Working Paper No.119
WASHCost - CESS Working Paper No.20
September, 2012

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Acknowledgements

This paper is part of an ongoing action research project, WASHCost, supported by IRC, The Netherlands, in four countries (India, Ghana, Mozambique and Burkina Faso) and is prepared by Dr. G. Alivelu, Assistant Professor, Centre for Economic and Social Studies (CESS), Begumpet, Hyderabad, Professor.V. Ratna Reddy, Director, Livelihoods and Natural Resource Management Institute (LNRMI), Hyderabad and Research Director, WASHCost (India) Project, Dr. P. Bhushan, Junior Economist, WASHCost (India) Project, Centre for Economic and Social Studies (CESS), Begumpet, Hyderabad and Anitha.V, Research Scholar, WASHCost (India) Project, Centre for Economic and Social Studies (CESS), Begumpet, Hyderabad. For more information on WASHCost project see www.washcost.info. Thanks are due to Dr. Arjen Naffs, Country Coordinator, WASHCost (Mozambique) for his critical comments on the earlier drafts of the paper. However the usual disclaimers apply.

Costs and Service Levels of Water and Sanitation: A Study of Peri-Urban Locations in Andhra Pradesh

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ABSTRACT

The present study's main objectives are to estimate the cost of service provision across peri-urban locations for drinking water and sanitation and the relative expenditure on different cost components in reality against the existing norms. Life Cycle Cost Approach (LCCA) is adopted to estimate the actual cost components of service provision. The study is based on the analysis carried out using data collected from 18 peri-urban locations spread over nine agro-climatic zones of AP. The data is collected at two levels. At level one cost data were obtained from 18 municipalities - 2 from each zone. This data is generated from the official records of Public Health and Engineering Department (PHED) at the municipality level. At level two, detailed household level data on socio-economic aspects along with the information pertaining to drinking water and sanitation are gathered from a selected ward from each of the 11 municipalities.

Most of the investments are on capital expenditure on hardware i.e on creation of water and sanitation infrastructure assets. Investment on capital expenditure on software is either absent or negligible. Allocations towards water planning and designing are negligible. At the state level, for water, only 30 percent of the households own tap. During summer, households scored above basic services in terms of quality and reliability while 16 percent of the households scored above basic services in terms of accessibility. In case of quantity, we do not find any households which scored above basic service levels.

As far as sanitation is concerned, households spend more both on construction and also maintenance of toilets. Relative shares of various components indicate that sanitation

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CapExHard accounts for 60 percent of the cost at the State level while recurrent costs account for 40 percent. The field survey clearly shows that the male members of the household do not use toilets and resort to open defecation. On an average, at the State level, around 39 percent of men and women each use toilets in eleven peri-urban towns, while only 21 per cent of children use toilets. On the sanitation service ladder, all the indicators except access which is scored as basic, at the aggregate level, we observe limited or no service with respect to use, reliability and environmental protection. When service levels are plotted against the unit cost, there appears to be no association between the two. There is no correspondence, especially in the case of use. Reliability is very low. The higher level of environmental protection indicator could be due to other reasons rather than unit costs.

Acronym	Definition
AP	Andhra Pradesh
BC	Backward Caste
BW	Buying water
CA	Coastal Andhra
CV	Coefficient of Variation
GDP	Gross Domestic Product
HH	Household
HP	Hand Pump
IEC	Information, Education and Communication
INR	Indian Rupee
IRC	International Research Centre on Water and Sanitation
ISL	Individual Sanitary Latrine
LCCA	Life Cycle Cost Approach
NA	Not Available
NS	Non-summer
NW	Not working
OC	Other Caste
OHT	Over Head Tank
PHED	Public Health and Engineering Department
PSP	Public Stand Post
QIS	Qualitative Information Score
RRA	Rapid Rural Appraisal
SC	Scheduled Caste
ST	Scheduled Tribe
US	United States
WASH	Water, Sanitation and Hygiene

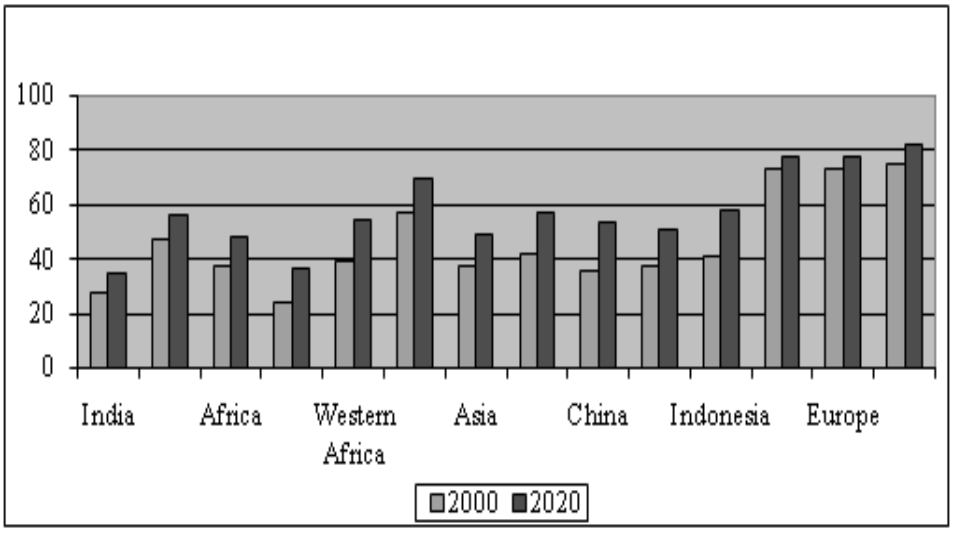
Costs and Service Levels of Water and Sanitation: A Study of Peri-Urban Locations in Andhra Pradesh

G. Alivelu, V. Ratna Reddy, P. Bhushan and V. Anitha

I. Introduction

Urbanization in India is on the high growth path, which is expected to continue due to the projected sustained high growth of the economy in the coming years. Presently, India has the lowest level of urbanization (percentage of urban population) among comparable countries in the world. By the year 2000, the extent of urbanization in India was 28 percent as against 37.5 percent in Asia (Figure 1). The India China differences in urbanization are likely to widen by 2020 i.e., 35 percent in India as against 53 percent in China. It is projected that urbanization in India would reach 40.1 percent by 2030 (www.un.org/population/publications). The growth of urbanization would be much faster during the next two decades when compared to the last five decades, if India continues to be a services economy. The pace could be faster, if the share of manufacturing in the GDP increases substantially. The share of manufacturing sector ought to increase in order to sustain the present growth fuelled by the service

Figure 1: Extent of Urbanisation across World



Source: www.un.org/population/publications

sector (Reddy, 2006). However, the growth in urbanization is also shifting from metropolitan cities to secondary towns over the years. Most of the towns in this category have recorded faster growth when compared to larger cities (GoI, 2001). It is observed that bulk of population growth in India is expected to occur in the small towns with population greater than $2240 (Scott, et. al., 2004). In most of the towns, the pre-urban fringe is expanding not only due to the expansion and emergence of new colonies and but also due to the merger of surrounding villages with the urban centres.

This fast paced urbanization has costs associated with it, such as increased demand for basic amenities like water, sanitation, power, etc. Most strident is the demand for water in domestic and commercial purposes and sanitation services. Moreover, most poor communities live in these locations. Here *Peri-urban* locations are defined as the locations that are not directly served by (conventional) urban utilities but located on the periphery or very close to the urban areas. Provision of water and sanitation services to the expanding peri-urban locations is a challenge. Often, peri-urban locations are not part of the designing of the urban water systems and hence become an additional burden on the existing systems. For, these areas are provided with scanty services in the absence of proper investments in upgrading the systems. Services are often informal, adhoc and uncertain. The service levels and the costs associated with it are expected to be different in these areas. The paper attempts to assess the unit costs and service levels of water and sanitation in selected peri-urban locations. Specific objectives include:

a) Estimating the cost of service provision across peri-urban locations for drinking water and sanitation, and

b) Estimating the relative expenditure on different cost components in reality against the existing norms.

II Approach

Life Cycle Cost (LCC) Approach[1] 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 pro-poor institutional support (Fonseca, et. al., 2011). Both public and household expenditure are included in the analysis, as households may be making additional investments in water and sanitation infrastructure due to the poor service levels.

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

This paper is based on the analysis carried out using data collected from 18 peri-urban locations spread over nine agro-climatic zones of Andhra Pradesh. The sample locations were selected on the basis of a stratified sampling design in each of the agro-climatic zones at four stages (Table 1)[2] . The data is collected at two levels. At level one cost data were obtained from 18 municipalities - 2 from each zone. This data were generated from the official records of Public Health and Engineering Department (PHED) at the municipality level. At level two, detailed household level data on socio-economic aspects along with the information pertaining to drinking water and sanitation are gathered from a selected ward from each of the 11 municipalities. General household information was collected from all the households in the selected ward (totalling 5122), while detailed information was elicited from a sample of 50 households from each selected ward. In other words, detailed household information was generated from 550 households i.e., 50 households from each ward in the respective peri-urban location (Table 1). Selected peri-urban locations are part of the main sample towns i.e., a ward of the selected town. While the cost data is obtained from the municipal records of the selected towns, service levels are assessed based on the selected location (ward) within the town. The costs are divided on the basis of population (per capita) and assumed that these costs are appropriate across all locations. In some of the locations (wards) service levels may not commensurate with unit costs. Though this appears like over estimation of costs in comparison with the service level, such assumption is reasonable in most towns. For instance, in most of the towns service levels are unevenly distributed across the locations, irrespective of their peri-urban nature. In fact, in towns like Vikarabad, some of the wards located in the centre of the town get poor water supplies for various reasons. Hardware investments may not be there in all the wards, but in the absence of Hardware (at some place in the town), they may not receive any water. Given the reality, that peri-urban areas are add on to the existing water supply investments as well as service lines, the authorities are expected to increase the investments by way of adding distribution lines or even over head tank(OHT), (CapExHrd) to facilitate add on peri-urban areas. In the absence of these investments service levels suffer, which is evident from our analysis. We also argue that services are not proportionately distributed to these colonies/ wards.

Both qualitative and quantitative research tools were used to elicit information at secondary as well as primary levels. Qualitative and quantitative methods were used as complements rather than substitutes. For this purpose, number of formats and check

[2] Scientific sampling procedure was followed while selecting the sample habitations (See for details Reddy, et.al., 2009).

lists were used. Qualitative methods such as Rapid Rural Appraisal (RRA), Qualitative Information Systems (QIS), etc., were adopted in particular to elicit from the WASH service users. Quantitative information was collected from the department, households, communities, key informants, etc.

Table 1: Sampling Frame

Stage I	Stage II	Stage III	Stage IV
Agro climatic Zones	Wards - Level I	Wards -Level II	Households
Nine	Peri-urban: 9*2= 18 -Secondary data on unit costs from line Departments and PHED	Peri-urban: 11*1=11 -Listing of households -Detailed information at the Municipality and Wards using qualitative techniques.	Peri-urban: 11*50=550 -Detailed quanti tative and qualita-tive information at the Household level.

Cost components and calculations

The various cost components[3] and their calculations are mentioned below

- 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 / collapse of a 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 summed over the years.

- Cost of Capital (CoC) is the interest paid on borrowed money from external funders like banks, aid agencies, etc. It is included in the estimates, where ever applicable and data is provided.

[3] For details see WASHCost (India), 2010

- 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 (ExpDS) are in the form of salaries of the staff, IEC activities, demand management initiatives, etc.

- Expenditure on indirect support costs (ExpIDS) 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[4].

Since capital and capital maintenance expenditure are one time investments in the past they are converted to current values (2010) 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). These costs are annualised using the normative life span and/or observed life of the systems. The data on normative life are provided by the Department, which is simply the expected life of a specific component. The observed life span is the actual number of years the system (major component) lasts. All the cost estimates are made for the wards using the town level data on costs. The costs are worked out on the basis of population. Hence, wherever peri-urban locality is mentioned, it implies that we are talking about the specific sample ward and not the entire town.

Profile of Peri-urban Locations

The sample wards differ in size and socio-economic composition of the households (Table2). Except in Vikarabad (ward 9), ward 33 of Guntakal, Bheemunipatnam (ward 2), in all the other peri-urban towns, we find that percentage share of Backward castes (BC) is very high as compared to Scheduled castes (SC) and Other castes (OC). Share of SC population is the highest in Bheemunipatnam (ward 2) while that of OC percentage share is the highest in Vikarabad (ward 9) (Table 2). On the other hand, economic composition shows that within the low income group, ward 9 of Vikarabad has the highest share of households falling in this group, followed by ward 22 of Peddapuram and ward 2 of Bheemunipatnam. In the remaining eight peri-urban towns, percentage share of middle income households is high. It is only in Guntakal town (ward 33) do we find a slightly higher share (33%) of high income households (Table 2). The literacy rate is the highest in Gadwal.

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

Table2: Profile of Peri-urban locations

Zone	Town	Total Population (2009)	Ward	No. of HH	Social composition (OC/BC /SC/ST) (%)	Economic Composition (L/M/H) (%)	% Literacy
Southern Telangana	Vikarabad	43862	9	267	50/30/20/0	90/9/1	59
	Miryalguda	121440	17	665	23/63/14/0	29/57/14	82
	Gadwal	81000	20	554	25/72/3/0	39/52/9	87
Central Telangana	Jangaon	54648	2	408	23/72/5/0	26/63/11	71
North Telangana	Bodhan	101200	6	380	1/66/33/0	31/59/10	64
Scarce rainfall	Guntakal	134596	33	462	5/14/81/0	25/41/34	71
Krishna	Sattennapalli	62744	20	535	40/49/11	31/52/17	55
Southern	Venkatagiri	48921	3	430	34/86/8/0	24/63/13	59
Godavari	Peddapuram	50600	22	444	2/97/1/0	76/20/4	58
North Coastal	Bheemunipatnam	49862	2	376	10/40/50/0	55/29/16	71
High altitude	Saluru	54188	14	601	17/62/6/15	65/29/6	62

Note: SC= Scheduled Castes; BC= Backward Caste and OC= Other Castes. L= Low Income; M= Middle Income; and H= High Income.

