

Life-Cycle Costs Approach for Sustainable Service Delivery: Application to WASH in the Indian Context

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Executive summary[1]

Adopting a life-cycle costs approach (LCCA) to the WASH sector could provide potential benefits in terms of WASH services so that they are less prone to slippage, are better value for money, and are more cost effective. The LCCA is flexible enough to be adapted to the WASH sector in a service delivery context. The comprehensive nature of the cost and service level components emphasises the importance of investments at various stages of a system's life-cycle in sustaining the services. This note provides an overview of the LCCA framework as developed by WASHCost as well as its application to the WASH sector. Based on extensive data analysis at village and household levels in Andhra Pradesh, it is argued that WASH policies should relook the way norms are fixed and financial allocations are awarded to the sector. Although various components of LCCA are not new to the Indian WASH sector, they are not fully considered when budget allocations are decided on. The Government's new drinking water guidelines, suggest indicative allocations to most of the cost components. WASHCost research in Andhra Pradesh helps in arriving at the appropriate allocations for various components. The research furthermore highlights the importance of capital maintenance expenditures (CapManEx) in the provision of sustainable service delivery. Sustainable services need to be understood in a broader context of access, quantity, quality, reliability and security.

1 Introduction

A life-cycle costs approach (LCCA) is a comprehensive tool that is often used in project evaluation, especially in the context of environmental sustainability of various investments leading to products or services. Although the basic principles of LCCA are nearly a century old, its systematic use is only about 25-30 years old (Salem, 1999). LCCA is an economic assessment, or project appraisal tool that can be applied at any phase of a project's life cycle by including the whole chain and spread of activities, including external factors. Such a system's perspective is valid for both the environmental dimension as well as for social and economic dimensions. LCCA is widely used in infrastructure projects such as roads and power, etc., while its use in the water, sanitation and hygiene (WASH) sectors is very limited. Even in developed countries like the USA the adoption of LCCA to the WASH sector is limited to 30% of systems (Salem, 1999).

LCCA goes beyond achieving the technical ability to quantify and make costs readily available. It seeks to influence sector understanding of why ensuring proper financing – both public and private – is critical for improved service delivery approach (SDA) as well as influencing the behaviour of sector stakeholders, so that life-cycle unit costs are mainstreamed into WASH governance processes at all institutional levels from local to national (Ludin, 2002; Baringer, 2003; McConville, 2006).

[1] This paper draws from findings of the WASHCost Research in collaboration with the IRC-International Resource Centre, The Hague; Centre for Economic and Social Studies, Hyderabad; Livelihoods and Natural Resource Management Institute, Hyderabad and WASSAN, Hyderabad. Thanks are due to Catarina Fonseca, Charles Batchelor and Baby Kurian for useful comments.

The objective of using LCCA in the WASH sector is to increase the ability and willingness of decision makers (both users and those involved in service planning, budgeting and delivery), to make informed and relevant choices between different types and levels of WASH service. A significant element of the LCCA, as developed by WASHCost (Fonseca, et. al., 2011), is an understanding that costs can only be compared and properly assessed when they are related to particular service levels, to lifespans, and over a period of time. This note specifically aims to draw attention to the role of LCCA in sustainable service delivery with evidence from rural drinking water in Andhra Pradesh State, India[2].

2 Life-Cycle Costs Approach and Service Delivery Approach: A Framework

The LCCA, as developed by WASHCost, analyses the aggregate costs of ensuring the delivery of different levels of equitable and sustainable WASH services to a population in a specified area. Unlike the conventional LCC assessment, a life-cycle costs approach adopted here does not address project evaluation, but adopts a service delivery approach, i.e., it assesses the costs of providing a certain level of service in a sustainable manner over a period of time. It analyses the costs that have gone into service provision rather than incorporating all the costs that are demanded in a project evaluation frame. The costs assessed cover the construction and maintenance of systems in the short and long term, taking into account the need for hardware and software, operation and maintenance (O&M), capital costs, source protection, and the need for direct and indirect support costs, including training, planning and institutional pro-poor support (Fonseca, et al., 2011). The delivery of sustainable services also demands that budgetary allocations are made to ensure that infrastructure can be renewed or replaced at the end of its useful life and to extend delivery systems in response to increases in demand (Reddy, et al., 2009).

