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Cost of Provision: How Good are Unconditional Allocations? A Study of Water Services Delivery in Rural Andhra Pradesh

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ABSTRACT

This paper estimates the actual unit cost of delivering domestic water services in rural Andhra Pradesh across 187 habitations spread over nine agro climatic zones. These estimates are compared with state allocations for rural water supply in terms of magnitude and composition. The paper questions the logic of uniform or unconditional allocations for each scheme based on norms across geographic locations. It argues that region or location specific allocations could be more efficient and effective from the sustainability point of view and in terms of the implications for services received by users. The note also illustrates the bias in the structure of the cost composition in favour of infrastructure. Key findings from the analysis include:

a) *Unit costs of water supply per capita revealed by the LCCA are substantially higher than the prescribed norms and they vary substantially across agro-climatic zones. Intra zonal (inter village) variations are much higher than that of inter zonal variations.*
b) *Fixed costs per capita per year vary between US$ 7 and US$ 19 across the zones, while they range from less than US$1 to US$ 63 between villages. Recurrent costs range between US$ 1.2 to US$ 3.9 per capita per year.*
c) *The differences in per capita per year unit costs (fixed and recurrent) between zones are significant in number of cases. These variations are quite substantial and go against uniform allocations.*
d) *Lower observed life span of the systems is one of the main reasons for these variations apart from the agro-climatic conditions. The analysis suggests that allocations towards capital management along with proper designing and governance of the systems could help reducing the gap between normative and observed life spans.*
e) *There is no clear association between capital costs and service levels across villages (quantity, quality, accessibility and reliability). Recurrent costs are too low to make any reliable analysis.*

f) There is need for rethinking the policy of uniform village-level allocations across the zones on the basis of the norms fixed at the state level. Inter and intra zonal variations in unit costs should be kept in view while allocating the funds. A more systematic analysis of hydro geological conditions would be desirable in this regard.

g) There is need to revise the allocations to the sector in terms of magnitude and composition as suggested in this paper.

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I. Introduction

Allocations towards rural water supply is based on norms fixed using the Standard Scheduled Rates (SSRs) and are one time investments with annual allocations towards operation and maintenance of the systems. State level norms are arrived at using the average of the administrative regions of the state. Often the differences between regions mostly pertain to labour costs. And these norms are arrived for each technology i.e., single village schemes (SVS); multi village schemes (MVS) and hand pumps (HPs). These norms i.e., one norm for each technology, are used for fixing the allocations for rural water supply systems across Andhra Pradesh. The expenditure is assumed to last for a fixed number of years that range between 10 and 30 year depending on the component (see appendix Table 1), i.e., a normative life of the systems, which is based on technical assumptions by the Rural Water Supply and Sanitation Department. Similarly, operation and maintenance allocations are fixed for each technology and allocated annually. Operation and Maintenance expenditure is often met from the resources generated through water charges by village panchayat, which is responsible for the management of the systems, and the allocations from the department of rural water supply and sanitation (RWSS).

In reality most habitations use more than one scheme or source at any point in time in order to ensure water supplies. Often these systems are accumulated over the years in order to address the water demands and service improvements or break down of the existing systems. Typically, habitations are introduced initially to hand pumps followed by direct pumping, mini piped water supply schemes, single village schemes and then connected to multi-village schemes. Besides, there are water purification plants established by private agencies and non-government organisations and also by government are becoming part of supply sources along with informal sources like streams, local tanks, private wells, etc. And these sources are not connected to any scheme. This is an accepted policy norm in India as there is no fixed delivery model for service provision. This could be termed as service delivery model, i.e., combination of different technologies and sources[1] . Actual cost of service delivery should include all the public systems that are providing services presently, while the informal sources may not be included as no costs are available.

This note compares the normative allocations with the actual expenditure across nine agro-climatic zones of Andhra Pradesh. Actual costs are estimated based on the data collected from 187 habitations spread over 9 agro-climatic regions of the state. The rationale for agro-climatic representation is that cost of provision for drinking water is expected to vary mainly due to the climatic and hydro geological conditions and exploration of groundwater for other compeling demands, especially in the locations where groundwater is the main source. Though agro-climatic zones do not reflect the hydro geology they do take number of aspects that influence drinking water use. Hence, this categorisation is considered as the best proxy to capture the variations in the absence of such data at the village level. These differences are difficult to measure at the village level and hence are captured in the agro-climatic divisions. The sampling frame, thus, helps in controlling this important factor. Specific questions answered from the study include:

a) Estimating the cost of service provision across agro-climatic zones of Andhra Pradesh and compare them with agency (RWSS) norms.

b) Comparing cost of provision in terms of cost per year for actual life of the system and the normative life, and

c) Estimating the relative expenditure on different cost components in reality against the agency norms.