Source: Based on the information collected from the WASHCost (India) Project (2011) sample habitations; population data from the census data

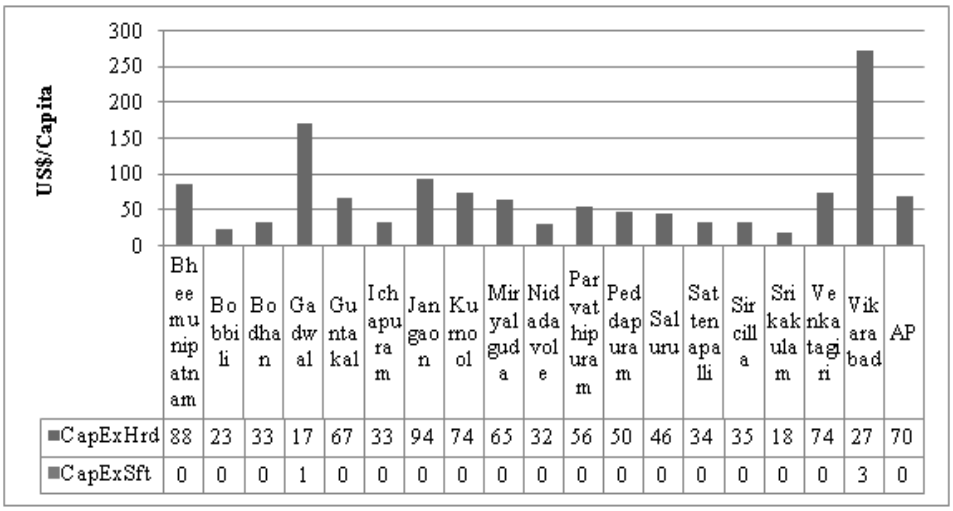
III Cost of Provision: Water

Fixed Costs

Total fixed costs (CapEx) over the years range between US$ 18 (Rs828) per capita in Srikakulam to US$ 94 (Rs 4324) per capita in Jangaon (fig. 2). Within the capital costs almost the entire amount is spent on infrastructure, as the expenditure on CapExSft (planning and designing) is either absent or negligible in all the sample locations. Planning and designing component is visible only in the cases with high capital expenditure such as Vikarabad and Gadwal. Even in these cases the allocations are hardly one percent. At the aggregate (State) level these costs are US$ 70 (Rs3220) per capita. When these costs are annualised the unit costs range between US$ 1(Rs 46) per capita per year in Srikakulam and US$ 23 (Rs 1058) in Vikarabad when normative life is assumed to the system (Fig. 3). But in reality systems life is much less than the norms, as reflected in unit costs when observed life is taken in to account i.e., the costs range between US$ 4 (Rs 184) in Jangaon to US$ 88 (Rs 4048) in Bheemunipatnam. This indicates clearly the observed life of the systems is much less than the normative life, which forms the basis for allocating the resources, implying that the unit costs in reality are much higher

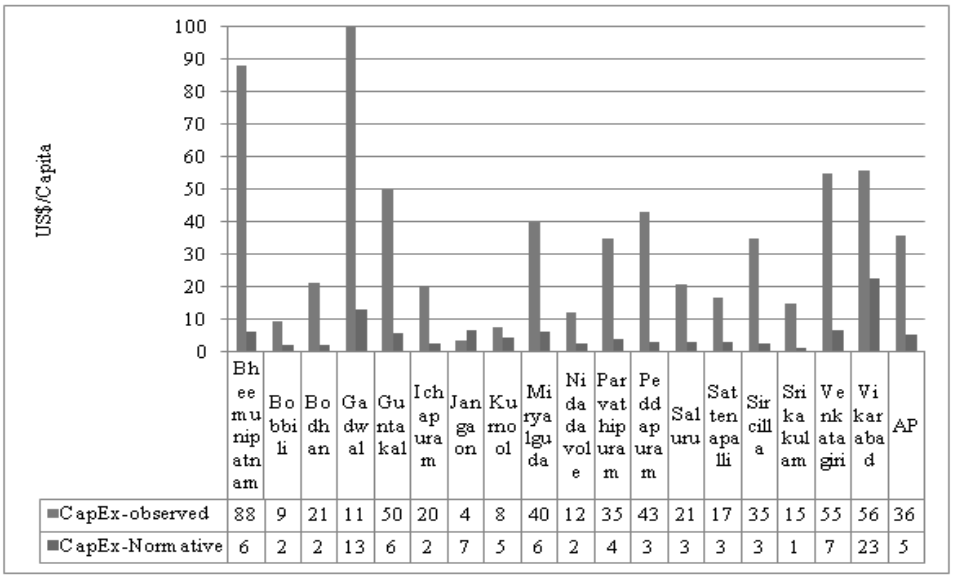
than the norms fixed by the Department. There are wide variations across the locations, irrespective of the life span, though variations are slightly higher in the case of actual life (Table 3). At the State level, the annualised costs range between US$ 36 (Rs 1656) and US$ 5 (Rs 230) when observed and normative life spans are used.

Figure 2: Cost of Provision across Peri-urban Locations (CapEx per Capita in US$)



Source: Based on the data collected from PHED and Municipal offices?

Figure 3: Actual Vs. Normative Fixed Costs across Peri-urban Locations



Source: Based on the data collected from PHED and Municipal offices

The unit costs of providing drinking water in the peri-urban locations are much higher when compared to rural areas (Table 3). Costs are higher when observed life of the systems is used. The high costs in some of the peri-urban areas like Gadwal, Bheemunipatnam, Vikarabad, etc., are due to resource provision costs, as they depend on surface water sources. While Vikarabad has been traditionally supported by a tank, Gadwal depends on the Krishna River water for which huge infrastructure has been created specifically for this purpose. In case of Bheemunipatnam town, we observe that the town is dependent on surface water resulting in huge infrastructure costs. Further, the old water pipes are being replaced with the new ones as the old ones are not able to take the water pressure. On the other hand, the intensity of public WASH infrastructure in the sample peri-urban locations is much less and investments are less regular when compared to the rural investment pattern, indicating peri-urban locations are not getting the regular investments as frequently as in the rural areas.

Table 3: Fixed Costs Per Capita Per year in Peri-urban and Rural Areas (Actual and normative life)

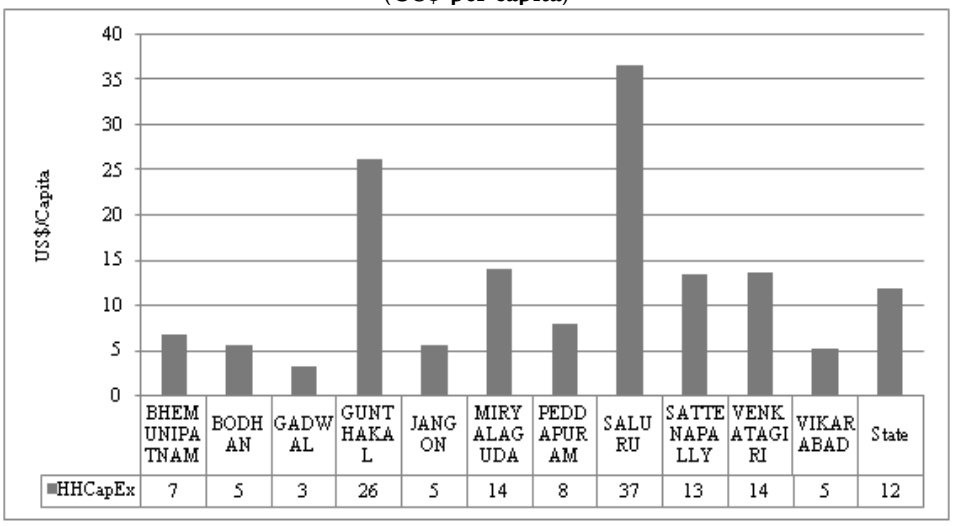
	Peri - Urban		Rural	
	CapEx-observed	CapEx-normative	CapEx-observed	CapEx-normative
Average	36	5	12.1	3.4
Median	28	3	8.6	2.8
Minimum	4	1	0.2	0
Maximum	115	19	63	12
Coefficient of variation	82	84	92	65

Source: Based on the data collected from PHED and Municipal offices

Household Cost

Apart from public expenditure, households also spend on fixed infrastructure in order to improve or complement the service levels. Household expenditure ranges between US$ 3 (Rs 138) in Gadwal to US$ 37 (Rs 1702) in Saluru (Fig.4). These costs are substantial at 25 percent of the public expenditure. Household capital expenditure does not seem to be linked to public expenditure.

Figure 4: Household Capital Expenditure across the Peri-urban Locations (US$ per capita)

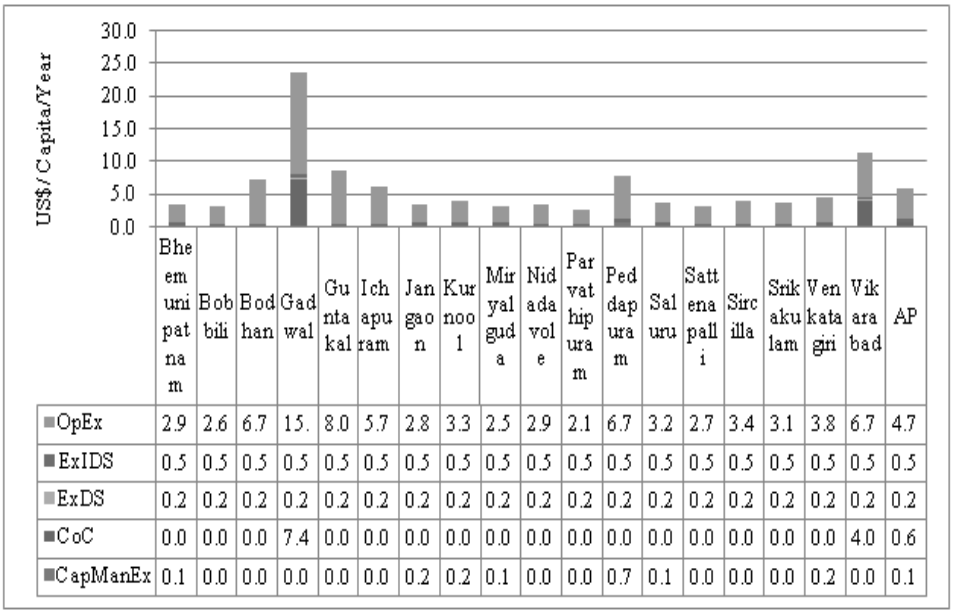


Source: Based on the WASHCost (India) Project (2011) field survey data

Recurrent Costs

Recurring costs include capital maintenance, cost of capital, operation and maintenance and direct and indirect support costs. Recurring costs are estimated at US$ 6 (Rs 280) per capita per year. Of this US$ 5 (Rs 230) is spent towards operation and maintenance (OpEx) (Table 4). These costs range between US$ 3 (Rs 138) in Parvathipuram to US$ 24 (Rs 1104) in Gadwal (Fig. 5). And the OpEx ranges between US$ 2 (Rs 97) and US$ 16 (Rs 736) in the same locations (Fig 5). Capital maintenance is incurred in seven out of 18 sample locations. And Cost of Capital (CoC) is reported only in Vikarabad and Gadwal towns. Among the recurring costs O&M takes a lion's share i.e., 80 percent of all the recurring costs at the state level (Fig. 6). Across the locations the relative share of OpEx is as high as 93 percent in Guntakal and as lowest as 59 percent in Vikarabad. Support costs account for about 14 percent of the recurring costs while capital maintenance accounts for 2 percent (Fig 6).The low capital maintenance costs could be due to high operation and maintenance costs. At the same time observed life of the systems is very low. In other words, while major break downs are avoided due to high maintenance costs, complete breakdowns are more and could be due to other reasons not related to regular maintenance. On the contrary the OpEx costs are substantial in peri-urban followed by support costs, and cost of capital. Though households also incur some expenditure on operation and maintenance, the costs are marginal.