The comprehensive nature of LCCA makes it necessary to define the service boundaries of the system. The choice of boundaries depends on the nature and type of project (for a review see Lundin, 2002). For rural water systems four sets of system boundaries can be identified:

i. Resource
ii. Infrastructure
iii. Use (demand and access)
iv. Externalities (see Figure 1)

[2] As part of WASHCost research we have covered water, sanitation and hygiene in rural and peri-urban areas. For the sake of brevity, we present here the rural drinking water data only.

All these are critical for a service delivery approach, and the LCCA framework combines them. Resource parameters are defined to ensure source sustainability and help sustainable service delivery, although multiple sources are the norm for basic services in India. Assessment at this level assists in the understanding of potential environmental benefits, costs and sustainability of a water system. Infrastructure boundaries offer a more complete view of the system in terms of technologies, design efficiencies and planning (such as linking drinking water and sewage), etc.

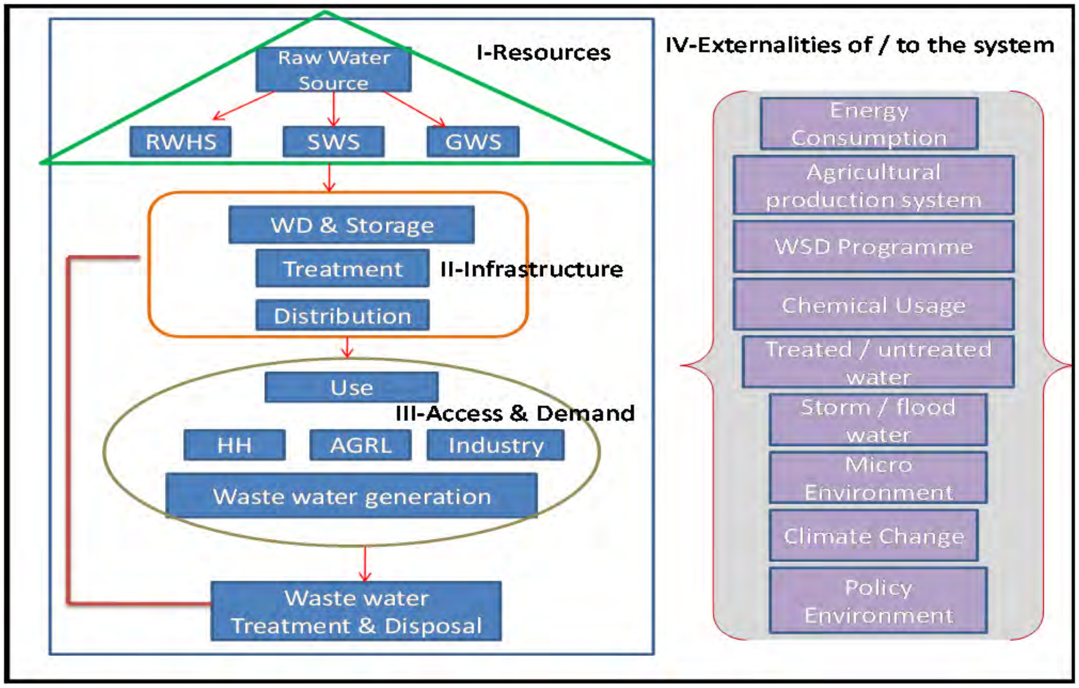

Figure 1 LCCA Service Boundaries for Rural Water Supplies
Source: Adopted with modification from Lundin (2002).

While agencies are usually constrained by financial and legislative obligations, they tend to override the options that allow them to move towards environmental sustainability. Such a perspective may limit the potential of an agency to identify major environmental impacts or improvements throughout the life cycle. Use issues, such as demand and access, often dealt with at community, institutional, and household levels pertain to access, competing demands (domestic, agriculture, industry, etc.), water-use practices, and sanitation and hygiene practices. This set often only gets marginal attention, if not completely ignored, at the project planning level. It also reflects and determines the adoptability of the system in terms of capacities (technologies), affordability (finance), awareness (quality, health, etc.) and attitudes (cultural); etc. Externalities and/or system drivers are closely linked; and they surround the main system and determine the sustainability of the services. However, this set is often not included in the evaluation due to the methodological complexities in valuing externalities[3].