II. Approach

Life cycle cost (LCC) approach[2] is adopted to estimate the actual cost components of service provision. The costs assessed here 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, cost of capital, source protection, and the need for direct and indirect support costs, including training, planning and institutional pro-poor support (Fonseca, et. al., 2011). Only financial costs (i.e., public expenditure) are included in the analysis, though households also invest in water infrastructure to

[1] Service delivery model is adopted in the WASHCost project parlance at the global level to specify multiple service systems at the village level.

[2] For details see Fonseca, et. al., (2011) and other WASHCost publications at (www.washcost.info)

complement the service levels, in order to make it comparable with agency (RWSS department) norms.

This paper is based on the analysis carried out using data collected from 187 habitations spread over nine agro-climatic zones of Andhra Pradesh. The sample villages were selected on the basis of a stratified sampling design in each of the agro-climatic zones[3]. A village is considered as a sampling unit for the survey. The sample villages represent the three service status of drinking water services in India: Fully Covered (FC), Partially Covered (PC) and No Safe Source (NSS). Cost data were obtained from the official records of the Rural Water Supply and Sanitation (RWSS) department at district level. These data were triangulated or crosschecked with the help of data generated from the village panchayat (local government). The data on Operation and Maintenance were obtained from the village panchayat records.

Cost components and calculations[4]

Capital expenditure has two components, namely hardware (CapExHrd) and software (CapExSft). Establishment of water infrastructure, water extracting elements, purification equipment, storage reservoirs, distribution systems, etc., are part of capital expenditure on hardware. Capital expenditure on software includes the costs of planning and designing the water and sanitation schemes at village level. The capital costs, hardware as well as software are one-time costs.

For the purpose of the present analysis we have taken only investments in infrastructure that are still functional. In most of the cases the system or infrastructure is non-functional when the source fails beyond rehabilitation i.e., drying up of a bore well or collapse of bore well. All the capital investments are cumulated over the years. Capital maintenance expenditure (CapManEx) is another major expenditure item that is made for renewal and rehabilitation of the systems i.e., replacement of major equipment like pump sets, boreholes, plant equipment, distribution systems, etc. Capital management expenditure is also summed over the years. Operational expenditure (OpEx) made on regular maintenance of the systems, is incurred annually, and hence we have taken the average of the years for which data are available after bringing them to the current year. Expenditure on direct support costs (ExDS) are in the form of salaries of the staff, IEC activities, demand management initiatives, etc. Expenditure on indirect support costs

[3] Scientific sampling procedure was followed while selecting the sample habitations (See for details Reddy, et.al., 2010).

[4]For details see WASHCost (India), 2010.

[5] For details see WASHCost India (2011).

(ExIDS) are the costs associated with macro planning and policy making at the national and state level. These costs are estimated based on the data from the planning and budgetary documents with the help of some assumptions and expert opinion[5].

Since capital and capital maintenance expenditure are one time investments in the past they are converted to current values (2009) using the National GDP inflator for the specific years and converted to US dollars using the average 2009 exchange rate (US$ 1=INR 48.40). These costs are annualised using the normative life span and observed life of the systems. The data on normative life are provided by the department, which is nothing but the expected life of a specific component. The observed life span is the actual number of years the system (major component) lasts.

In the case of departmental cost figures we have taken the latest (2009-2010) estimates for different systems. Estimates are provided for single and multi-village schemes separately. Since, the actual costs include both these sources, in most cases we have taken the average of both. The official cost estimates do not include salary component of direct support costs (ExDS) and the indirect support costs (ExIDS). These two components, which are estimated using budget data, are added to the official norms in order to make them comparable with the actual costs based on our estimates.

III. Cost of Provision: Norms vis-a-vis Actual

Total cost of provision is estimated in terms of per capita cost per year after converting the past capital investments (CapEx) to current value and then annualising them. These are fixed costs. Recurring costs such as capital maintenance (CapManEx), direct and indirect support costs (ExDS and ExIDS) and operation and maintenance costs (OpEx) are added to the fixed costs. These costs pertain to different technologies and do not represent any specific technology. However, sample villages are mostly dominated by single village (SVS) followed by multi-village schemes (MVS) or a combination of both or more systems. This we call service delivery model. These estimates are based on the actual data collected from 187 sample habitations spread over 9 agro-climatic zones. Cost estimates are made zone wise and also at the state level. In the case of agency or departmental (RWSS) norms there is only one figure for the entire state. While separate norms are fixed for single and multi village schemes (see Appendix Table A2), we have taken the weighted average (on the basis of their numbers i.e., 70 % of schemes are single village while 30 percent are multi village) of both to arrive at a comparable figure. The estimates are carried out for both normative and observed life spans. While the normative life span is worked out on the basis of technical, economic and useful life of the systems, observed life span is the life of the systems on ground or in reality. Futuristic service delivery requirements and their cost norms are arrived at by the department on the basis of normative life of the systems.