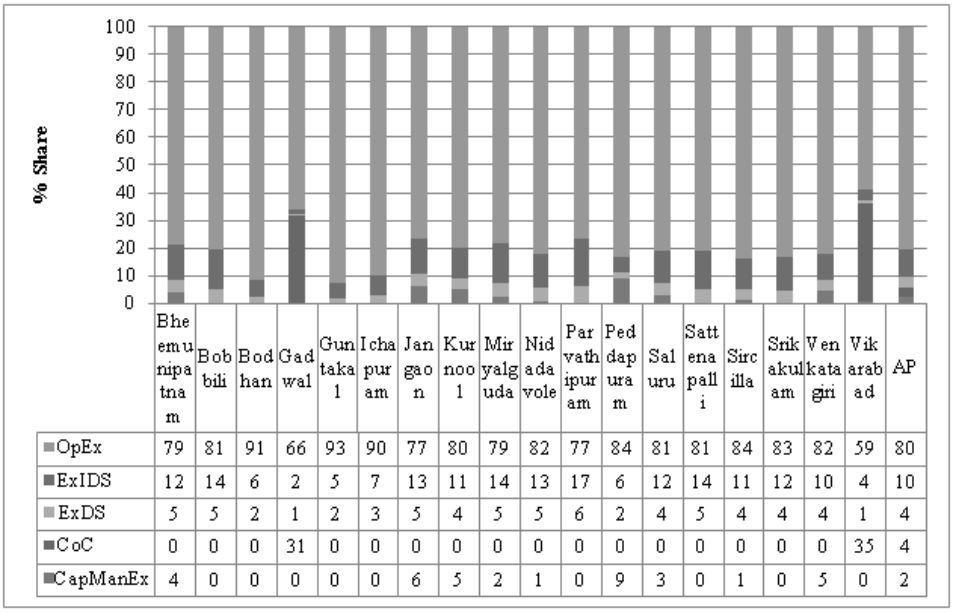
Figure 5: Recurring Cost of Provision in Peri-urban Areas (US$ / capita / Year)



	Bheemunipatnam	Bobbili	Bodhan	Gadwal	Guntakal	Ichapuram	Jangaon	Kurnool	Miryalguda	Nidadavole	Parvathipuram	Peddapuram	Saluru	Sattenapalli	Srikalam	Venkatagiri	Vikarabad	AP
OpEx	2.9	2.6	6.7	15.	8.0	5.7	2.8	3.3	2.5	2.9	2.1	6.7	3.2	2.7	3.4	3.1	3.8	6.7	4.7
ExIDS	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
ExDS	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
CoC	0.0	0.0	0.0	7.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.6
CapManEx	0.1	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.1	0.0	0.0	0.7	0.1	0.0	0.0	0.0	0.2	0.0	0.1

Source: Based on the data collected from PHED and Municipal offices

Figure 6: Relative Shares of recurring Costs across Peri-urban Locations (percentages)



	Bheemunipatnam	Bobbili	Bodhan	Gadwal	Guntakal	Ichapuram	Jangaon	Kurnool	Miryalguda	Nidadavole	Parvathipuram	Peddapuram	Saluru	Sattenapalli	Srikakulam	Venkatagiri	Vikarabad	AP
OpEx	79	81	91	66	93	90	77	80	79	82	77	84	81	81	84	83	82	59	80
ExIDS	12	14	6	2	5	7	13	11	14	13	17	6	12	14	11	12	10	4	10
ExDS	5	5	2	1	2	3	5	4	5	5	6	2	4	5	4	4	4	1	4
CoC	0	0	0	31	0	0	0	0	0	0	0	0	0	0	0	0	0	35	4
CapManEx	4	0	0	0	0	0	6	5	2	1	0	9	3	0	1	0	5	0	2

Source: Based on the data collected from PHED and Municipal offices

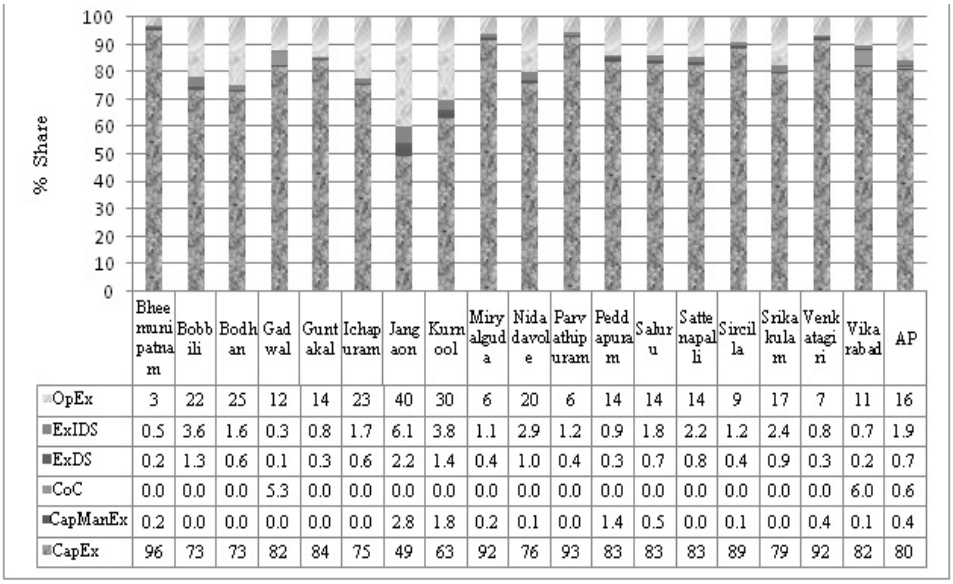
Table 4: Annualised Cost of Provision (fixed and recurring) in Peri-urban Locations (US$ per capita)

	CapEx	CapManEx	CoC	ExDS	ExIDS	OpEx	Total
Bheemunipatnam	88	0.1	0.0	0.2	0.5	3.1	91.8
Bobbili	9	0.0	0.0	0.2	0.5	2.8	12.8
Bodhan	21	0.0	0.0	0.2	0.5	7.2	28.8
Gadwal	116	0.0	7.4	0.2	0.5	16.9	141.2
Guntakal	50	0.0	0.0	0.2	0.5	8.6	59.1
Ichapuram	20	0.0	0.0	0.2	0.5	6.1	27.2
Jangaon	4	0.2	0.0	0.2	0.5	3.0	7.5
Kurnool	8	0.2	0.0	0.2	0.5	3.6	12.0
Miryalguda	40	0.1	0.0	0.2	0.5	2.7	43.2
Nidadavole	12	0.0	0.0	0.2	0.5	3.1	15.8
Parvathipuram	35	0.0	0.0	0.2	0.5	2.2	37.8
Peddapuram	43	0.7	0.0	0.2	0.5	7.2	51.6
Saluru	21	0.1	0.0	0.2	0.5	3.5	24.8
Sattenapalli	17	0.0	0.0	0.2	0.5	2.9	20.4
Sircilla	35	0.0	0.0	0.2	0.5	3.7	39.2
Srikakulam	15	0.0	0.0	0.2	0.5	3.3	18.9
Venkatagiri	55	0.2	0.0	0.2	0.5	4.1	59.7
Vikarabad	56	0.0	4.0	0.2	0.5	7.2	67.7
Average (AP)	36	0	1	0	0	5	42
Median	27.9	0.0	0.0	0.2	0.5	3.5	33.3
Range (Min-Max)	4-116	0-0.7	0-7.4	0.2-0.2	0.5-0.5	2.2-16.9	7.5-141
CV	82.5	166.8	305.1	0.0	0.0	69.8	79.3

Source: Based on the data collected from PHED and Municipal offices

In terms of total costs (fixed + recurring) per capita per year, fixed costs account for 80 percent of the costs at the State level. Of the recurring costs, OpEx accounts for 16 percent and the remaining costs are negligible (Fig. 7). In comparison with the rural drinking water peri-urban areas are spending more on operation and maintenance. That means, peri-urban locations are characterised with high capital cost as well as high maintenance costs. This reflects an urban bias in the investment in the water sector. However, whether these high costs are resulting in better service levels or not is examined in the next section.

Figure 7: Relative Shares of fixed and Recurring Costs (in percentages)



	Bheemunipatnam	Bobbili	Bodhan	Gadwal	Guntakal	Ichapuram	Jangaon	Kurnool	Miryalguda	Nidadavole	Parvathipuram	Peddapuram	Sahuru	Sattenapalli	Sircilla	Srikakulam	Venkatagiri	Vikarabad	AP
OpEx	3	22	25	12	14	23	40	30	6	20	6	14	14	14	9	17	7	11	16
ExIDS	0.5	3.6	1.6	0.3	0.8	1.7	6.1	3.8	1.1	2.9	1.2	0.9	1.8	2.2	1.2	2.4	0.8	0.7	1.9
ExDS	0.2	1.3	0.6	0.1	0.3	0.6	2.2	1.4	0.4	1.0	0.4	0.3	0.7	0.8	0.4	0.9	0.3	0.2	0.7
CoC	0.0	0.0	0.0	5.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0	0.6
CapManEx	0.2	0.0	0.0	0.0	0.0	0.0	2.8	1.8	0.2	0.1	0.0	1.4	0.5	0.0	0.1	0.0	0.4	0.1	0.4
CapEx	96	73	73	82	84	75	49	63	92	76	93	83	83	83	89	79	92	82	80

Source: Based on the data collected from PHED and Municipal offices

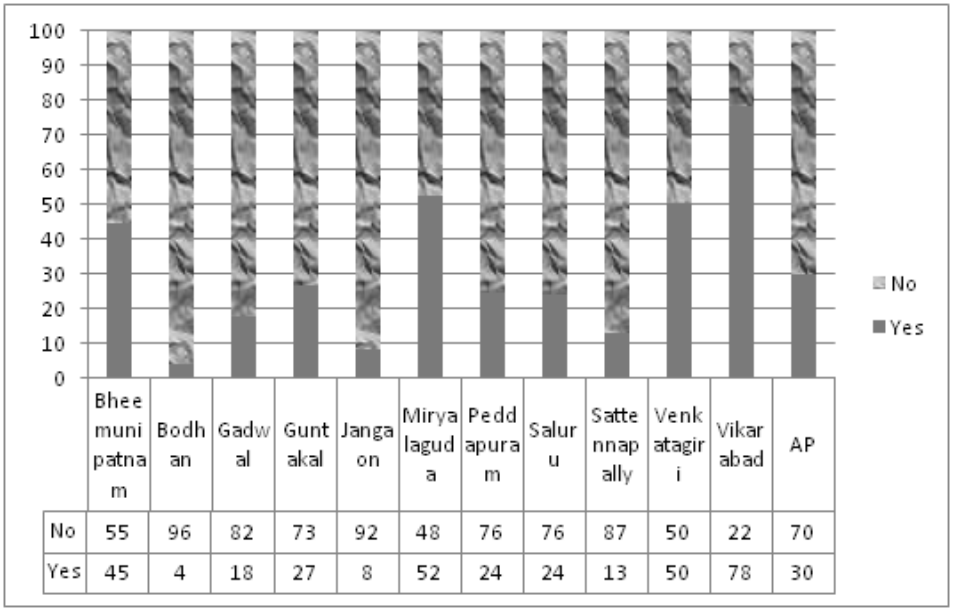
IV Service Levels: Water

Service levels are assessed based on the household data collected from 5122 sample households from each ward selected from the eleven peri-urban locations. These service levels are assessed based on the data collected on owning a tap, source of water, type of water connection, water infrastructure assets, quantity, quality and accessibility of water.

Water infrastructure is critical for service delivery. At the household level having an own tap provides easy access to water. However, having a house connection does not ensure good service. Good service depends on number of other things like quality of infrastructure, source of water, management of the systems in terms of reliability and predictability. Besides, buying water is also common in the peri-urban locations, especially in the locations where public service delivery is poor. Here, we look at some of these aspects of water service delivery and the service levels received at the household level.

Ward 9 of Vikarabad peri-urban location has the highest percentage (78 percent) of households owning tap, followed by ward 17 of Miryalguda (52 percent) and ward 3 of Venkatagiri (50 percent). Bodhan has the least percentage (around 4 percent) of households owning a tap. This is followed by Jangaon (nearly 8 percent) (Figure 8). If we look at the State as a whole, owning a tap presents a dismal picture as only 30 percent of the households own tap while nearly seventy per cent of the households do not own a tap.

Figure 8: Households owning and not owning a tap (percent)



	Bheemunipatnam	Bodhan	Gadwal	Guntakal	Jangaon	Miryalaguda	Peddapuram	Saluru	Sattennapally	Venkatagiri	Vikarabad	AP
No	55	96	82	73	92	48	76	76	87	50	22	70
Yes	45	4	18	27	8	52	24	24	13	50	78	30

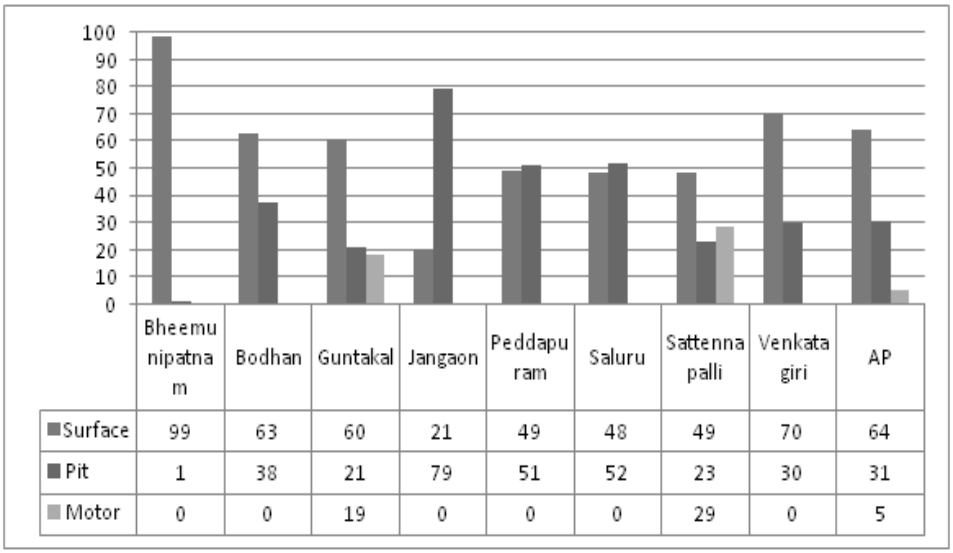
Source: Based on the information collected from the WASHCost (India) Project (2011) sample habitations.

Buying water

When a household does not own a tap, it has to depend on public stand posts, hand pumps or tanker supplies in the peri-urban locations. In addition, it may force the households to buy water, if the public supplies are not adequate or of poor quality.

In the respective wards of Bodhan, Guntakal, Venkatagiri and Bheemunipatnam, a large percentage of household taps are connected to the surface level, while in Peddapuram, Jangaon and Saluru they are connected to a pit. In some locations like Guntakal and Sattennapalli, house connections are connected to motors (booster pumps) to extract more water from low pressure systems or even pump it to over head tanks. Such illegal connections are observed in 29 percent of the sample households in Sattennapalli and 19 percent in Guntakal (Fig 9). This kind of illegal extraction of water results in poor supplies or no supplies to the downstream households. Households may resort to buying water when service levels are poor even from other sources like PSP and HP.