[3] Methodologies are now available to internalise most of the externalities.

3 Adopting a Life-Cycle Costs Approach in the India WASH Sector

The main purpose of adopting LCCA in the WASH sector (in the Indian context) is to arrive at disaggregated unit costs and identify the gaps in terms of different cost components (see Box 1). These cost components are not new to the WASH sector in India. In fact, most of these costs are part of the planning process, although under different names. But, allocations towards these cost components are either negligible or not made at all. As a result these cost components are not included when unit costs that are used for budget requirements are estimated. The government's new guidelines (GoI, 2010) make indicative allocations towards most of these cost components. In this section it is shown that, in reality, all the LCCA cost components are incurred despite the fact that they are not part of the budget allocations or even the new guidelines.

Box 1 Different Cost Components

	Fixed Costs
CapExHrd	Includes expenditure on infrastructure like water sources, pumps, storage, filters, distributions systems, etc.
CapExSft	Includes Expenditure on planning and designing costs of the schemes
	Recurring Costs
CapManEx	Includes capital maintenance like rehabilitation of sources, systems, etc.
CoC	Cost of Capital includes the interest paid on the borrowed capital for investment in the WASH sector.
ExDS	Includes staff salaries, post implementation activities like IEC, demand management, training of mechanics.
ExIDS	Includes policy planning at the macro level i.e., central and state.
OpEx	Includes regular operation and maintenance of the systems like energy costs, minor repairs, filtering costs, salaries of water man, etc.

Source: Fonseca, et al., 2011.

All these costs are part of public investment; although households also invest to complement their service levels. In the case of water, only public investment is taken into account, as the government is expected to provide basic service levels. The cost of capital (CoC) is not included in the analysis as government is the main source of finance, with little or no external finance.

All the fixed capital investments were made over years and hence accumulated after being converting into current values using the national GDP inflator for the specific years and converted to US dollars using the average 2010 exchange rate (US$ 1 = INR 45.72). Capital costs are assessed as cumulative, as well as annualised, costs. In order to arrive at the annualised costs, all the capital costs (CapExHrd) are annualised using the actual life-span of the systems. The actual lifespan is the observed life of the systems during which service is provided.

Service levels are assessed with the help of the service-ladder approach using four parameters: quantity, quality, accessibility and reliability (Moriarty, et al., 2011). Service levels are assessed in terms of the proportion of households that receive basic and above-basic service level for the four different parameters[4]. Basic and above-basic service levels correspond with the Indian service-level norms. These service levels are compared with unit costs across the nine agro-climatic zones of Andhra Pradesh state.

Unit Cost of Rural Water Supplies: Life-Cycle Costs Approach vs. Norms

The cost analysis provided in this paper is based on the data collected from 187 villages spread over nine agro-climatic zones of Andhra Pradesh state. The service level data is obtained from 5500 households in 107 villages spread over the nine agro-climatic zones. The per capita capital expenditure (CapEx) works out to be US$ 50 in the sample villages against the norm of US$ 32 per capita (Figure 2). The Andhra Pradesh Rural Water Supply and Sanitation Department's (APRWSS) unit costs (norms) that form the basis for budget allocations are substantially lower than the actual expenditure incurred in the sample villages over the period. Moreover, the norms are uniformly allocated across all the regions in the state, although in reality, the unit costs vary between US$ 30 in Godavari Zone (GZ) to US$ 77 in South Telangana Zone (STZ). When annualised, using the actual life of the systems, the per capita costs are about US$ 6 per year at state level and range between US$ 4.2 (NCZ) and US$ 10.5 (STZ) across the zones.

This highlights two important issues:

i. The real unit costs are substantially higher than the normative unit costs fixed5 by the department using the standard schedule of rates (SSR) even though they are regularly adjusted to market prices[6]
ii. There exist substantial variations in unit costs within and between zones[7].