Table 1: Observed and Normative Life Spans of the Rural Water Systems across Agro-climatic Zones of Andhra Pradesh.

Zone	Observed Life Span@			Normative Life span*			Avg. Age of the systems$	
	Average	Range (Min-Max)	CV+	Average	Range (Min-Max)	CV+	Average	Range (Min-Max)
HAZ	7.9	1.0-40.0	69.9	11.2	10.0-30.0	19.1	06	0-11
NCZ	9.8	1.0-49.0	95.6	11.6	10.0-30.0	23.3	09	3-20
GZ	3.7	1.0-31.0	21.9	14.1	10.0-30.0	55.2	10	2-24
KZ	10.9	1.0-49.0	127.9	11.8	10.0-30.0	26.9	11	1-28
SZ	8.4	1.0-45.0	86.9	12.5	10.0-30.0	34.5	18	0-39
SRZ	8.6	1.0-40.0	72.9	13.9	10.0-30.0	56.0	14	1-25
STZ	7.3	1.0-36.0	52.9	13.0	10.0-30.0	44.1	16	1-30
CTZ	7.5	1.0-40.0	54.8	12.7	10.0-30.0	39.4	15	4-32
NTZ	8.4	1.0-40.0	66.8	12.8	10.0-30.0	44.2	18	7-29
AP State	**8.2**	**1.0-49.0**	74.5	**12.7**	10.0-30.0	**39.8**	**14**	**0-39**

Note: HAZ= High Altitude Zone; NCZ= North Coastal Zone; GZ= Godavari Zone; KZ= Krishna Zone; SZ= Southern Zone; SRZ= Scarce Rainfall Zone; STZ= South Telangana Zone; CTZ= Central Telangana Zone and NTZ= North Telangana Zone. More details of these zones in terms of coverage of districts and sample habitations in the appendix Table A2.

@Estimated using the observed data from the 187 sample habitations spread over 9 agro-climatic zones. * Based on the data provided by the Department of Rural Water Supply and Sanitation, Government of Andhra Pradesh.

$= Average age of the functional systems is arrived at on the basis of year of first scheme.

+CV= Coefficient of variation of the sample habitations in the respective zone.

Source: Village wise data collected from the RWSS department at the District level

The observed life of the systems at the aggregate (state) level is 8.2 year as against the normative life span of 12.7 years (Table 1). While the normative life span across the zones does not vary much the observed life span varies between 3.7 years in Godavari zone and 10.9 years in Krishna zone. Observed life span could be lower due to the reason that systems breakdown frequently due lack of maintenance or due to the geo-hydrological conditions of the region (bore well failure). Similarly, in the case of new systems where break downs are few, the observed life span could be lower. Very few sample habitations fall in the latter category, as the average age of the systems range between 6-18 years across the zones, with a state average of 14 years (Table 1). High

Altitude Zone (HAZ) has the youngest systems with an observed life span of 7.9 years that is close to state average. These are mainly hand pumps and mini piped water supply systems. The reason for low observed life span in the Godavari Zone could be due to the frequent break downs, which is reflected in the lowest range when compared to other zones. Moreover, the extent of system and source failure is also the highest at 41 and 72 percent respectively in the Godavari Zone when compared to 12 and 24 percent respectively at the state level (Table 2). This is mainly due to the quality of water. Turbidity levels in water are quite high in this region leading to choking of water filters and pumps. Sea water intrusion or saline ingress is another reason for abandoning the sources in parts of the zone. On the other hand, Godavari Zone has also shifted to surface water sources as the river and canal network is quite good here.

Table 2: Functionality of the Water Supply Systems and Sources across Agro-climatic Zones

Zone	Systems (HPs; PSPs; Pumps; Storage, etc)			Sources (open and borewells, tanks, etc)		
	Total	Functioning	% Failure	Total	Functioning	% Failure
HAZ	98	95	03	27	21	22
NCZ	164	162	01	36	30	17
GZ	125	74	41	29	8	72
KZ	265	258	03	43	37	14
SZ	189	170	02	70	63	10
SRZ	218	190	13	44	36	18
STZ	358	307	14	92	82	11
CTZ	328	278	15	85	60	29
NTZ	389	339	13	96	62	35
AP State	2134	1873	12	522	399	24

Source: Village wise data collected from the RWSS department at the District level

