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Approach to cost information in the WASH sector in Colombia

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Abstract

According to the last census held in 2005, the national coverage rates for piped water systems and sanitation services in Colombia were 83.4% and 41.1%, respectively. There are, however, significant differences between urban and rural areas where the service coverage rate is 47% for water supply and 18% for sanitation access. The analysis by the national government entities suggests that the resources available in this sector have increased, but the local governments budgets allocated to water and sanitation investments have had low impact.

This paper presents the results of the case study entitled "Approach to cost information in the WASH sector in Colombia", which analyzes cost components in the investment programs executed by local and regional entities and two communities in a peri-urban and a rural area of the city of Cali. Information about costs has been collected using the WASHCost cost terminology.

Unit cost information is a valuable and pertinent issue because it is needed to determine the financial resources that the country needs in order to: improve WASH services in rural areas; evaluate the efficiency of investments; and make progress in the social control and transparency practices in the sector.
Although the case study explored a small sample, it was a first step to recognize how cost information is being used in Colombia. One of the relevant conclusions is that there is no disaggregation of costs in the available budgets of national entities, and there are no specific items allocated to WASH services. Also, information at regional and local level is not systematized; it requires data analysis to obtain some cost components.

The analysis of cost components allows for an approximation of some variables which in turn have an influential effect on the components themselves. In the water supply programs, the investment purpose, existence of scale economies, population size, and location can affect the cost indicators. On the other hand, the comprehensiveness of investments is a key factor in understanding the differences in the unit cost indicators for sanitation.

Keywords

Colombia, Sanitation, Unit costs, Water supply.

INTRODUCTION

In Colombia, the last Census from 2005 reported a national coverage average of 83.4% for piped systems and 41.1% for sewerage systems. However, there are major differences in the country according to the municipality category as well as between urban and rural areas. The service coverage in rural areas is 47% for water supply, and 18% for sanitation.

Although the existence of an institutional and a policy framework has been created since the establishment of a decentralization process in the 1980s, monitoring the execution of the financial resources revealed that these investments had low impact on the improvement of water and sanitation services in the country (Attorney General's Office et al., 2005).

Because of this, in the last years, control and regulatory tools have been implemented on a national level with the aim of to improving efficiency in the provision of water and sanitation services. However, the lack of information and the complexity of the existing information management system limited the use of these tools to local government staff and service providers in small towns and rural areas.

At the moment, unit cost information in the country is not monitored or reported, but it is clearly needed, especially by the government entities that are now developing the Water Department Plans throughout the country. The backwardness in the WASH service and the data limitations identified by this study show the importance of improving knowledge on this topic. The national government uses the World Bank's (WB) cost indicators to estimate the viability of investments and to quantify financial resources to achieve the MDGs. However, the results of this study found a large variation in unit cost indicators in the local and regional programs which mean that the WB indicators need to be revised and adjusted to the Colombian context.

This paper summarizes the findings of the case study carried out in Colombia. The purpose was to learn about the state of unit cost information in Colombia and to identify the life-cycle costs in two communities of the city of Cali. The communities were deliberately selected to cover the rural and peri-urban areas and to include a set of criteria proposed for the WASHCost Project. Data collection also followed the WASHCost cost methodology[1].

METHODOLOGY

Life-cycle costs (LCC) represent the aggregate costs of ensuring equitable and sustainable delivery of WASH services to a population in a specified area (Fonseca, 2010). The case study reviewed some of the range of cost components that are part of the life cycle costs in WASH services: Capital Expenditure Costs (CapEx), Operation Expenditure Costs (OpEx), and Capital Maintenance Expenditure Costs (CapManEx)[2].

Table 1 presents a description of the cost components analyzed in the case study.

[1] The WASHCost project is led by the International Water and Sanitation Center (IRC) of The Netherlands.
[2] The case study used the cost component terminology of the WASHCost Project.

