (Tema Municipal Assembly) WASH related activities.

### Revenue

The total annual revenue mobilised at current value (2009) is US\$ 308,000 (US\$ 15 per capita/yr) based on 2006 to 2008 records. The revenue takes care of all expenditures on the water system management such as administrative cost, operational and maintenance expenditures, etc. From the revenue and water system expenditure figures (recurrent cost and capital expenditure enhancement), the system has a surplus of about US\$ 3 per capita/yr for future expenditure on capital maintenance which could be significant.



## Conclusion

The initial investment cost for the Oyibi water scheme is US\$ 186 per person and the recurrent cost for running the system is about US\$ 11 per capita/year. The system is currently delivering acceptable service (basic or better) to 74% of users. However, only a small proportion of poor users (mostly in the rural users) are receiving acceptable (basic or better) service compared to the non-poor and peri-urban users. The average quantity of water use by the peri-urban community is about four times that consumed by the rural communities. Few people (9%) use water from the scheme for drinking in the peri-urban community since sachet water is mostly used for drinking. The case is different for the rural communities where about 50% of the inhabitants use water from the scheme for drinking purposes. The quantity of water used by both the poor and non-poor in the rural and peri-urban communities ranges from 27 l/c/d to 103 l/c/d.

From the revenue mobilization, the water scheme has a surplus of about US\$ 3 per capita/yr which is encouraging for future expenditure on capital maintenance. The water system's management seem committed to maintenance and are investing in assets for better service delivery.

The average household cash expenditure by the rural communities (US\$ 575/c/yr) was less than that of the peri-urban community (US\$ 1,273/c/yr). The poor and the non-poor all spend 3% of all their household expenditure on water which is less than the 5% normally recommended suggesting that the water tariffs might not be expensive to the poor users.

On hygiene, most rural respondents (70%) do not have access to toilet facilities unlike respondents of peri-urban (100%) who have access to acceptable (basic or better) toilet facilities in their homes. Also the poor spend more on soap (an indicator of hygiene related activities) than their non-poor counterparts.

## Recommendations for policy

The following recommendations are made, based on this study:

- The WASHCost methodology provides a strong assessment framework for effectiveness and efficiency of small town water supply interventions adopted in the sector. The use of the WASHCost framework in the subsector will inform planning and decision making on financing and sustainability of small towns' water systems.
- CWSA and District Authorities should be financially resourced through Water and Sanitation Plans (WSP) with clear budgeting for the various life-cycle cost components especially direct support cost for monitoring and evaluation of maintenance and management for existing and new facilities.



## 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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