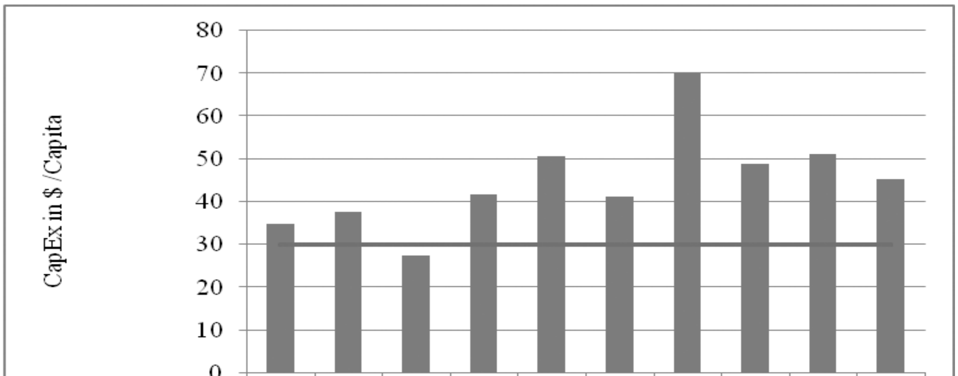
Fixed Costs

The preceding discussion helps in understanding and explaining the unit cost variations between the official norms and actual, normative and observed life spans and also among the geographical locations (agro-climatic zones). As explained above it may be noted that normative life is defined by the rural water supply and sanitation department (RWSS), as per the technical details of the components. When it is assumed that the systems and sources would work to full normative life span the cost of provision the per capita fixed costs are US$ 45 in our sample villages as against US$ 30 per capita (Fig. 1). While the RWSS unit costs are almost uniformly allocated across the state by the

RWSS department, the unit costs in reality vary between US$ 27 in Godavari zone to US$ 70 in Southern Telangana zone.

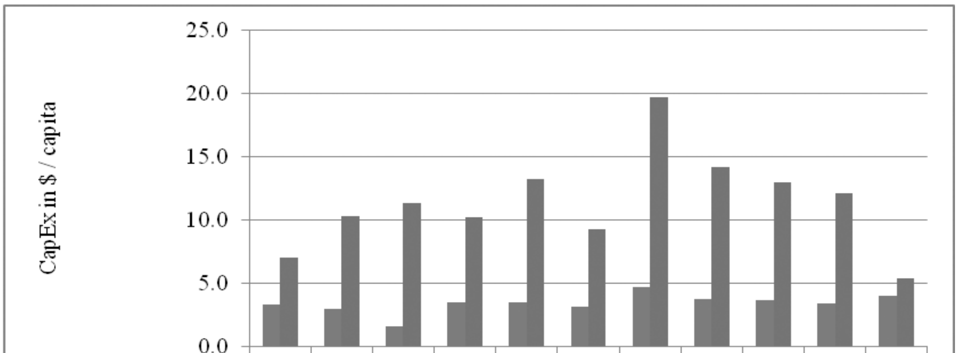
When these costs are annualised the unit cost is US$ 3.4 per capita per year at the state level in terms of normative life (Fig. 2). This is lower than the norms fixed by the RWSS department (US$ 4). Across the locations eight out of nine zones have shown that unit costs are below or equal to the departmental norms, while one zone (STZ) has higher than the norm (Fig. 2). This indicates there are variations in unit costs even when normative life span is assumed.

Figure 1: Cost of Provision across Agroclimatic Zones (CapEx per Capita in US$)



	HAZ	NCZ	GZ	KZ	SZ	SRZ	STZ	CTZ	NTZ	State
WASHCost	35	37	27	42	51	41	70	49	51	45
APRWSS	30	30	30	30	30	30	30	30	30	30

Figure 2: Fixed Costs per Capita Per Year with Normative and Observed Life Spans



	HAZ	NCZ	GZ	KZ	SZ	SRZ	STZ	CTZ	NTZ	State	RWSS
CapEx-Noramtive	3.4	3.0	1.6	3.5	3.5	3.2	4.8	3.8	3.7	3.4	4.0
CapEx-Observed	7.1	10.4	11.3	10.3	13.3	9.3	19.7	14.3	13.0	12.1	5.4

However, this is different from the reality, as the observed life is 35 percent less than the normative life. And the unit cost of provision has gone up from US$ 3.4 (normative) to US$ 12.1 (observed) per capita per year i.e., 256 percent higher (Fig. 2). Under the existing observed life span the departmental norm goes up from US$ 4 to US$ 5.4 per capita per year assuming all other criteria of costing remain the same. This means a straight increase of 35 percent in the cost of provision or budget allocations. However, life span could be improved with investments or allocations towards capital maintenance, which are absent at present. The real unit costs are above the departmental norms (observed) in all the agro-climatic zones. Intra zonal (inter village) variations are much higher than that of inter zonal variations (Table 3). The difference between zones is statistically significant in number of cases (see Appendix Table 3). Intra zonal variations are much higher than inter zonal variations, which is one of the reasons for the differences between the zones are not significant in all the cases. And the intra zonal variations are substantially higher in the case of observed unit costs when compared to normative unit costs.