Cost component	What it includes	How it was collected
Capital Expenditure Costs- CapEx Costs	Initial investment to build the systems infrastructure, the replacement costs to change the elements that have reached the end of their useful life, and future investments to expand coverage or improve the quality of services.	Secondary data. Semi-structured interviews with officials from both local and regional entities. Questionnaires/Surveys at the community organization level
Operation Expenditure Costs- OpEx Costs	All requirements for the operation of the water supply or sanitation systems (chemical supplies, tools, and operator wages, financial and commercial procedures, and administrative staff wages, among others).	Questionnaires/Surveys at the community organization level
Capital Maintenance Expenditure Costs- CapManEx Costs	The costs incurred by services providers to replace the components that reached the end of their useful life.	Surveys at the community organization level

Table 1 Cost components analyzed in the case study

Data collection focused on obtaining disaggregated costs. Firstly, data was gathered at regional and local level through the entities that execute investment plans and programs in the WASH sector. Here, the study employed participatory techniques such as semi-structured interviews and the review of secondary data (budgets and databases of the entities).

At community level, some visits were made to the various communities to become familiar with the water supply systems and work with the community-based committees. The data collection procedure was adapted from the WASHCost methodological tools to reflect the Colombian context, particularly in terms of service level. In comparison to the service levels proposed by WASHCost, water and sanitation provision in peri-urban and rural areas of Cali are included in the range from basic to high level, while the original questionnaires/surveys assume indicators at lower service levels that correspond to the context of WASHCost countries. The communities described in the case study have quality, accessibility, and reliability indicators that are consistent with a high service level.

The case study included: the selection of a community in the rural and peri-urban areas of Cali; the review of a set of criteria such as poverty condition, location, existence of community-based organizations; and the existence of representative water supply technology in the municipality.

To begin with, the poverty condition was relevant because in rural areas socioeconomic characteristics are diverse, which implies that water and sanitation access can be limited to some population groups. Location in the context of this case study was also important in relation to accessibility and public order. Next, the existence of a community-based organization allowed for the application of questionnaires and techniques among the organization directive committees. Finally, selecting communities with the most representative technology to make comparisons was relevant, particularly in the rural area of Cali where multi-stage filtration is the predominant type of technology. According to these variables, the selected communities were Golondrinas (rural area) and La Sirena (peri-urban area).

FINDINGS AND DISCUSSION

CapEx costs water supply

The cost indicators of CapEx costs were obtained from the Rural Water Supply Program PAAR[3] and the Healthcare Consensus Committee for rural areas HCC[4] in the city of Cali, and the case study in

Golondrinas. The relevant characteristic for analyzing the service level in these indicators is associated with water supply or drinking water provision. Quality standards provide for access to drinking water, but most service delivery standards in Colombia are designed for urban areas. Compliance with these requirements in rural areas is difficult. Table 2 provides details of the CapEx cost indicators.

Program/ Community	**Average CapEx cost per capita (USD) Water supply system**	**Service Levels**
Rural Water Supply Program P.A.A.R. / Valle del Cauca Governor[5]	161	Rural communities Population served in the communities: Between 50 and 5,000 inhabitants. Beneficiary population in the program: 157,028 inhabitants Water uses: domestic, agriculture, and animal maintenance. Water quantity: 130-200 liters per person per day Capacity of water supply systems:1-10.89 Lps Surface and underground water wells Coverage: 100% According to WASHCost, service level indicators are consistent with to an intermediate level[5].
Healthcare consensus committees for rural areas HCC / City of Cali [6]	270	Rural and peri-urban communities Population served in the communities: between 95 and 7,500 inhabitants Beneficiary population in the program: 47,030 inhabitants Water uses: domestic and agriculture Water quantity: 100 liters per person per day Capacity of water supply systems:1-20 Lps Surface and underground water wells Coverage:100% Technology: Multi-stage filtration According to WASHCost, service level indicators correspond to a high level.
Golondrinas (rural community)[7]	242	Population: 2,990 inhabitants Households: 475 Capacity of the water supply system: 9 Lps Coverage: 100% Continuity: High zone 3 hpd , Low zone 24 hpd

[3] The program addresses the financial resources of the sector entities for the rural projects in the state. Since 2003, the communities have benefited from investments in construction, optimization, and organizational strengthening.

[4] Since 2001 the HCC has been operating with the involvement of organized communities and institutions. Together they communicate and discuss their needs, proposals, and projects with officials from the City Health Department and other organizations in order to reach an agreement on the viability of potential solutions.

[5] IRC-CINARA, 2010. Rural water supply service models in Colombia. Study report. Triple-S: Sustainable Service at Scale.