Figure 9: Tap Connection (type) (percent of Households)



	Bheemunipatnam	Bodhan	Guntakal	Jangaon	Peddapuram	Saluru	Sattennapalli	Venkatagiri	AP
Surface	99	63	60	21	49	48	49	70	64
Pit	1	38	21	79	51	52	23	30	31
Motor	0	0	19	0	0	0	29	0	5

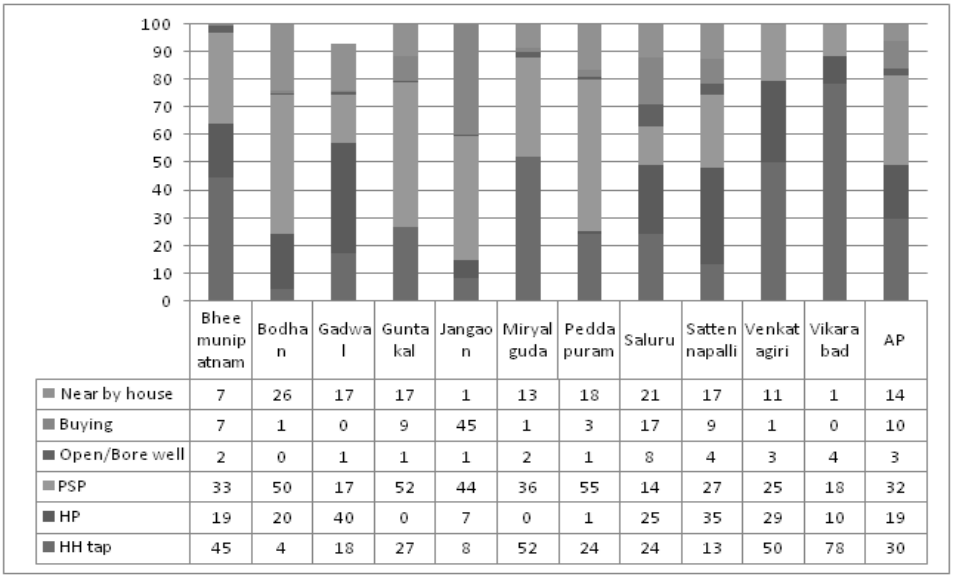
Source: Based on WASHCost (India) Project (2011) field survey

* Data on Vikarabad, Miryalguda, Gadwal is not included as this specific data information was not collected during the field visit

Multiple Source of Water

Having a house connection does not necessarily mean that, it is the only source of water. Households rely on multiple sources for their water requirements (Fig. 10). Higher percentage share of households depend on household taps as the major source of water in the respective wards of Vikarabad (around 68 percent), Miryalguda (48 percent) and Venkatagiri (31 percent). In Bodhan, Guntakal, Peddapuram and Bheemunipatnam, for the majority of the households, source of water is Public Stand Posts (PSP). Around 40 percent of the households in ward 20 of Gadwal town and 35 percent of the households in ward 20 of Sattennapalli depend on hand pumps (HP) for their water needs. Data clearly shows that in all the eleven towns, major water sources are HPs and PSPs. Only in Jangaon town do we see that nearly 45 percent of the households buy water despite having nearly 44 percent of PSPs, indicating poor quality of supply (Fig 10).

Figure10: Source of Water (percent)



	Bheemunipatnam	Bodhan	Gadwal	Guntakal	Jangaon	Miryalguda	Peddapuram	Saluru	Sattenapalli	Venkatagiri	Vikarabad	AP
Near by house	7	26	17	17	1	13	18	21	17	11	1	14
Buying	7	1	0	9	45	1	3	17	9	1	0	10
Open/Bore well	2	0	1	1	1	2	1	8	4	3	4	3
PSP	33	50	17	52	44	36	55	14	27	25	18	32
HP	19	20	40	0	7	0	1	25	35	29	10	19
HH tap	45	4	18	27	8	52	24	24	13	50	78	30

Source: Based on WASHCost (India) Project (2011) field survey

Functionality of Water Infrastructure

In Vikarabad, Gadwal, Sattennapalli and Bheemunipatnam all the PSP's existing are in working condition. In Jangaon only 2 out of a total of 52 and in Guntakal, one out of the total 42 PSPs are not in working condition. However, in Saluru, we observe that about 50 percent of the PSPs are not working. In Miryalguda 12 PSPs are abandoned and 4 are not working out of a total of 43 PSPs (Table 5).

With regard to HPs, in the respective wards of Gadwal, Venkatagiri and Bheemunipatnam, all HPs existing in the wards are in working condition. In Saluru, Jangaon, Bodhan, Peddapuram, Miryalguda and Sattennapalli, majority of the HPs are not in working condition (Table 5). This again takes us back to the question of dependency on water sources especially Bodhan and Jangaon where large number of households is dependent either on public stand posts or hand pumps. This increased dependency on less number of water infrastructure assets may further deteriorate the functioning of these assets and quality of service. As a result households have to resort to buying water as is evident from Jangaon.

Table 5: Water Infrastructure in the Sample Habitations

	Wells/Borewells				PSPs				HPs			
	Total	Wkg	NW	Abd	Total	Wkg	NW	Abd	Total	Wkg	NW	Abd
Bheemunip-atnam	Nil	Nil	Nil	Nil	15	15	Nil	Nil	12	12		
Bodhan	5	5	Nil	Nil	41	36	1	5	18	11	6	1
Gadwal	Nil	Nil	Nil	Nil	25	25	Nil	Nil	10	10	Nil	Nil
Guntakal	Nil	Nil	Nil	Nil	42	41	1	Nil	2	1	1	Nil
Jangaon	Nil	Nil	Nil	Nil	52	50	2	Nil	14	8	6	Nil
Miryalguda	Nil	Nil	Nil	Nil	43	39	4	12	12	5	5	2
Peddapuram	1	Nil	1	Nil	6	4	2	Nil	2		2	Nil
Saluru	Nil	Nil	Nil	Nil	13	6	7	Nil	13	5	8	Nil
Sattennapalli	Nil	Nil	Nil	Nil	11	11	Nil	Nil	23	18	5	Nil
Venkatagiri	Nil	Nil	Nil	Nil	33	29	4	Nil	20	20	Nil	Nil
Vikarabad	Nil	Nil	Nil	Nil	15	15	Nil	Nil	4	3	1	Nil

Source: Based on the information collected from the WASHCost (India) Project (2011) sample habitations;

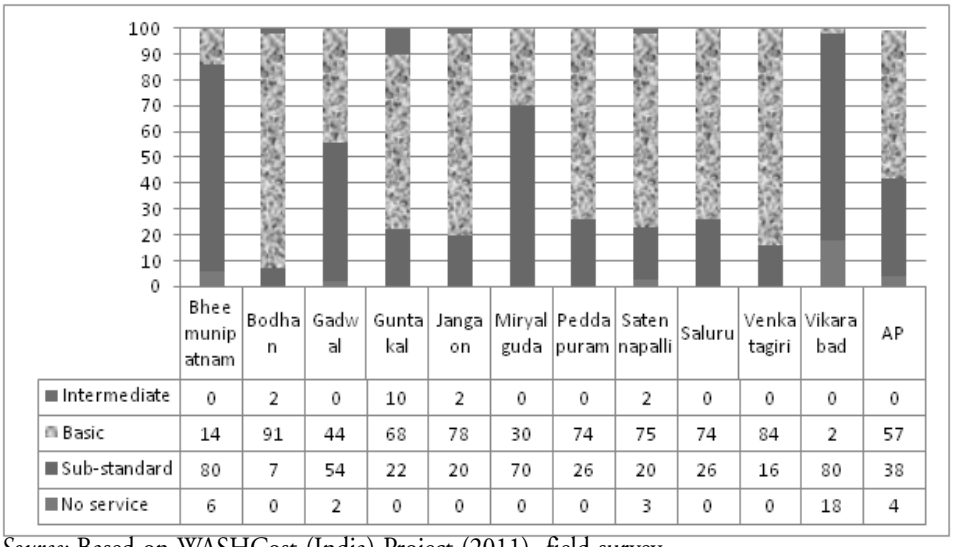
* NW - Not working; Abd- Abandoned; Wkg - Working

Service levels Analysis

Service ladder approach is used to assess the water service levels in terms of quantity, quality, reliability and accessibility. And the households' perceptions reflecting five levels of service viz., no service, sub-standard, basic, intermediate and high, are captured and scored on the above mentioned indicators for summer as well as non-summer periods[5]. With regard to water quantity it is observed that in seven (Jangaon, Bodhan, Guntakal, Venkatagiri, Peddapuram, Sattennapalli and Saluru) peri-urban towns, majority of the households' rate water quantity as basic. On the other hand, in Vikarabad, Miryalguda, Bheemunipatnam and Gadwal water quantity is rated as sub-standard (Fig.11).

[5] Including and excluding livestock quantity requirements are also elicited. Since, livestock population is very limited in peri-urban locations; the quantity perceptions presented here exclude livestock.

Fig 11: Water Quantity excluding livestock (summer)

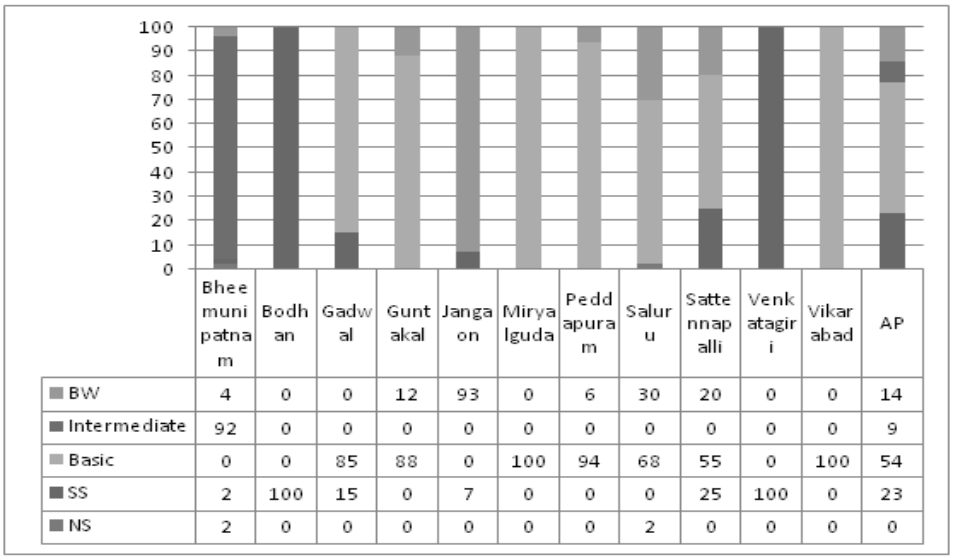


	Bheemunipatnam	Bodhan	Gadwal	Guntakal	Jangaon	Miryalguda	Peddapuram	Satenapalli	Saluru	Venkatagiri	Vikarabad	AP
Intermediate	0	2	0	10	2	0	0	2	0	0	0	0
Basic	14	91	44	68	78	30	74	75	74	84	2	57
Sub-standard	80	7	54	22	20	70	26	20	26	16	80	38
No service	6	0	2	0	0	0	0	3	0	0	18	4

Source: Based on WASHCost (India) Project (2011) field survey

Water quality is scored as basic in seven out of eleven peri-urban locations, while it is sub-standard in Bodhan and Venkatagiri (fig.12). The scoring based on perceptions on accessibility to water shows that it is either no service or sub-standard in majority of the wards mentioned in the eleven peri-urban towns. At the State level, we find that accessibility to water is scored as no service (fig.13).

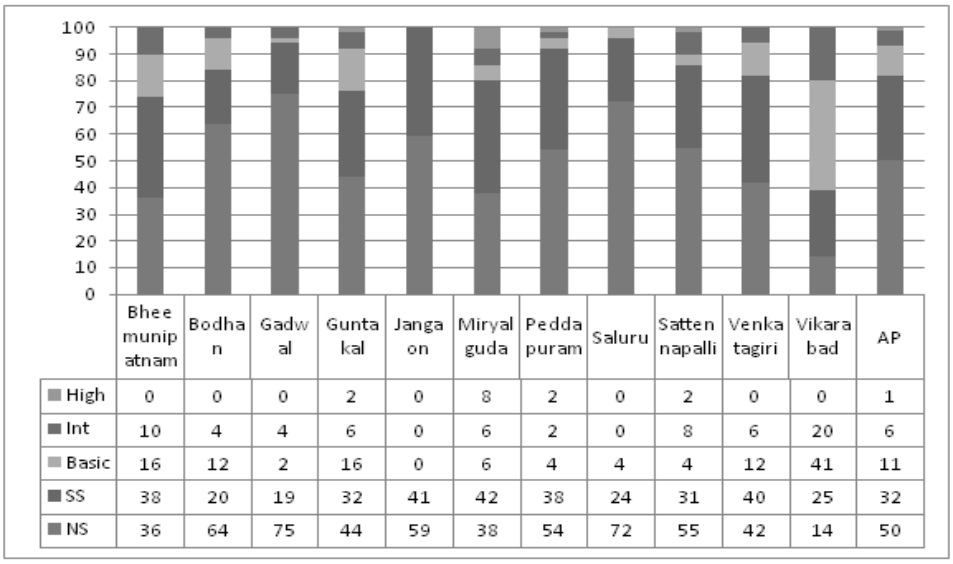
Fig 12: Water Quality (summer)



	Bheemunipatnam	Bodhan	Gadwal	Guntakal	Jangaon	Miryalguda	Peddapuram	Salur u	Satennapalli	Venkatagiri	Vikarabad	AP
BW	4	0	0	12	93	0	6	30	20	0	0	14
Intermediate	92	0	0	0	0	0	0	0	0	0	0	9
Basic	0	0	85	88	0	100	94	68	55	0	100	54
SS	2	100	15	0	7	0	0	0	25	100	0	23
NS	2	0	0	0	0	0	0	2	0	0	0	0