This is mainly due to differences in costs across villages (and zones) consequent to the variations in the functionality of the systems. One of the main reasons for this is source failure. Source protection gets negligible allocations within capital expenditure. The substantial (20%) allocations provided for source protection in the new guidelines would help address the issue of slippage effectively when implemented (GoI, 2010). Differential allocation of resources across locations based on hydro-geological conditions is needed in order to address the differences in unit costs across zones or locations.

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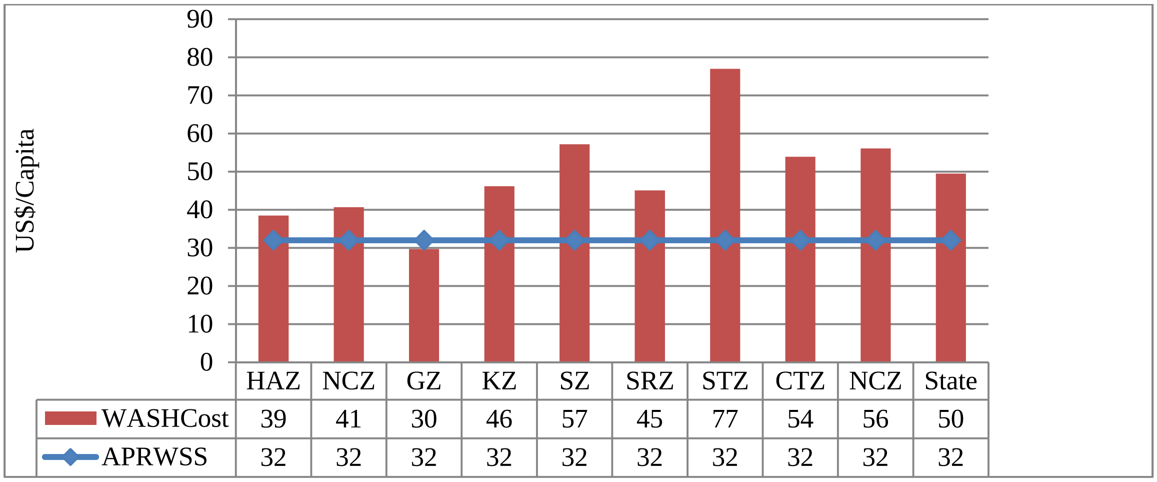
[4] Detailed analysis of service levels in Andhra Pradesh is taken up in another paper (WASHCost India, 2011: Briefing Note). For instance, in the case of quantity service levels are defined as: <20 lpcd=no service; 20-40 lpcd= Sub-standard; 40-60 lpcd= Basic; 60-80 lpcd= Intermediate; and >80 lpcd= High.

[5] This is not to say that there is an investment gap. That is over the years utilities end up spending more than normative allocations and these allocations are drawn from other cost components. Even households end up spending in order to improve service levels.

[6] This varies from state to state. Some states have a lag of two to three years.

[7] These variations go beyond political economy factors, where a part of higher investments could be attributed to political interference.

While capital or fixed costs are one-time investments, recurrent costs are incurred on a regular basis in order to maintain the systems. These costs include capital maintenance (CapManEx), direct and indirect support costs (ExDS and ExIDS) and operation and maintenance costs (OpEx). The composition of these costs is critical for sustainability of the systems. In the absence of allocations towards all the components, especially capital maintenance (CapManEx), capital costs would escalate due to the breakdown of the systems. Recurring costs are annualised to assess the relative shares using the observed or actual life span of the systems.



	HAZ	NCZ	GZ	KZ	SZ	SRZ	STZ	CTZ	NCZ	State
WASHCost	39	41	30	46	57	45	77	54	56	50
APRWSS	32	32	32	32	32	32	32	32	32	32

Figure 2 Cost of Provision across Agro-climatic Zones (CapEx per Capita in US$)
Source: Reddy, et. al. 2012.