[6] Author's calculation based on UES information.

[7] Author's calculation based on ESAAG E.S.P. [4] Vice-ministry for water and sanitation, 2008. Guidelines of the one-stop service program.

		Rationing during the dry season According to WASHCost, service level indicators correspond to a high level.
World Bank/ National reference[8]	150	Rural areas Population: less than 2,500 inhabitants Water use: domestic Quantity: 100-125 liters per person per day Quality: WHO guidelines According to WASHCost, service level indicators correspond to a high level.

Official exchange rate (2009): 1 USD = COL$ 2,167 (http://databank.worldbank.org)

Table 1 CapEx costs indicator for water supply systems

- As illustrated in table 2, the Rural Water Supply Program PAAR presents a CapEx cost indicator in water supply for rural areas. However, it needs a better disaggregation to analyze the differences between the kind of system (pump and surface) and the kind of investment (new infrastructure and optimization).
- Compared to the HCC CapEx cost, it shows a large variation. It could be explained because the HCC indicator includes the operation of the infrastructure for the drinking water system. Also, the investment addresses villages where the population is concentrated while PAAR investment is more rural.
- The WB indicator is lower than the CapEx costs for drinking water service. It needs attention because the assumption is that the regional and local programs in review have scale economies as investments are made in large number of communities at the same time. In this sense, the indicator for one municipality or community that submits a project to a national entity could be higher than this reference.
- Additional information from programs in a different region of the country show greater differences. To water supply, the CapEx cost indicator estimated for the Caldas State Coffee Growers' Committee is USD426 per capita (IRC-CINARA, 2010). In terms of service level, this corresponds with the intermediate level. However, this program is strong in training activities and support to the communities after commissioning the systems. So the continuous support explains the big difference in comparison with the programs analyzed in Valle del Cauca, such as P.A.A.R., which tracks the system operation six months after the system has been made available to the community.

CapEx costs-sanitation

The unit cost indicators of CapEx costs were obtained from the Rural Sanitation Program S.A.N.E.A.R.[9] and the Healthcare Consensus Committees for Rural Areas HCC[10]. A recent study carried out by Robinson A. (2009) also found a CapEx cost indicator for investments

[8] Moriarty P. et al , 2010. Working Paper 2. Ladders for assessing and costing water service delivery.
[9] The SANEAR Program initiated investment projects in 2005. Between then and 2008 it invested USD1,189,356 in wastewater treatment systems and USD1,002,204 in individual wastewater treatment systems. These investments were made in rural areas in most municipalities in the state.
[10] Op. Cit. 4

from the International Plan in Colombia[11]. Although the sanitation investments discussed here include wastewater systems, the infrastructure for the households is not as complete as that of the International Plan. For example, the toilets are not financed by the programs, and the SANEAR Program does not cover the sewerage system. Table 3 presents the findings on this cost component.

Program/ community	**Average CapEx cost per capita (US$) Sanitation system**	**Service level**
Rural Sanitation Program S.A.N.E.A.R. / CVC[12]	Individual wastewater system: 312	Rural and peri-urban communities Population served in the communities: between 290 and 1,550 inhabitants Beneficiary population in the program: 11,305 inhabitants Technology: septic tank and anaerobic filter According to WASHCost, service level indicators are consistent with an improved level.[13]
	Sewage treatment system : 124	
Healthcare consensus committees for rural areas/ City of Cali[14]	Sewage treatment system: 93	Rural and peri-urban communities Population served in the communities: between 95 and 7,500 inhabitants Beneficiary population in the program: 17,880 inhabitants Technology: sewerage and wastewater systems According to WASHCost, service level indicators correspond to an improved level.
International Plan / Donor[15]	1090	Rural and peri-urban communities Technology: individual wastewater system or sewage treatment system
World Bank/ National reference[16]	100	Rural communities Without specifying other characteristics

Exchange rate: 1 USD = COL$ 2,167 (http://databank.worldbank.org)

Table 3 CapEx costs indicator to sanitation systems

- The data shows that the kind of sanitation system installed is relevant in explaining the differences between the unit cost indicators. In the Colombian context, due to the poor sanitation coverage, investment programs can manage financial resources for densely populated or scattered communities. In most cases, governments prioritize sewage treatment systems because of the cost per capita relation.
- Compared to the International Plan indicator, there is a large variation. These differences are explained by the integrality of the solutions promoted by the Plan in Colombia. For example, interventions include expenditures on direct support (ExpDS). As a result, in