Table 3: Variations in Fixed Costs across Agro-climatic Zones (in US$ per capita / year)

Zone	Observed Life Span				Normative Life Span			
	CapEx	Median	Range (Min-Max)	CV	CapEx	Median	Range (Min-Max)	CV
HAZ	7.1	5	1.0-23	87	3.4	2.8	0-9	66
NCZ	10.4	4.9	1.0-42	122	3.0	2.3	1.0-7	54
GZ	11.3	7.5	0.3-32	91	1.6	1.6	0.0-5	96
KZ	10.3	8.4	2.0-29	77	3.5	2.7	1.0-9	59
SZ	13.3	12.8	.4-37	57	3.5	3.6	0.3-8.6	53
SRZ	9.3	7.3	0.2-33	84	3.2	2.5	0-7	59
STZ	19.7	13.9	3.0-63	61	4.8	3.3	2.0-12	67
CTZ	14.3	8.8	4.0-55	86	3.8	3.2	2.0-8	43
NTZ	13.0	11.2	0.2-56	87	3.7	3.2	0-8.8	58
State	12.1	8.6	0.2-63	92	3.4	2.8	0.0-12	65

The analysis brings out two important issues: i) the real unit costs are substantially higher than the normative unit costs fixed by the department using the standard schedule of rates (SSR) even though they are adjusted to market prices regularly; and ii) there exist substantial variations in unit costs within and between zones[6]. This is mainly due

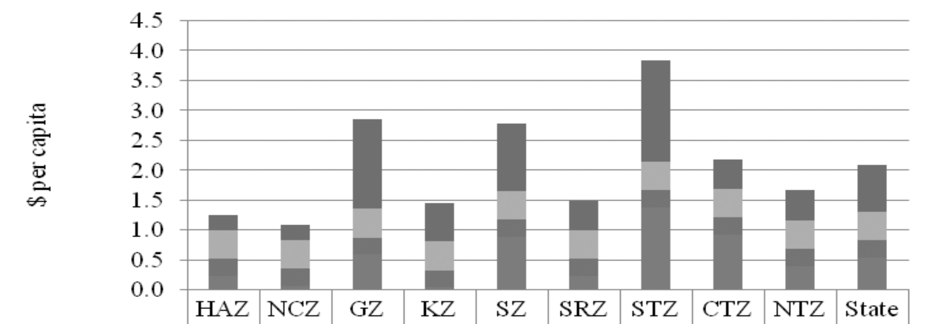
[6] These variations go beyond political economy factors, where a part of higher investments could be attributed to political interference.

to the differences in observed life of the systems across villages (and zones) consequent to the variations in the functionality of the systems. This calls for a revision of unit costs reflecting the reality especially in terms of life span of the systems or allocations towards capital maintenance that would increase the life of the systems. For instance, the high unit costs in Southern Telangana Zone could be attributed to frequent well failure though a more detailed analysis would be taken up separately. Besides, there is a need for differential allocation of resources in order to address the differences in unit costs across zones or locations. Apart from fixed costs recurrent costs also influence service levels.

Recurrent costs

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). These costs are also annualised on per capita basis. At the state level these costs account for US$ 2.1 per capita per year (Fig.3). Across the zones these costs range between US$ 1.2 in North Coastal Zone (NCZ) and US$ 3.9 in Southern Telangana Zone (STZ). STZ has high capital costs as well as recurrent costs. Of the recurrent costs OpEx takes major share followed by CapManEx, ExIDS and ExDS at the state level, though the cost composition varies across zones.

Figure 3: Recurrent Costs across Zones



	HAZ	NCZ	GZ	KZ	SZ	SRZ	STZ	CTZ	NTZ	State
OpEx	0.3	0.3	1.5	0.6	1.1	0.5	1.7	0.5	0.5	0.8
EXIDS	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
ExDS	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
CapManEx	0.2	0.1	0.6	0.0	0.9	0.2	1.4	0.9	0.4	0.5

Cost Composition

The latest guidelines (GoI, 2010) emphasise the shift away from the conventional approach of normative service levels measured in litres per capita per day (lpcd) and a move towards water security at the household level, which includes equity aspects. In order to ensure this the guidelines has accorded importance to allocating resources to various components such as source sustainability (20 percent), water quality (20 percent); operation and maintenance (10 percent) and to mitigate the impact of natural calamities / climate change (5 percent), alongside the allocation for access i.e., Capital expenditure on hardware and software (45 percent). Here we examined how various cost components account for in the real expenditure. Though the earlier guidelines have also suggested component wise allocations, they are hardly followed in reality. Moreover, these allocations are often followed at the sector level and not at the scheme level.