Source: Based on WASHCost (India) Project (2011) field survey;
*Note: NS - No service; SS- sub-standard; BW -Buying water

Fig 13: Water accessibility (summer)

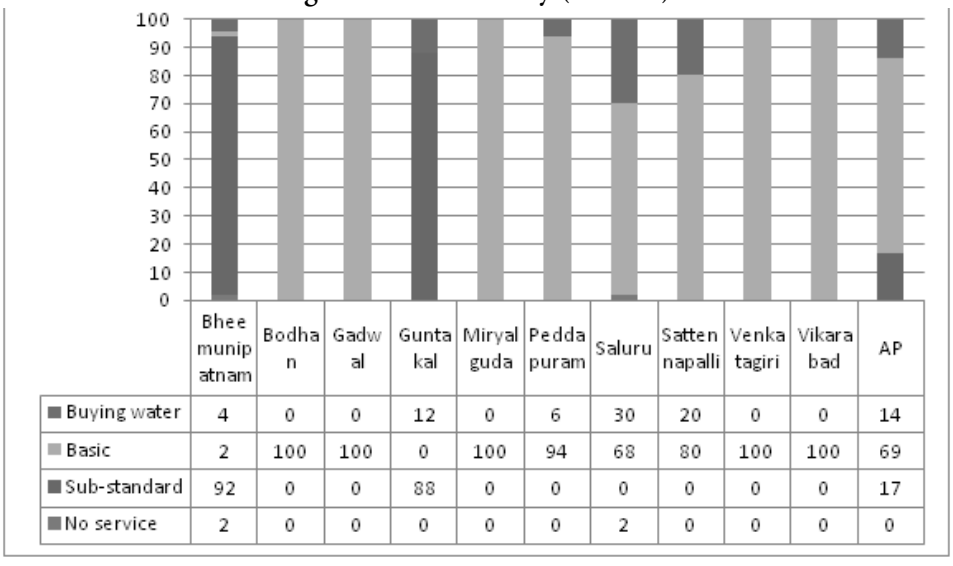


	Bheemunipatnam	Bodhan	Gadwal	Guntakal	Jangaon	Miryalguda	Peddapuram	Saluru	Sattenapalli	Venkatagiri	Vikarabad	AP
High	0	0	0	2	0	8	2	0	2	0	0	1
Int	10	4	4	6	0	6	2	0	8	6	20	6
Basic	16	12	2	16	0	6	4	4	4	12	41	11
SS	38	20	19	32	41	42	38	24	31	40	25	32
NS	36	64	75	44	59	38	54	72	55	42	14	50

Source: Based on WASHCost (India) Project (2011) field survey;
Note: NS - No service; SS- Sub-standard; Int. - Intermediate;

Water reliability is scored as basic by majority of the households in the respective wards of the eleven municipalities (fig 14)?

Fig 14: Water reliability (summer)

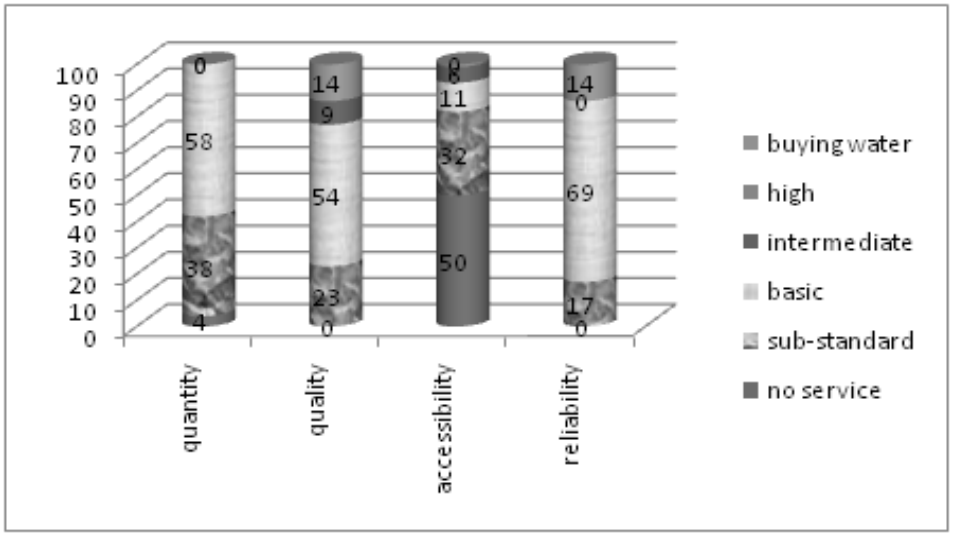


	Bheemunipatnam	Bodhan	Gadwal	Guntakal	Miryalguda	Peddapuram	Saluru	Sattenapalli	Venkatagiri	Vikarabad	AP
Buying water	4	0	0	12	0	6	30	20	0	0	14
Basic	2	100	100	0	100	94	68	80	100	100	69
Sub-standard	92	0	0	88	0	0	0	0	0	0	17
No service	2	0	0	0	0	0	2	0	0	0	0

Source: Based on WASHCost (India) Project (2011) field survey

At the aggregate (State) level, it is observed that during summer, households scored above basic services in terms of quality (77%) and reliability (83%) while 16 percent of the households scored above basic services in terms of accessibility. In case of quantity, we do not find any households which scored above basic service levels (fig 15).

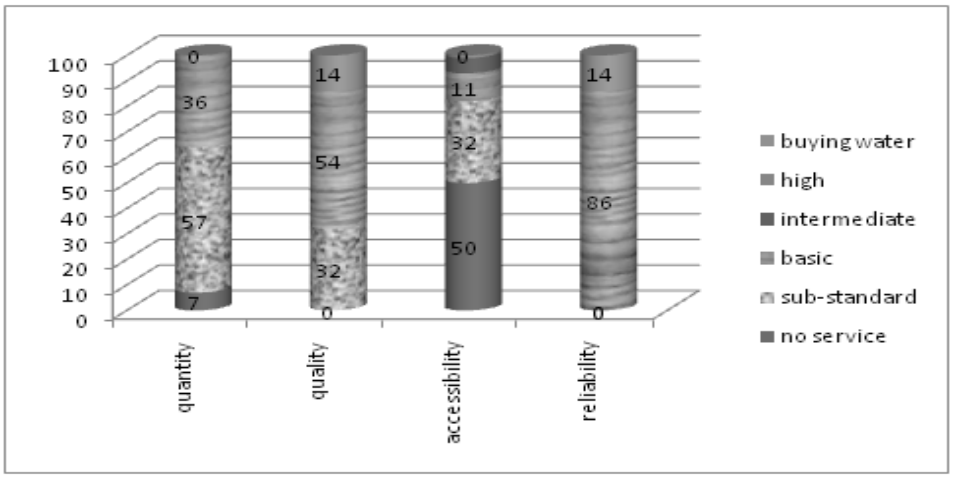
Figure 15: Water quantity, quality, accessibility and reliability (summer)



Source: Based on WASHCost (India) Project (2011) field survey

During non-summer, 14 percent of the households scored above basic in terms of reliability and quality while 36 percent of the households reported basic in terms of quantity and 11 percent in terms of accessibility (figure 16).

Figure16: Water quantity, quality, accessibility and reliability (non-summer)

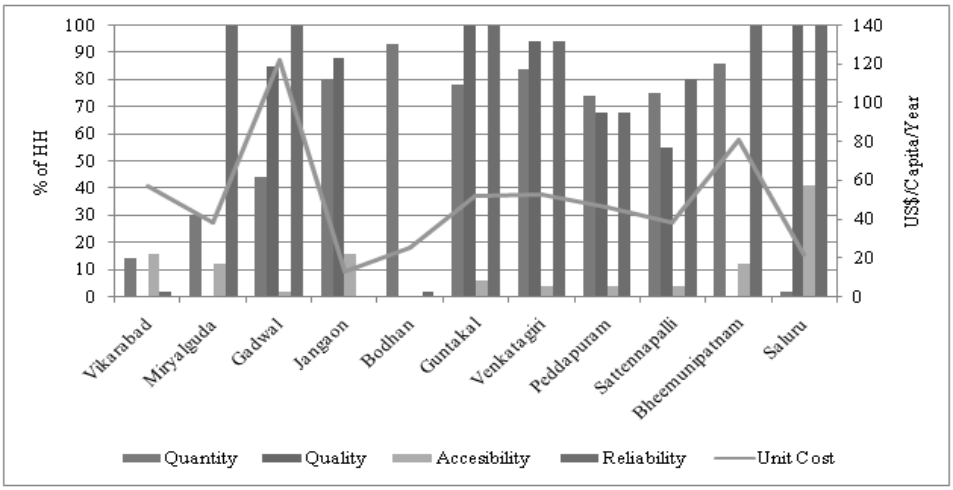


Source: Based on WASHCost (India) Project (2011) field survey

Cost versus service levels

One of the starting points of the study has been to compare costs with services. However, when these service levels are compared with unit cost, there is no one to one correspondence between costs and service level (Figure 17). In fact none of the service level indicators are associated with unit price.?

Figure 17: Service Levels and Unit Costs across Peri-urban Locations



Source: Based on the data collected from PHED and Municipal offices and data collected from WASHCost (India) Project (2011) field survey

V Cost of Sanitation

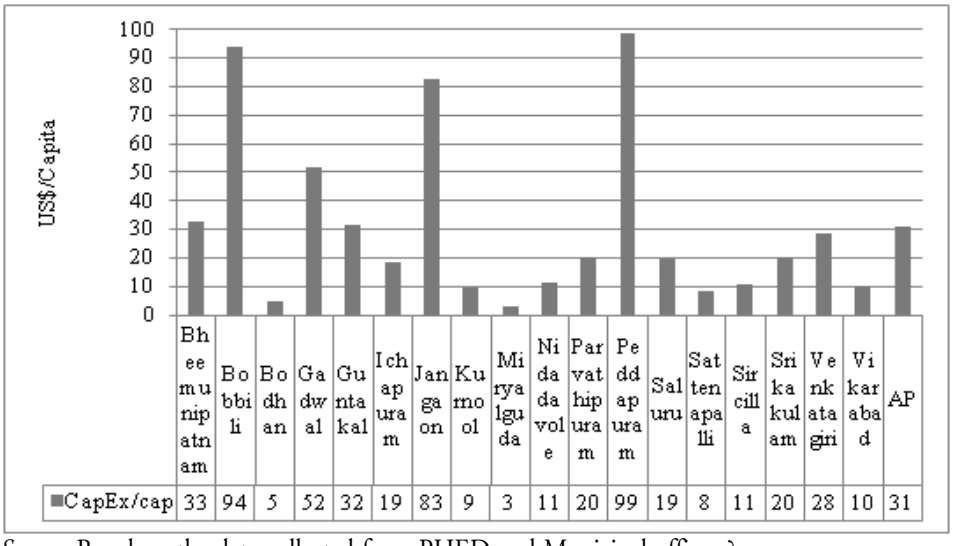
In the peri-urban context sanitation and hygiene includes construction of toilets / urinals at the community level, subsidy on individual toilets, provision of drainage facilities (sewer lines, etc), solid waste management, insect and disease control. The peri-urban locations do not have drainage coverage for the entire population, as 50 percent of the areas do not have proper drainage. And the remaining area is covered with sewer lines (covered and uncovered). Sanitation coverage is not as equitous as drinking water. For, poor colonies get neglected in the provision of sanitation facilities. Therefore, the sanitation costs may not reflect the comparable service levels across locations- some locations are better served than others. More importantly, sanitation at the household level is the responsibility of the household. But, government is providing subsidy to construct individual toilets for the below poverty line households. The subsidy is worked out on the basis of unit cost of ISL, that ranges from US$ 83 (Rs.4000) to US$ 207 (Rs. 10000), of which government provides a subsidy that ranges between US$ 66 (Rs. 3200) to US$ 186 (Rs. 9000) and the remaining amount has to be borne by the households. Therefore, the public expenditure on sanitation includes the subsidy amount

on the ISL along with other components listed above. The unit costs (officially fixed) of toilets in peri-urban locations are much higher than that of rural areas, which is US$ 63 for all the rural areas (Rs.3050). The proportion of households getting subsidy is much less in the peri-urban locations, when compared to rural. It is observed in our sample locations that only 20 percent of the households owning toilets have received subsidy. Households on their part spend more than their required contribution, as the amounts fixed for ISL (unit) cost is often less than the market price. Besides, households also spend extra money for improved facilities like tiles, etc. However, such additional investments are done by economically better off households. Therefore, expenditure on sanitation is a combination of public and private investments. Unlike in the case of drinking water, in sanitation there may not be any service in the absence of household investments.

Fixed Costs

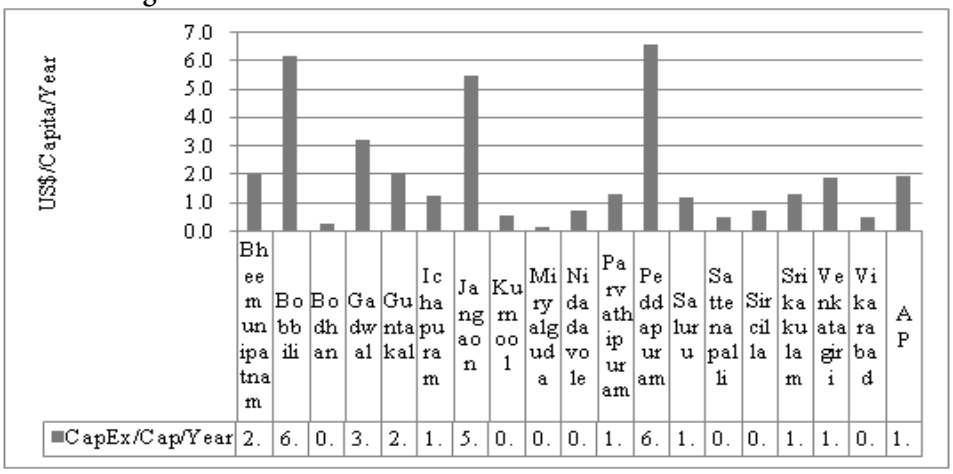
The per capita public cost of sanitation in the peri-urban locations is US$ 31 (Rs 1426). The unit costs range between US$ 5 (Rs 230) in Bodhan and US$ 99 (Rs 4554) in Peddapuram (Fig. 18). There are wide variations across urban locations, which could be due to variations in coverage apart from other amenities like drainage, underground drainage, etc. In the case of sanitation, annualisation is done using normative life spans only, as the systems are relatively new (less than 5 years old) and hence observed life span is not relevant. When annualised these costs range between US$ 0.2 (Rs 9) in Miryalguda to US$ 7 (Rs 322) in Peddapuram (Fig. 19). It may be noted that there is no expenditure on planning and designing of the systems.