[11] The involvement of the International Plan in Colombia began in 1990. Besides fostering children as they grow, the Plan also conducts activities in the water and sanitation sectors, such as designing systems, building infrastructure, establishing and strengthening organizations, and providing training in healthy hygiene habits.
[12] Author's calculation based on CVC information.
[13] Potter A. et al, 2010. Working Paper 3. Assessing sanitation service levels.
[14] Author's calculation based on UES information.
[15] Robinson A., 2009. Global expenditure review: water supply and environmental sanitation. Plan Ltd.
[16] Vice-ministry for water and sanitation, 2008. Guidelines of the one-stop service program.

Colombia the unit cost magnitude can be explained by the support to the communities and the focus on strengthening capabilities in technical aspects, service management and hygiene practices. Therefore, the International Plan invests in rural communities where access and public order are difficult.

- CapEx cost indicators in sanitation could be higher as sometimes households or municipal governments finance certain cost components such as land or labor. This shows the importance of cost disaggregation at the entities.

Although local and regional programs deal with many communities, there is a lack of information and disaggregation which hampers the study of other cost components. Consequently, to explore CapManEx and OpEx costs, the case study analyzed the two communities selected, i.e. Golondrinas and La Sirena.

CapManEx Costs - Water supply

The CapManEx cost represents expenditures for asset renewal, replacement, and rehabilitation costs (Fonseca C., 2010). However, in the country, small investments in some infrastructure elements in water and sanitation systems are also part of this. To analyze this cost component, it is necessary to establish what minor replacements are. In the Colombian rural context, community-based organizations usually can only finance small replacements in the system infrastructure – in this case, there is a clearly defined difference with respect to infrastructure optimization. Table 4 shows the results of CapManEx costs in the communities.

Program/Community	**Average annual CapManEx cost per capita (US$)**	**Service levels**
Golondrinas (Rural community)[17]	1.75	Population: 2,990 inhabitants Households: 475 Capacity of the water supply system: 9 Lps Coverage: 100% Continuity: High zone 3 hpd , Low zone 24 hpd Rationing during the dry season According to WASHCost, service level indicators correspond to a high level.[18]
La Sirena (peri-urban community)[19]	4	Population: 4,200 inhabitants Households: 813 Capacity of the water supply system: 11 Lps Coverage: 100% Continuity: 24 hpd Rationing during the dry season According to WASHCost service level indicators correspond to a high level.
World Bank (national reference)[20]	4	Rural communities

[17] Author's calculation based on ESAAG E.S.P.
[18] Moriarty P. et al , 2010. Working Paper 2. Ladders for assessing and costing water service delivery.
[19] Author's calculation based on data supplied by the association of aqueduct users in La Sirena.

		Without specifying other characteristics

Exchange rate: 1 USD = COL$ 2,167 (http://databank.worldbank.org)

Table 4 CapManEx cost indicator for water supply

- The difference in the results is related to the magnitude of the infrastructure replacement that usually depends on condition, operation, and useful life. There are also some natural conditions that affect this component. In the Golondrinas case, the soil characteristics are relevant factors in this component.
- The CapManEx cost in La Sirena is higher because it includes the replacement of a storage tank. Again, the magnitude of CapManEx depends on what is considered a minor replacement or an investment.
- In analyzing this component in the rural areas in Colombia, there could be a big difference if the system requires a high-cost component, such as a pumping system which is expensive in relation to the economic capacity of the families. The experience in the Pacific zone is one of system collapse for lack of sufficient financial resources to do these replacements.

OpEx Costs-Water supply

Households in Colombia take full responsibility for operation and maintenance costs. Although subsidies are available to low-income populations, it is difficult to cover these costs with the municipal budgets in the rural areas. The community-based organizations in these cases operate the systems and manage the financial resources obtained from user fees. However, the unit costs were calculated from the accounting documents to accurately obtain the OpEx costs indicators. Most service level indicators in the two communities correspond to a high level, but the quantity supplied can be at the basic level in Golondrinas. Table 5 provides details of the OpEx cost indicators.