At the state level the cost components are assessed for normative as well as observed life spans. It may be noted that support costs (ExDS and ExIDS) are estimated using the state level and national level budgetary data and these costs are assumed to be constant across zones. These costs, which are not included in the official cost norms, are added to official cost data, as they are already incurred at the state and national level. Another component that is not part of the official norms is the capital maintenance (CapManEx), but came up in the WASHCost data. In fact, capital maintenance does not figure even in the new guidelines, though it finds a mention under operation and maintenance. This could be due to the reason the budget allocations do not have provision for depreciation.

Capital expenditure on hardware gets higher allocations even as per norms i.e., above 50 percent, when compared to new guidelines (Fig. 4). In reality it gets as much as 85 percent of the total expenditure. Support costs get about 5 percent, this too is mainly in the form of salaries and macro planning. It may be noted that presently 72 percent of the executive and superintendent engineer posts are vacant indicating poor support services at the district and sub-district levels. At the state level capital maintenance (CapManEx) account for 4 percent of the total expenditure, though these costs are not part of the norms. Capital maintenance expenditure is ad hoc i.e., as and when need arises. Even the annual budget allocations reveal that the preference is for creating new infrastructure rather than maintaining the old ones (Reddy and Jayakumar, 2011). Operation and maintenance costs account for 5 percent in reality when compared to 10 percent as per the guidelines. Comparing cost allocations between normative life span and observe life span indicate that most of the operation and maintenance might have been diverted to capital expenditure on hardware. That is when unit costs are worked out in accordance with actual life of the systems or separate allocations are made towards capital maintenance, allocations towards operation and maintenance would be utilised for the actual purpose.

Figure 4: Composition of Unit Costs (in %) with Normative and Observed Life Spans in Andhra Pradesh

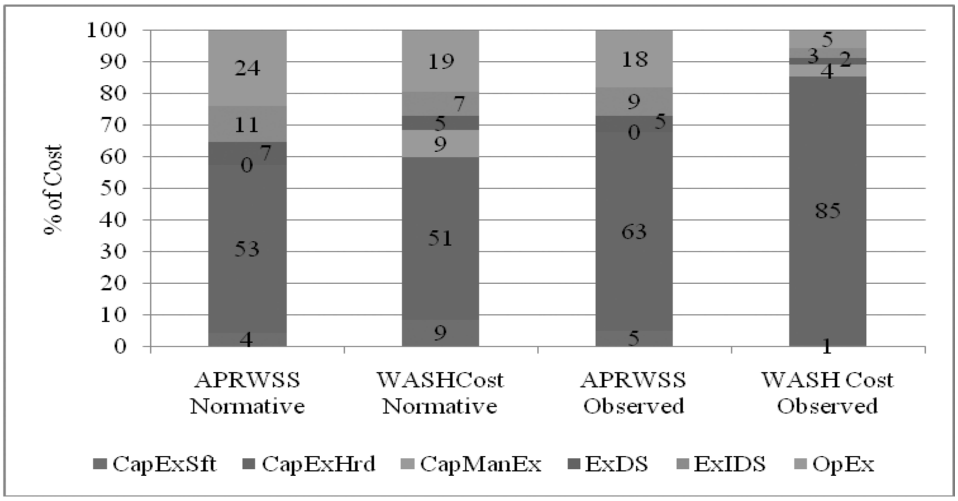
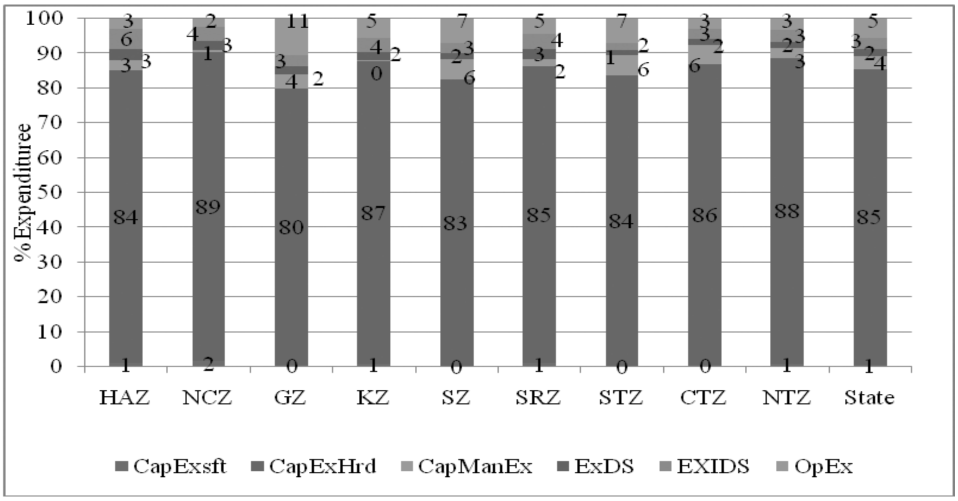