Figure 18: Fixed Public Cost of Sanitation Peri-urban locations (US$ per capita)



Source: Based on the data collected from PHED and Municipal offices ?

Figure 19: Annualised Fixed Costs across Peri-urban Locations

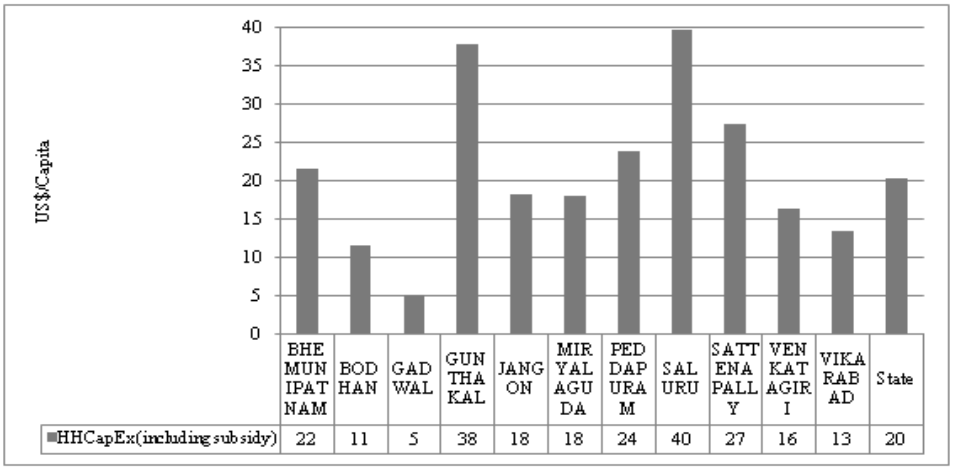


Source: Based on the data collected from PHED and Municipal offices

Household Costs

Over and above the public expenditure, households spend substantial amounts. At the State level households spend about US$ 20 (Rs 920) on an average. That is together the capital cost is about US$ 46 (Rs 2116). This comes to about 43 percent of the capital cost at the aggregate (State) level. Across the locations the household costs range between US$ 5 (Rs 230) in Gadwal and US$ 40 (Rs 1840) in Saluru (Fig. 20). The share of household capital expenditure ranges between 70 percent in Saluru to 10 percent in Gadwal. In the case of Gadwal peri-urban area the public expenditure is on the higher side due to the provision of drainage.

Figure 20: Household Capital Expenditure on Sanitation (ISL) in Peri-urban Locations (US$/Capita)

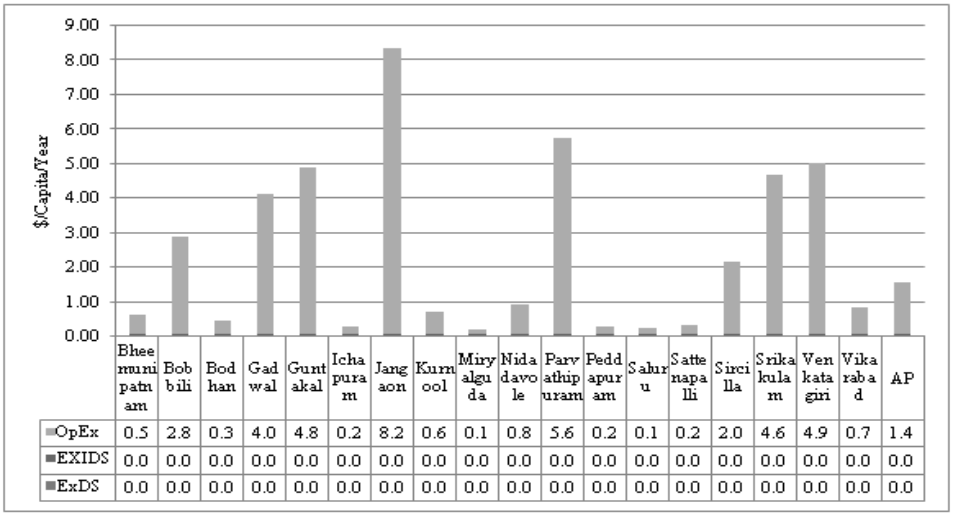


Source: Based on the data collected from PHED and Municipal offices

Recurring Costs

Sanitation recurring costs include operation and maintenance, direct and indirect support costs. No capital maintenance (CapManEx) and cost of capital (CoC) allocations have been found as nobody spent on these components. Major expenditure in the recurring costs is on operation and maintenance, while the other components are negligible (Fig. 21). On an average, at the State level US$ 1.55 (Rs 71) is spent on recurring costs by the Government, of this US$ 1.5 (Rs 69) is spent on O&M. Households spend about US$ 1 (Rs 46) on OpEx at the State level and they range between US$ 0.1 (Rs 5) in Gadwal to US$ 2 (Rs 92) in Guntakal (Fig. 22).On the whole, more than US$ 2 (Rs 92) are spent on OpEx at the State level. There are wide variations across the peri-urban locations, as the recurring costs range between US$ 8 (Rs377) in Jangoan and US$ 0.18 (Rs 8) in Miryalaguda (Fig 21).

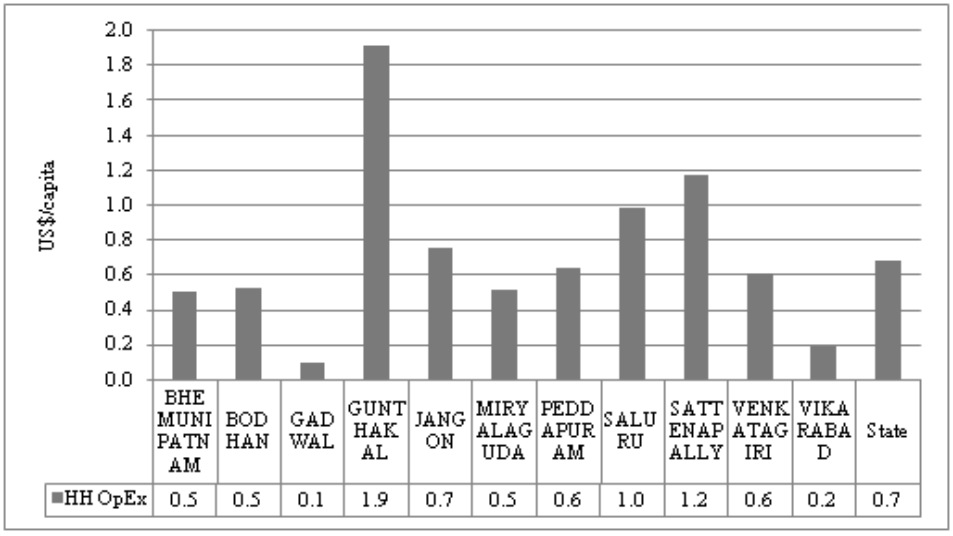
Figure 21: Recurring Costs of Sanitation in Peri-urban Locations (US$/Capita)



	Bheemunipatnam	Bobbili	Bodhan	Gadwal	Guntakal	Ichapuram	Jangaon	Kurnool	Miryalguda	Nidadavole	Parvathipuram	Peddapuram	Salur	Sattenapalli	Sircilla	Srikakulam	Venkatagiri	Vikarabad	AP
OpEx	0.5	2.8	0.3	4.0	4.8	0.2	8.2	0.6	0.1	0.8	5.6	0.2	0.1	0.2	2.0	4.6	4.9	0.7	1.4
EXIDS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ExDS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Source: Based on the data collected from PHED and Municipal offices?

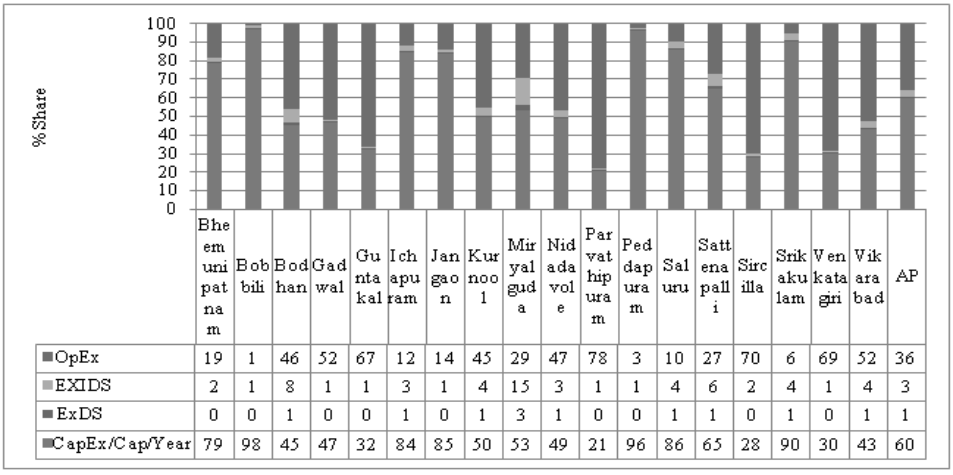
Figure 22: Household Expenditure on OpEx across Peri-urban Locations (US$/Capita)



Source: Based on WASHCost (India) Project (2011) field survey

Most of the public expenditure is on infrastructure, including subsidies on individual toilets. Relative shares of various components indicate that CapExHard accounts for 60 percent of the cost at the state level while recurrent costs account for 40 percent. There are wide variations across the peri-urban locations (Fig. 23). The share of CapEx ranges between 21 percent in the case of Parvatipuram and 98 percent in Bobbili. These high variations could be due to the coverage status. When household expenditure is included the relative share may alter. For, the share of HHCapEx is about 40 percent in the peri-urban areas.

Figure 23: Relative Shares of Fixed and Recurring Costs across Peri-urban locations (%)



Source: Based on the data collected from PHED and Municipal offices

VI Service Levels: Sanitation

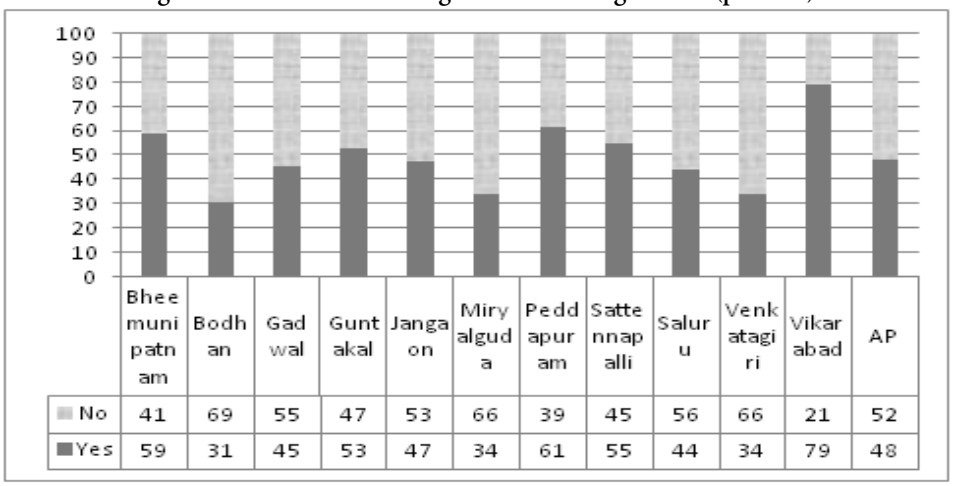
Service levels are assessed using the service ladder approach where households perceptions on four indicators of sanitation viz., access; use; reliability and environmental protection are recorded on four sservice levels i.e., no service, limited / sub-standard, basic, and improved. Prior to assessing the household perceptions, we examine the infrastructure status in the sample locations. In terms of proportion of households owning a toilet, about fifty percent of the households own toilets in the peri-urban locations of the State, though there are wide variations. Three types of toilets are used by the households viz., single pit, double pit and septic tank. The data shows that large percentage of households in the peri-urban locations own either single pit toilets or septic latrines (Table 6).