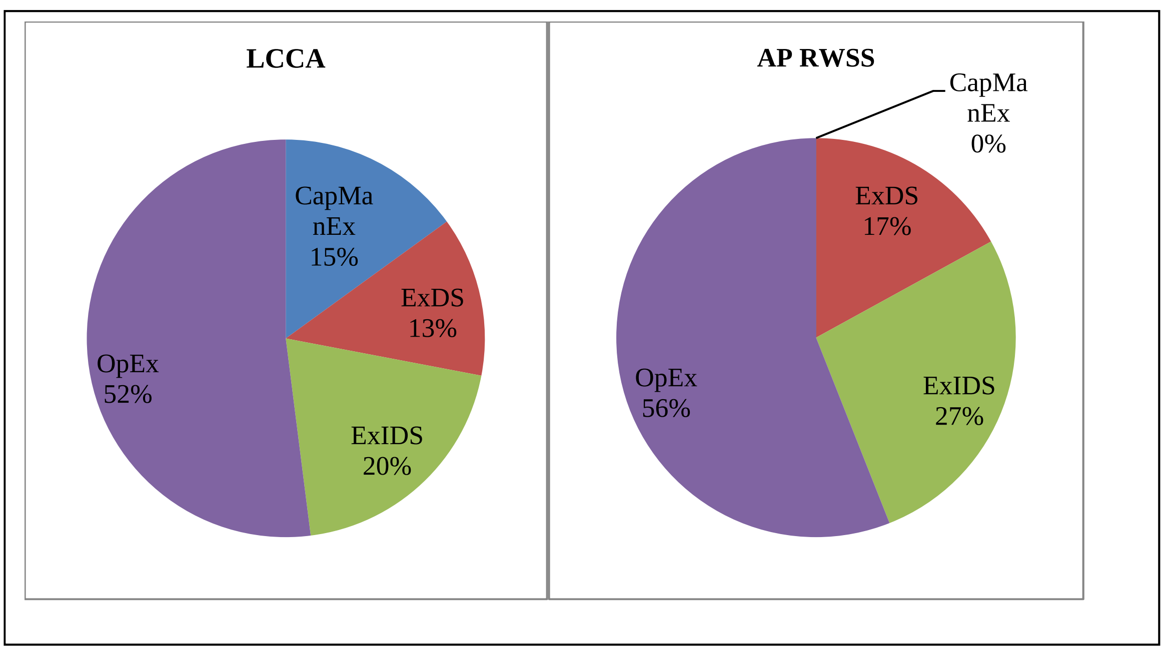


Figure 3 Relative Shares of Unit Costs: LCCA vs. Andhra Pradesh Rural Water Supply and Sanitation Department (APRWSS)
Source: Modified presentation of the data from Reddy, et. al. 2012.

The cost composition indicates that capital maintenance expenditure (CapManEx) gets substantial allocations (15%) in reality (LCCA) when compared to zero allocations as per norms (APRWSS) (Figure 3). Support costs get 33% of allocations in the case of LCCA and 44% in the case of APRWSS; mainly in the form of salaries and macro planning which are the same in both cases. On the other hand, capital maintenance (CapManEx) costs are not part of the present norms (APRWSS). Capital maintenance expenditure is ad hoc i.e., as and when the need arises. In fact, it is observed that capital maintenance is drawn from operation and maintenance cost (OpEx) allocations. This is reflected in the high allocations towards OpEx as the norm. In reality, part of OpEx is shifted to CapManEx due to the breakdown emergencies though in a limited way in the absence of formal allocations. In the absence of CapManEx allocations, the expenditure on CapEx also increases, adversely affecting allocations to other components. This in turn results in the reduction in system lifespans, because appropriate and separate CapManEx allocations ensure the use of these allocations towards OpEx while also improving the life of the systems as a whole.

Service provision forms the bulk of water supply systems' expenditure'. Assessing service levels is complex and represents multiple indicators. A service-ladder approach uses four parameters, being quantity; quality; accessibility and reliability, which are adopted in WASHCost research (for details see Moriarty, et. al., 2011). Here we try to examine whether there is any relation between the unit costs and service levels across agro-climatic zones.