Figure 5: Composition of Unit Costs of Observed Life Span across Agro-climatic Zones (Percentages)

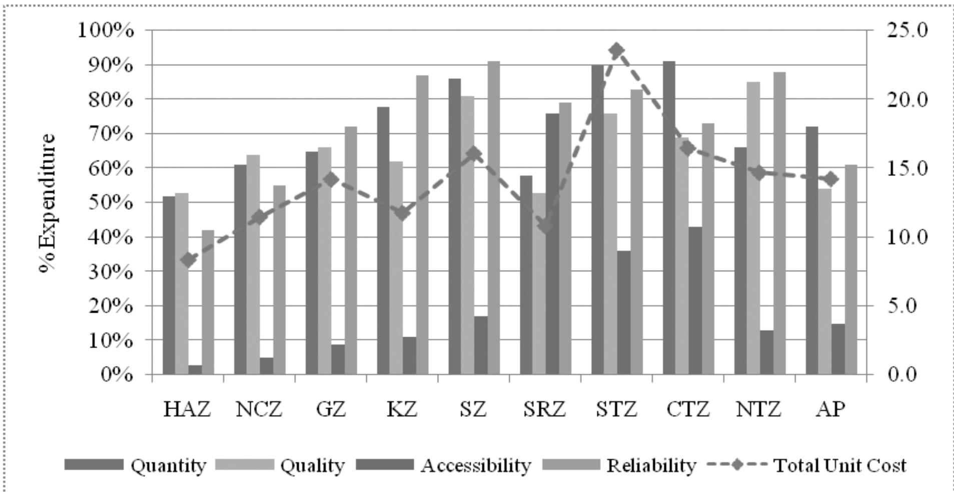


Unit cost composition varies across zones. While Capital expenditure on hardware takes more than 80 percent of the share in all the zones, it is the share of other components that vary more (Fig. 5). Support costs vary between 3 (STZ) and 9 (HAZ) percent. Capital maintenance varies between 0 (KZ) and 6 percent (CTZ, STZ and SZ). The share of operation and maintenance varies between 2 (NCZ) and 11(GZ) percent of the total costs. Incidentally, North Coastal Zone has the highest share of capital expenditure on hardware (89 percent) while Godavari Zone has the lowest share (80 percent). These variations in cost components and composition emphasises our argument that adoption of uniform unit costs and blanket allocation of funds may not be effective in achieving sustainable service delivery. Such variations need to be taken in to account while fixing the norms for fund allocations across zones and also within zones.

Unit Costs and Service Levels

Providing service is expected to be the main reason behind spending on water supply systems. While assessing service levels is complex, as it represents multiple indicators, a service ladder approach using four parameters viz., quantity, quality, accessibility and reliability is adopted in WASHCost research (for details see Moriarty, et. al., 2011). This note focuses on variations in unit costs (fixed as well as recurring) across regions and here we try to examine whether there is any relation between the unit costs and service levels across the agro-climatic zones. Service levels are assessed in terms of proportion of households receiving basic and above service level for the four different parameter[7]. For, basic and above service levels correspond with the Indian norms of service levels.

Figure 6: Service Levels (basic and above) and Unit Costs across Zones.



[7] 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.

At the state level, majority of the households (above 50%) get basic and above service levels for three parameters in all the zones (Fig. 6). Accessibility gets the lowest rating with only 15 percent of the households reporting above basic service level. Across the zones, Scarce Rainfall Zone (SRZ) reported highest proportion (>50%) of the households receiving basic and above service levels in all the four parameters. On the other hand, High Altitude Zone (HAZ) has the lowest proportion of households receiving basic and above services in all the four parameters. While low unit costs (US$ 8.4) in High Altitude Zone could be termed as the reason for the poor service level, the relation does not appear to be that straight forward in the case of Southern Zone (SZ) Scarce Rainfall (SRZ) and Central Telangana (CTZ) Zones, as the service levels don't strictly correspond to unit costs. Krishna Zone, which has the second lowest unit cost (US$ 11.8), has more than 60 % of the households receiving basic and above service levels in three parameters due to the household investments in individual bore wells. This indicates unit costs could be a pointer to service levels at the best. For the composition of costs also plays an important role in the provision of sustainable services. Besides, there could be number of other factors that influence service levels as well as unit costs. A more nuanced analysis of the relation between costs and service levels could provide a better understanding[8] .

IV. Conclusions

The cost estimates using the life-cycle costs approach bring out the following important issues:

I. Unit costs revealed by the LCCA are substantially higher than the prescribed norms and they vary substantially across agro-climatic zones.