Table 6: Distribution of Toilets by Type (per cent)

	Single Pit	Double pit	Septic Latrine
Vikarabad	14	6	80
Miryalguda	32	2	0
Gadwal	75	18	7
Jangaon	10	4	85
Bodhan	100	0	0
Guntakal	65	1	34
Venkatagiri	95	0	5
Peddapuram	48	3	49
Sattennapalli	48	7	44
Bheemunipatnam	38	7	55
Saluru	38	5	57
AP	54	6	40

Source: Based on the information collected from the WASHCost (India) Project (2011) sample habitations

Figure 24: Household owning and not owning a toilet (per cent)

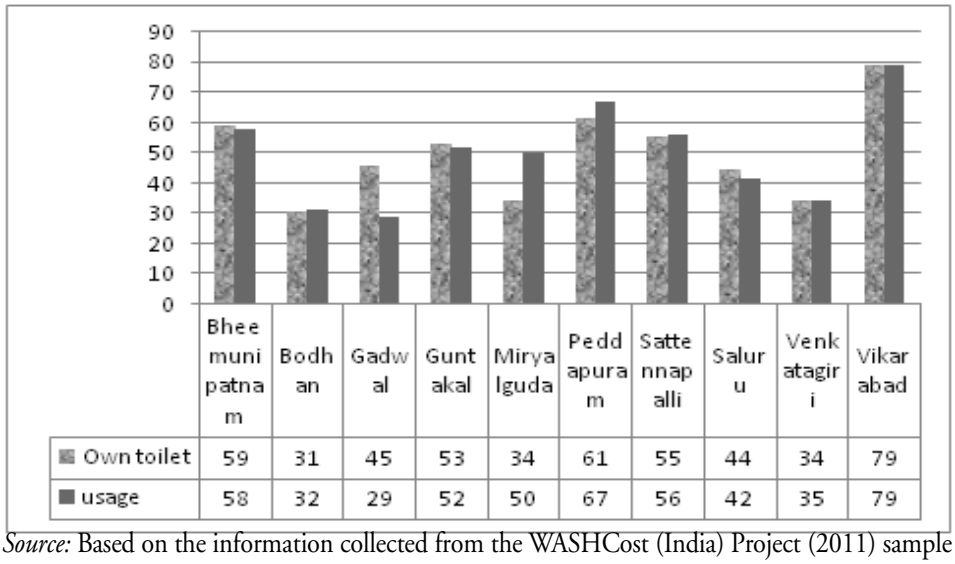


	Bheemunipatnam	Bodhan	Gadwal	Guntakal	Jangaon	Miryalguda	Peddapuram	Sattennapalli	Saluru	Venkatagiri	Vikarabad	AP
No	41	69	55	47	53	66	39	45	56	66	21	52
Yes	59	31	45	53	47	34	61	55	44	34	79	48

Source: Based on the information collected from the WASHCost (India) Project (2011) sample habitations.

Across the sample locations, Vikarabad has the highest proportion (79 percent) of households owning toilets, while Bodhan has the least percentage of households owning toilet (around 31 percent) (Fig. 24).But, just owning a toilet is not sufficient, usage of these toilets is the most import aspect. From figure 25, it is evident that percentage of households using toilets is more than percentage of households owning toilets in all the towns. More usage of toilets could be due to sharing of toilet in the same neighbourhood and also all the family members using the same toilet.

Figure 25: Owning and Usage of toilets

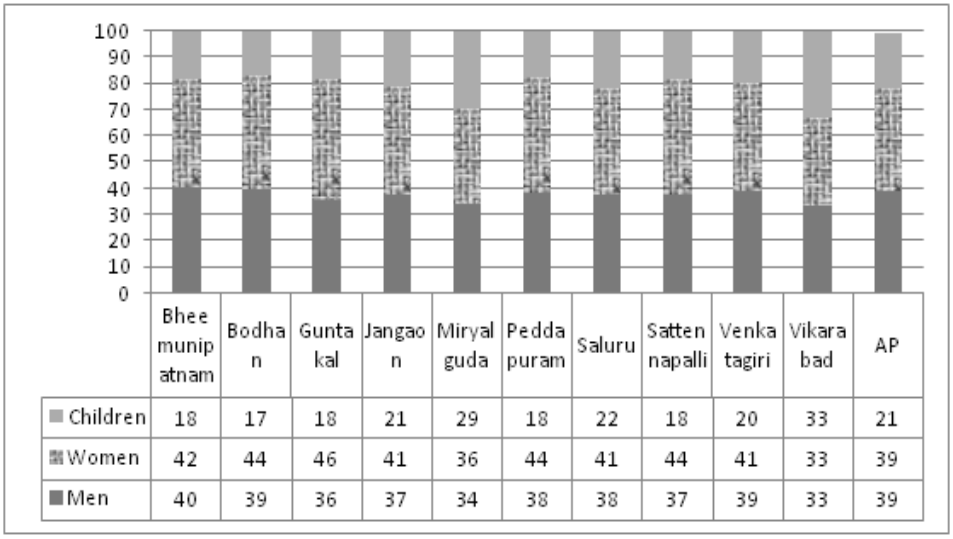


	Bheemunipatnam	Bodhan	Gadwal	Guntakal	Miryalguda	Peddapuram	Sattennapalli	Saluru	Venkatagiri	Vikarabad
Own toilet	59	31	45	53	34	61	55	44	34	79
usage	58	32	29	52	50	67	56	42	35	79

Source: Based on the information collected from the WASHCost (India) Project (2011) sample habitations.

The field survey clearly shows that the male members of the household do not use toilets and resort to open defecation. On an average, at the State level, around 39 percent of men and women each use toilets in eleven peri-urban towns, while only 21 per cent of children use toilets. The percentage of women using toilets is the highest (46 percent) in Guntakal followed by Peddapuram and Sattennapalli (44 percent) (Fig. 26). Only 21 percent of children use toilets with the usage being the lowest in Bodhan (17 percent) (Fig. 26).

Figure 26: Usage of Toilets by men, women and children



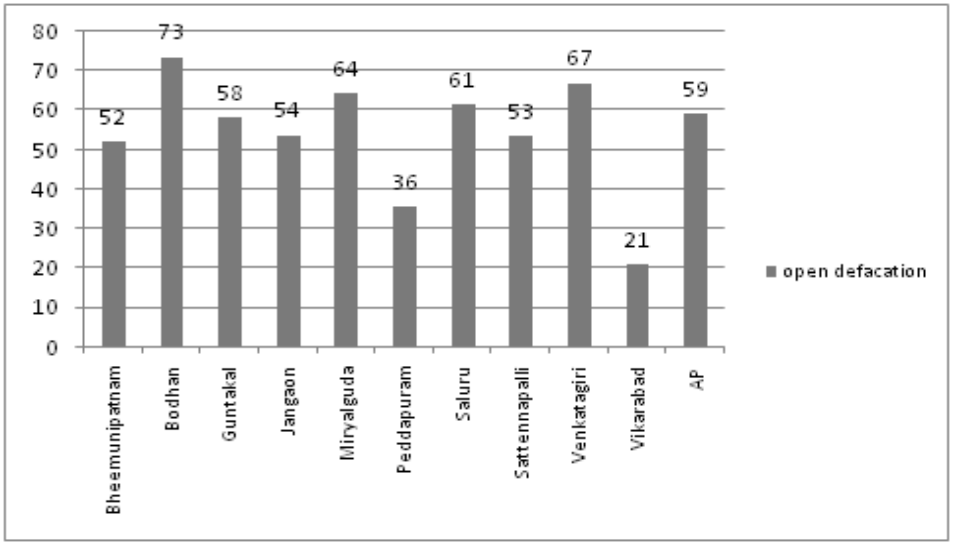
	Bheemunipatnam	Bodhan	Guntakal	Jangaon	Miryalguda	Peddapuram	Saluru	Sattenapalli	Venkatagiri	Vikarabad	AP
Children	18	17	18	21	29	18	22	18	20	33	21
Women	42	44	46	41	36	44	41	44	41	33	39
Men	40	39	36	37	34	38	38	37	39	33	39

Source: Own calculations

* Gadwal data not included as specific information was not collected during field visit

In case of households which do not own toilets, our field survey probed into the issue of open defecation. Open defecation is the highest in Bodhan (73 percent) followed by Venkatagiri (67 percent) and Miryalguda (64 percent) (fig 27). Open defecation, at the aggregate level, to a large extent takes place in bushes or open places (around 74 percent). Road side is another place where open defecation takes place. In Venkatagiri town, around 60 percent and in Vikarabad, around 70 percent of the individuals go for open defecation on road side (Figure 28).

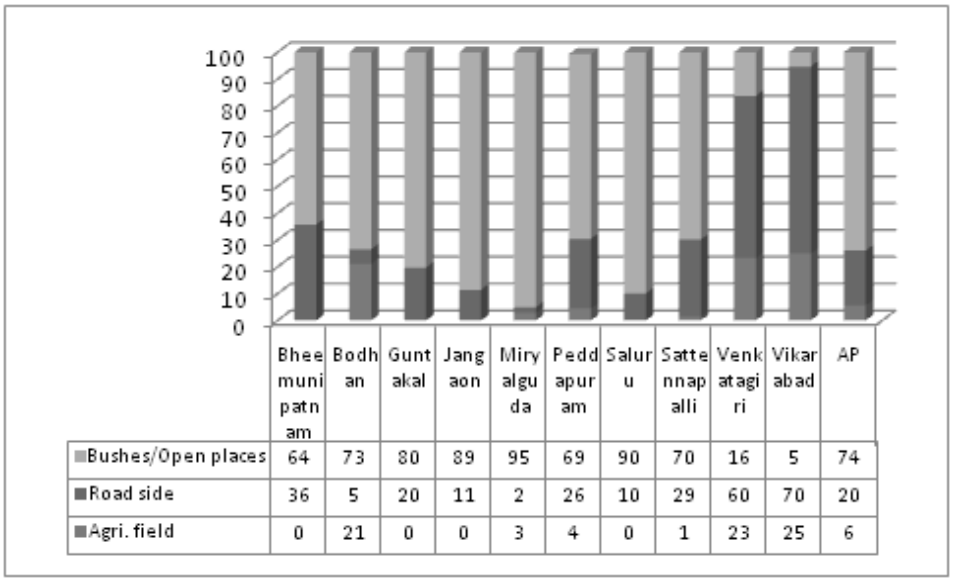
Figure 27: Open defecation (percent)



Source: Based on information collected from WASHCost (India) Project (2011) field survey

*Gadwal data not included as specific information was not collected during field visit

Figure 28: Open defecation places (percent)



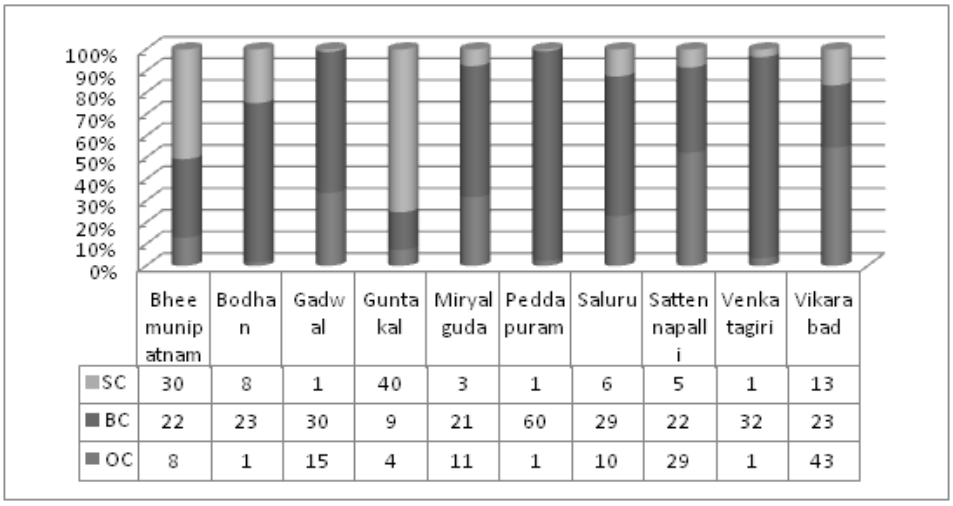
	Bheemunipatnam	Bodhan	Guntakal	Jangaon	Miryalguda	Peddapuram	Saluru	Sattennapalli	Venkatagiri	Vikarabad	AP
Bushes/Open places	64	73	80	89	95	69	90	70	16	5	74
Road side	36	5	20	11	2	26	10	29	60	70	20
Agri. field	0	21	0	0	3	4	0	1	23	25	6

Source: Based on WASHCost (India) Project (2011) field survey

*Gadwal data not included as specific information was not collected during field visit

Data on social composition of owning toilet shows that except in Guntakal town, in all the other 10 towns, a large percentage of the BC households own toilets. This can be corroborated by the presence of this community in large numbers in the respective towns. The subsidy given to the low income groups for construction of toilets would have resulted in higher share of BC households owning toilets. However, the subsidies are targeted at the poor households and hence SC households should have got the maximum benefit from these subsidies. Except Guntakal and Bheemunipatnam, in all other sample locations SC households own lowest proportion of toilets. At the aggregate level, we find that 27 per cent of the BC households own toilets, while it is 10 percent for the SC households and 11 percent for the OC households (Fig. 29). This indicates that subsidies are not benefiting the deserving and intended beneficiaries. But this aspect needs further probing, as the higher ownership of toilets among the BCs could be due to their own investments.