Program/Community	**Average annual OpEx cost per capita (USD)**
Golondrinas (rural community)[21]	9
La Sirena (peri-urban community)[22]	4.63

Exchange rate: 1 USD = COL $ 2,167 (http://databank.worldbank.org)

Table 5 OpEx cost indicator for water supply

- The OpEx cost in the two communities represents a difference of almost USD4. The first hypothesis that explains this is related to the distance. La Sirena is located in the peri-urban area while Golondrinas is in the rural area of the city of Cali, which implies additional transportation, materials, and service costs. Also, economies of scale are probably associated with the number of households in La Sirena.

[20] Vice-ministry for water and sanitation, 2008. Guidelines of the one-stop service program.
[21] Author's calculation based on ESAAG E.S.P.
[22] Author's calculation based on information supplied by the association of aqueduct users in La Sirena.

CONCLUSIONS

About the application of the methodology

Because unit costs are not reported or monitored, there is a lack of information on costs in rural areas in Colombia. Firstly, there is no disaggregation of costs in the budgets available at national entities, and there are no specific items allocated to WASH services. Secondly, information at regional and local levels is not systematized; data analysis is needed to obtain some cost components, such as CapEx Costs, in local and regional programs. Similarly, at a community level, although community-based organizations have a good management level, they do not identify unit costs easily, but the accounting documents do provide enough information to analyze unit costs.

The most relevant difference in applying the WASHCost methodological tools in the Colombian context was discovered in the service levels found in the rural communities. Compared to the findings from rural communities in Ghana, Mozambique, Burkina Faso and Andhra Pradesh, service levels in the rural areas of Cali can range between basic and high. However, this is not a generalized situation in Colombia where rural areas in smaller cities have water and sanitation access problems as outlined in the national coverage indicator.

About the analysis of cost components

In the case study, the results of CapEx costs in water supply differ a great deal from one investment program to the other. This can be associated with the purpose of investment and the existence of economies of scale. In addition, the population size and location can influence cost indicators. For example, the PAAR Program executes projects with small and large populations in rural areas, while the HCC focuses on the villages of Cali and the peri-urban areas of the city where the population is larger and more concentrated.

Alternatively, the support and integrality of the investments is a key factor to understanding the differences in unit cost indicators for water and sanitation. For example, the technical and management support given to the communities and the incorporation of healthy hygiene practices are indicative of strength in terms of the sustainability of solutions although this means higher costs.

In the case study, even if CapManEx could similar across different communities, it would be important to recognize that this component is affected by the condition of infrastructure as well as the characteristics of the system. Also, it is needed to distinguish between the investment size that is appropriate to the definition of CapManEx cost. For example, some of the interventions of the local and regional programs are executed as “system optimization” but when all system components are optimized, costs could be included in the CapEx cost. For rural communities in Colombia CapManEx costs are related to the kind of replacement and the possibility to finance it with their own resources.

On the other hand, OpEx cost results also show that the location of a community can influence the cost magnitude and the population size. However these are preliminary hypotheses as there are no major differences in labor and maintenance activities even at the community management level.

To analyze cost components in a broader scenario of communities following a rigorous research approach, there is a need to verify cost disaggregation in the databases of the entities. This can make a difference in the comparisons, thus contributing to reliable results.

About the importance for the decision-making processes

The new mechanisms for planning, controlling, and regulating investments in the water and sanitation sector require knowledge of the effectiveness and efficiency of the financial resources allocated to water and sanitation investments. The advances in the unit cost information can contribute to these processes, especially in rural investment planning because the diversity, complexity, geographical conditions, service level, and the poverty condition in the communities need to focus on end-to-end solutions that contribute to sustainable services.

A specific information management tool that improves cost information management in the rural areas is the Unique Information System, or *Sistema Unico de Informacion* (SUI) for small rural operators. This proposed system has been discussed with some stakeholders in the WASH sector, and is now gathering political will and financial resources to launch a pilot project in one of Colombia's regions. This platform will collect information about the systems to establish social, technical and environmental priorities in the interventions. At the same time, it will support the decision-making processes at department, municipal and community level. Unit cost information can be added to the platform to be included by the sector entities and to analyze regional cost components which are relevant according to the recent sector policies.

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