II. Intra zonal (inter village) variations are much higher than that of inter zonal variations.

III. Unit costs vary between US$ 8.4 and US$ 23.6 (fixed and recurrent) between the zones, while they range between US$1 and US$ 74 between villages. These variations are quite substantial and go against unconditional allocations.

IV. Lower observed life span of the systems is one of the main reasons for these variations apart from the agro-climatic conditions.

V. Cost composition as well their shares vary across locations. Cost composition is presently focused on infrastructure to the neglect of other important components such as source protection, capital maintenance, quality, etc.

[8] This analysis is beyond the scope of this paper and will be taken up separately.

VI. The analysis suggests that allocations towards capital maintenance could help reducing the gap between normative and observed life spans.

VII. There is no clear relation between unit costs and service levels (quantity, quality, accessibility and reliability) between zones.

While the approach of unconditional allocations towards provision of water in rural areas may be easier administratively and might benefit the low cost regions, it would result in below desirable out comes in the high cost regions. This paper calls for a change in the policy strategy towards rural water supply in India. There is need for rethinking on the policy of blanket or uniform allocations across the zones on the basis of the norms fixed at the state level. Inter and intra zonal variations in unit costs should be kept in view while allocating the funds. Added to this are the intra village variations across socioeconomic groups and geographical locations. The 2010 guidelines with emphasis on water security planning and designing are likely to ameliorate these inequalities if implemented properly. Further, there is need to revise the allocations to the sector in terms of magnitude and composition in the lines suggested here. LCCA is one tool that can help in achieving water security at household level though judicious allocations towards source sustainability or source protection, water quality, capital maintenance, water quality, etc. It facilitates a fairly comprehensive planning with a pragmatic and integrated water resource management approach to rural water service delivery.

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Appendix

Table A1: Life span of Water & Sanitation System Components

Component	Technical Lifetime (Yrs)	Economic Lifetime (Designed period) (Yrs)		Suggested Useful Life (Yrs)
	RWS	CPHEEO	RWS	RWS
Transmission Mains (Raw & Clear Water)	20-50	30	20-30	20
Distribution Mains	20-50	30	20-30	20
Bore wells	20-40	-	10-15	10
Buildings (Civil Works)	30-50	30	30-50	30
Pumps & transformers	10-20	15	10-15	10
Storage Dams / Reservoirs	50-75	50	30-50	50
Infiltration Works	30-50	30	10-15	10
Water Treatment Units	20-40	15	10-15	10
Pipe Connections to Treatment Units & other small Appurtenances	-	30	10-30	10
Clear Water Reservoirs at the Head Works, Balancing Tanks & Service Reservoirs	15-50	15	15-30	15
Distribution System	10- 30	30	5-15	10
Public Stand Post	10-20	-	10-20	10
Hand Pumps	10-15	-	10-15	10
Ceramic Pan	20-50	-	20-30	20
ISL	20-40	-	20-30	20

Note: RWS= Rural Water Supply Department, GoAP, Hyderabad; CPHEEO= Central Public Health and Environmental Engineering Organisation, GoI, New Delhi.
Source: Department of RWSS, Government of Andhra Pradesh

Appendix

Table A2: Cost Norms of Rural Water Supply and Sanitation Department of Andhra Pradesh

	MVS (%)	SVS (%)	Weighted Average
Per capita cost	Rs.2000-2800 (US$ 41- 58)	Rs.900 -1200 (US$ 18.6-24.8)	1455 (US$30)
Per capita Maintenance cost	Rs60.00- 65.00 (US$ 1.2-1.3)	Rs.30.00-35.00 (US$ 0.6-0.7)	41.5 (US$ 0.86)

Table A3: Difference between Unit Costs (observed / Normative) across (Paired 't' test)

Zone	HAZ	NCZ	GZ	KZ	SZ	SRZ	STZ	CTZ	NTZ	AP
HAZ	8.4/4.7									
NCZ	NS/NS	11.5/4.2								
GZ	**/NS	NS/NS	14.2/4.9							
KZ	NS/NS	NS/**	NS/NS	11.8/5.6						
SZ	**/NS	NS/**	NS/NS	NS/NS	16.1/6.4					
SRZ	NS/NS	NS/NS	NS/NS	NS/NS	NS/NS	10.8/5.2				
STZ	**/**	**/**	***/**	**/**	NS/**	**/**	23.6/9.9			
CTZ	**/**	NS/**	NS/NS	NS/NS	NS/NS	NS/NS	NS/**	16.5/6.5		
NTZ	**/**	NS/**	NS/NS	NS/NS	NS/NS	NS/NS	NS/**	NS/NS	14.7/6	
AP	**/**	NS/**	NS/***	NS/NS	NS/NS	NS/NS	***/**	NS/NS	NS/NS	14.2/6.0

Note: NS=Not Significant. ** and *** indicate significant at 5 and 10 percent confidence level respectively.

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