Figure 29: Owning Toilet by Social Composition (per cent)



	Bheemunipatnam	Bodhan	Gadwal	Guntakal	Miryalguda	Peddapuram	Saluru	Sattenapalli	Venkatagiri	Vikarabad
SC	30	8	1	40	3	1	6	5	1	13
BC	22	23	30	9	21	60	29	22	32	23
OC	8	1	15	4	11	1	10	29	1	43

Source: Based on WASHCost (India) Project (2011) field survey

*Gadwal data not included as specific information was not collected during field visit

Analysis of Sanitation Service Levels

As in the estimation of water service levels, sanitation service levels are also assessed on four indicators. Except in the case of accessibility, majority of the households reported below basic service at the aggregate (State) level (Table 7). Gadwal, Bheemunipatnam and Bodhan account for higher score for no service in terms of accessibility to sanitation, while Guntakal, Jangaon, Miryalguda, Peddapuram, Saluru and Sattennapalli, households score sanitation service levels as basic. With respect to sanitation use, Gadwal gives the highest score of no use followed by Venkatagiri while the other towns use toilets in a

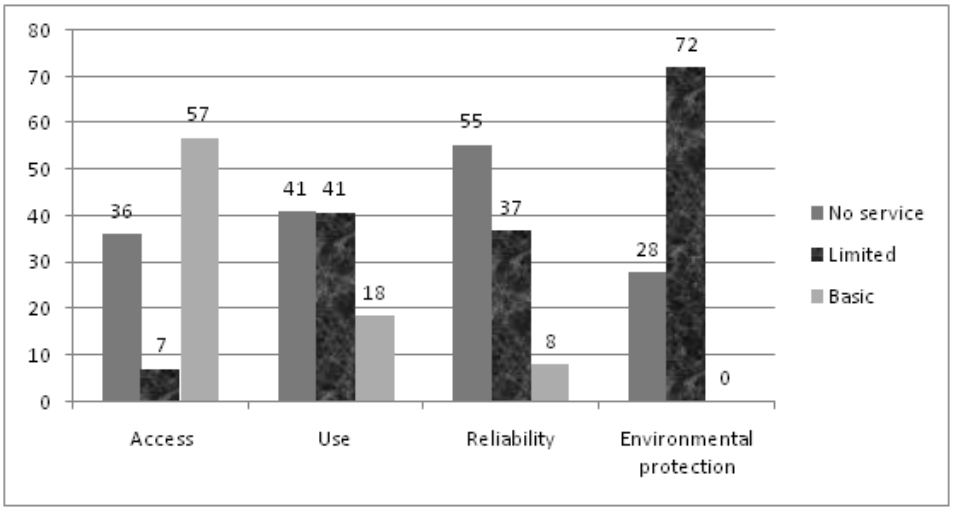
limited manner. On reliability in sanitation, in almost all the peri-urban towns tilt towards no service or sub-standard service. Reliability here is linked to maintenance of the toilets, indicating toilets are not properly maintained by the households. Households score on environmental protection due to sanitation services as limited in all the towns except Guntakal, Venkatagiri and Vikarabad where there is no environmental protection at all. When we look at the overall service levels in the peri-urban locations at the State level, we observe that around 55 percent of the households in all the eleven peri-urban locations put together say that there is no service in terms of reliability of sanitation service levels, while there is limited service (around 72 percent) in terms of environmental protection. The case of access to sanitation services show that around 57 percent of the households score this service as basic (Fig.30).

Table 7: Sanitation Service Ladder across Peri-urban Locations

Habitation	Accessibility			Use			Reliability			Environmental Protection	
	No Service	Limited	Basic	No Service	Limited	Basic	No Service	Sub-Standard	Basic	No Service	Limited
Bheemunipatnam	42	6	52	42	50	8	72	24	4	0	100
Bodhan	64	4	32	64	30	6	68	30	2	0	100
Gadwal	71	4	25	94	2	4	90	10	0	0	100
Guntakal	16	0	84	16	68	16	16	40	44	100	0
Jangoan	25	9	66	32	48	20	39	55	7	0	100
Miryalaguda	16	20	64	22	60	18	40	60	0	0	100
Peddapuram	28	14	58	28	56	16	76	8	16	0	100
Saluru	38	4	58	40	40	20	46	48	6	0	100
Sattenapally	31	2	67	33	43	24	41	53	6	0	100
Venakatagiri	48	12	40	56	38	6	64	34	2	100	0
Vikarabad	20	2	80	24	14	63	57	43	0	100	0
State	36	7	57	41	41	18	55	37	8	27	73

Source: Based on WASHCost (India) Project (2011) field survey

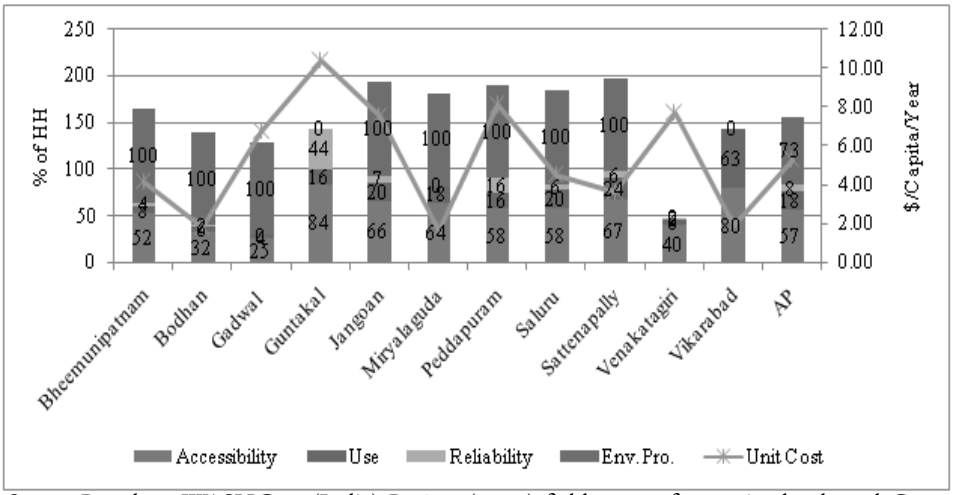
Figure 30: Sanitation Service levels in peri-urban locations of Andhra Pradesh



Source: Based on WASHCost (India) Project (2011) field survey
*Gadwal data not included as specific information was not collected during field visit

On the service ladder, all the indicators, except access which is scored as basic, at the aggregate level, we observe limited or no service with respect to use, reliability and environmental protection. When service levels are plotted against the unit cost, there appears to be no association between the two (Fig. 31). There is no correspondence, especially in the case of use. Reliability is very low. The higher level of environmental protection indicator could be due to other reasons rather than unit costs.

Figure 31: Service Levels and Unit Costs across Peri-urban Locations (<Basic)



Source: Based on WASHCost (India) Project (2011) field survey for service levels and Cost data collected from PHED and Municiapal offices.

VII Environmental Sanitation and Hygiene Practices

Here, we make an attempt to look at the environmental sanitation and hygiene practices at the household level. Under environmental sanitation, disposal of infant faeces, waste water drainage, environmental sanitation around the house, etc., are assessed. A large percentage (65 percent) of the households in the sample locations dispose infant faeces in the open places (usually back-yard) of the house or the street behind it posing a health hazard to the members of the households and another 27 percent of the households dispose on the road side (Table 8). Only in three locations (Vikarabad, Venkatagiri and Bodhan) more than 20 percent of the households dispose in the agricultural fields, which is relatively a better practice.

Waste water drainage appears to be better managed in the sample locations, as more than 80 percent of the households reported above average rating at the aggregate (state) level. In fact, only in four locations more than a quarter of households reported poor drainage. On the other hand, more than 50 percent of the households reported good drainage in Jangaon and Vikarabad locations. It is observed that the condition of waste water drainage is good in these places implying that there is proper maintenance of the drainage by the municipality. Nearly 69 percent of the households informed that the condition of waste water drainage is good in Jangoan. On the contrary, nearly 45 percent of the households in Venkatagiri are of the opinion that the condition of waste water drainage is poor, indicating poor management (Table 8). Similarly, environmental sanitation around the house is given better rating, as more than 80 percent of the households have reported above average management. Again Jangaon town has the highest proportion of households reporting good environmental sanitation (64percent). The environmental sanitation around the house is rated as average in the remaining peri-urban locations (Table 8). At the state level, maintenance of waste water drainage and environmental sanitation around house are reported as average.

Table 8: Disposal of Infant Faeces (percent) Across Peri-urban Locations

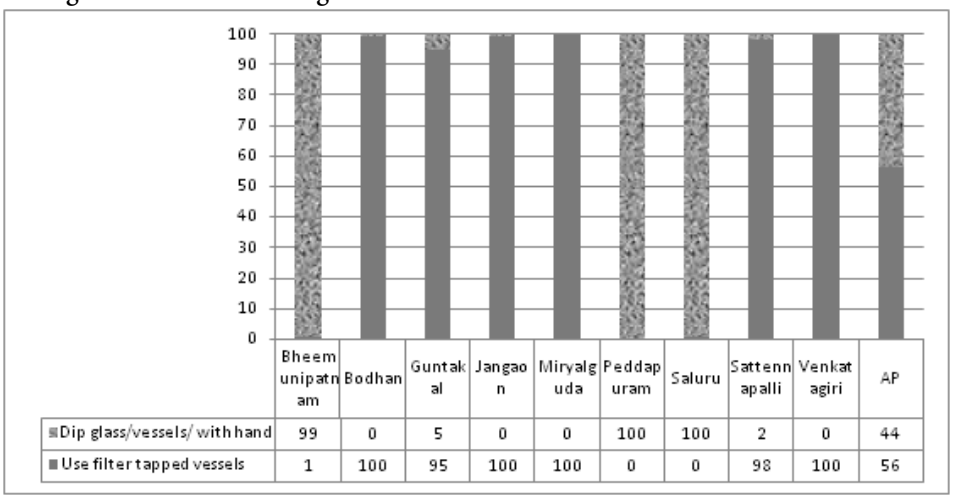
	Disposal of Infant Faeces			Waste water Drainage			Env. Sanitation around House		
	Agri. Fields	Road side	Bushes /Open places	Good	Average	Poor	Good	Average	Poor
Bheemunipatnam	0	36	64	20	73	7	43	53	4
Bodhan	21	5	73	6	86	9	8	85	8
Jangaon	0	11	89	69	28	3	64	34	2
Guntakal	0	20	80	39	40	21	45	39	16
Miryalguda	3	2	95	38	62	0	28	43	29
Peddapuram	4	26	69	9	65	26	22	60	18
Saluru	0	10	90	24	46	30	24	48	28
Sattennapalli	1	29	70	19	50	30	28	38	34
Venkatagiri	23	60	16	10	45	45	22	56	22
Vikarabad	25	70	5	53	47	0	28	72	0
AP	8	27	65	29	54	17	31	53	16

Source: Based on the information collected from the WASHCost (India) Project (2011) sample habitations

Water handling practices

In six out of 9 sample peri-urban locations from where water handling practices data has been obtained, the practices of the individuals are good as the tapped vessels are used for drinking water (Fig. 32). On the other hand, in 3 locations, Venkatagiri, Peddapuram and Saluru, individuals have reported dipping of glass with hand in the vessel, whenever water is drawn. One of the reasons for the poor hygiene practices is the absence of IEC activities and the low household participation in IEC activities. The data shows that it is only in Peddapuram (33 percent) and Saluru (18 percent) a small percentage of households have attended the IEC activities. In the remaining towns, especially Bodhan, Guntakal and Venkatagiri, participation of the households in IEC activities is less than one percentage point. This shows the lack of awareness on hygiene practices in sample locations.

Figure 32: Water Handling Practices of the Individuals in the Peri-urban locations



	Bheemunipatnam	Bodhan	Guntakal	Jangaon	Miryalguda	Peddapuram	Saluru	Sattennapalli	Venkatagiri	AP
Dip glass/vessels/ with hand	99	0	5	0	0	100	100	2	0	44
Use filter tapped vessels	1	100	95	100	100	0	0	98	100	56

Source: Based on the information collected from the WASHCost (India) Project (2011) sample habitations

Note: Information on these hygiene practices was not collected in Gadwal and Vikarabad

VIII Summary and Conclusions

Total fixed costs (CapEx) on water over the years range between US$ 18 (Rs828) per capita in Srikakulam to US$ 94 (Rs 4324) per capita in Jangaon. Within the capital costs almost the entire amount is spent on infrastructure, as the expenditure on CapExSft is either absent or negligible in all the sample locations. Household expenditures on water are substantial at 25 percent of the public expenditure. In terms of total costs per capita per year, fixed costs account for 80 percent of the costs at the state level. Of the recurring costs, OpEx accounts for 16 percent and the remaining costs are negligible.

The per capita public cost of sanitation in the peri-urban locations is US$ 31 (Rs 1426) per capita at the state level. The unit costs range between US$ 5 (Rs 230) in Bodhan and US$ 99 (Rs 4554) in Peddapuram. There are wide variations across urban locations, which could be due to variations in coverage apart from other amenities like drainage, underground drainage, etc. At the state level, households spend about US$ 20 (Rs 920) on an average. Share of household capital expenditure ranges between 70 percent in Saluru to 10 percent in Gadwal. Major expenditure in the recurring costs is on O&M, while the other components are negligible. On an average, at the state level US$ 1.55 (Rs 71) is spent on recurring costs by the government, of this US$ 1.49 (Rs 69) is spent on O&M. Households spend about US$ 0.7 (Rs 32) on OpEx at the state level and they range between US$ 0.1 (Rs 5) in Gadwal to US$ 1.9 (Rs 87) in Guntakal.. On the whole, more than US$ 2 (Rs 92) is spent on OpEx at the state level.

Vikarabad has the highest proportion (79 per cent) of households owning toilets, while Bodhan has the least percentage of households owning toilet (around 31 per cent). The field survey clearly show that the male members of the household still resort to open defecation. On an average, at the state level, mere 39 percent of men and women each use toilets in eleven peri-urban towns, while only 21 per cent of children use toilets. Data on open defecation shows that it is the highest in Bodhan (73 per cent) followed by Venkatagiri (67 per cent) and Miryalguda (64 per cent). On the sanitation service ladder, at the aggregate level, all the indicators except access which is scored as basic, we observe limited or no service with respect to use, reliability and environmental protection.

Following are the key messages that arise from the above analysis

- Allocations towards water planning and designing are negligible. However, one good feature about the water sector in the municipalities is that expenditure on O&M is quite substantial indicating that there will be no major system failures

- Adhoc investments or allocations towards extension and up gradation should be avoided. Adaptation of Life-Cycle Cost Approach (LCCA) could help in minimising adhoc and wasteful expenditure on infrastructure. LCCA would also facilitate judicious allocation of resources to different components.

- Yet another critical issue in terms of provision of water services is the huge gap between normative and observed life span of the infrastructure assets. Allocations towards capital management along with proper designing and governance of the systems could help reducing the gap.

- Improving literacy and education levels would not only help reducing the unit costs along with improving service levels in drinking water but also augment competence in other related sectors like hygiene, health, education, etc.

- Major concern is use of ISL at the household level. Proper propaganda of IEC activities would help in better environmental practices by the households.

- The existing governance structures appear to be too inadequate to have any influence of unit costs. But they seem to have a positive impact on service levels. Improving the performance and efficacy of the governance indicator such as water and sanitation committees could be a feasible policy alternative in this context.

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