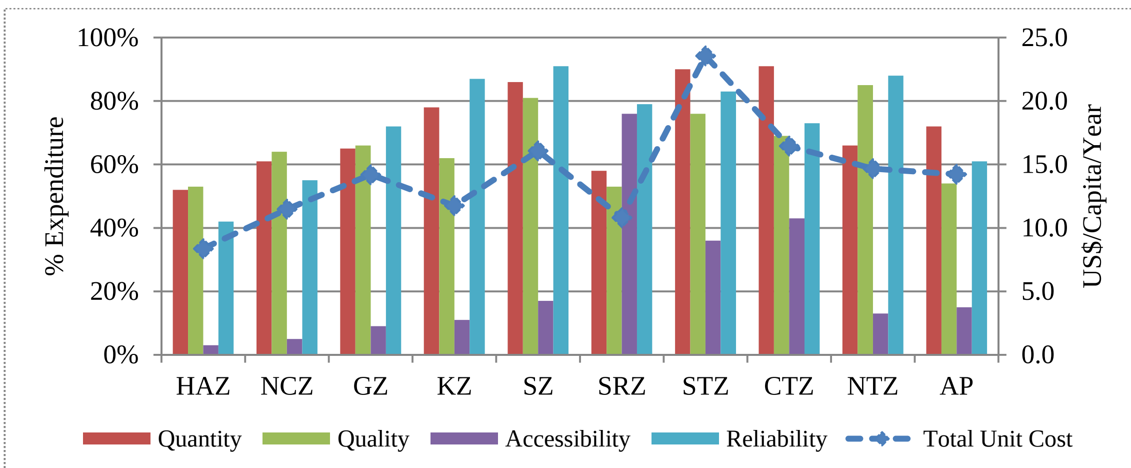


Figure 4 Service Levels (basic and above) and Unit Costs across Zones
Source: Reddy, et al. 2012.

The majority of households (above 50%) get basic and above-basic service levels for three parameters in all the zones (Figure 4). Accessibility gets the lowest rating with only 15% of surveyed households reporting above-basic service level. Across all zones, scarce rainfall zones (SRZ) reported the highest proportion (>50%) of households which receiving basic and above-basic service levels across all four parameters. Conversely, high altitude zones (HAZ) have the lowest proportion of households receiving basic and above-basic services in all four parameters.

This indicates that the best that one will get out of unit costs could be a pointer to service levels. There could be number of other factors that influence service levels as well as unit costs (Reddy, 2012).

4 Conclusion

Adopting the LCCA to the WASH sector could provide potential benefits in terms of judicious resource allocation for sustainable service delivery. The LCCA is flexible enough to be adapted to the WASH sector in achieving sustainable service delivery at scale. The comprehensive nature of LCCA components emphasises the importance of investments at various stages of a systems lifecycle in sustaining its services.

The key policy pointers include:

i. Actual expenditure in the public sector for rural drinking water services are much higher than those of the norms used for budget allocations.
ii. Analysis of data using LCCA components indicate that infrastructure takes the lion's share to the detriment of other important components such as capital maintenance (CapManEx) and source protection, etc.
iii. In the absence of allocation towards CapManEx, expenditure is often taken from OpEx allocations to address emergencies.
iv. As a result, both capital maintenance and operational maintenance suffer due to funding constraints, leading to an increased share of the capital expenditure. This is poor financial maintenance and it leads to the complete breakdown of systems that then require new capital investment.
v. Apart from appropriate allocations towards capital maintenance and operational expenditure, ring-fencing these allocations for the specified purpose is critical for improving the life-span of the systems.
vi. Sustainable services need to be understood in a broader context of access, quantity, quality, equity, reliability and security. Monitoring service levels is required to understand and achieve better value for money. While unit costs and allocations help to improve quantity to some extent, improving other service indicators, especially access, might depend on a number of other factors.

WASH policies should relook the way norms are fixed and how allocations are made towards the sector. Although various components of LCCA are not new, they are not considered when budget allocations are done. The new guidelines suggest indicative allocations to most of the components that are consistent with LCCA but ensuring real expenditure is critical. The budgetary process needs to be reoriented towards allocating funds for capital maintenance (CapManEx) and ring-fencing the allocations to various components, especially operation and maintenance (OpEx). This needs to be prioritised at state and national levels. The major contribution of LCCA is in terms of improving the life-span of the systems, which is the bottom line for sustainable service delivery.

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