Strategies for Improved Sanitation in Rural Andhra Pradesh

Final Report

Submitted to

United Nations Children's Funds (UNICEF)
Hyderabad
INDIA

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December 2012

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1. Background

The state of Andhra Pradesh has a total population of around 8.47 crore people[1]. In 2001, nearly seventy three percent of the population lived in rural areas. As per most recent estimates, the state has nearly 72,000 rural habitations comprising 137 lac households, and 4162 municipal wards with 41.7 lac households. The state has diverse climates (GOAP, 2007). It has three regions, viz., coastal Andhra, Rayalaseema and Telangana. Coastal Andhra is a flood-prone region, while Rayalaseema is a dry region. Telangana, also being upland in the Deccan plateau, mostly remains as a rain shadow region. Coastal and Rayalaseema regions are exposed to modernization as they were exposed to British rule. Telangana region is also caught up with modernization during the past 50-60 years.

Major claims are made about the success in implementing water and sanitation programmes in the State. For instance, 31.5% of rural households and 67.9% of urban households in the state (Source: Census 2011) were reported to have access to drinking water source within the premises. This is against 22.8% rural households and 57.2% urban households having access to drinking water sources within the premises in 2001. Further, nearly 32.2% of rural households and 86.1% of urban households in the state were reported to have access to latrines as per 2011 Census. This is against, 18.2% and 78.1% for rural and urban households, respectively having similar facilities in 2001 (Source: Census 2001). In spite of such impressive physical target achievements, the hinterlands and the slums in the urban areas suffer from improper hygiene conditions and lack of latrines for a variety of reasons. Outbreak of waterborne diseases and infections are a common phenomenon in these areas.

The key to understanding this contradiction lies in knowing the details such as actual extent of use of improved toilets, and how they vary regionally. An in-depth study to assess the same as well as the ways to improve the same would go a long way in bettering the life of poor and children by improving overall health, literacy, environment and livelihoods.

2. Rationale

Worldwide, few large scale sanitation programmes in developing countries had succeeded in achieving the desired outcomes. Still in many parts of the developing world, communities make their own investments in private sanitation infrastructure, without any subsidy (Jenkins and Scott, 2007). Increasingly, marketing techniques are advocated to generate demand for household sanitation as a way to leverage both individual and community level resources to close the sanitation gap (Cairncross, 2004). Understanding constraints to adoption is the starting point in any effort to boost the demand for improved sanitation (Jenkins and Scott, 2007). Constraints vary in their effect on sanitation decisions. Permanent constraints are likely to act at a very early stage of

[1] Provisional figures from the Census of India-2011

decision making, whereas the more temporary ones would come in the way at the later stage of making the final choice (Jenkins, 1999).

The Total Sanitation Campaign (TSC), launched in 1999, was a major institutional reform in India's sanitation sub-sector[2]. It marked a paradigm shift from a centralized supply driven Government schemes to a community-based "demand-driven" programme for improving the living environment in rural areas (WSP/GOI, 2008). The programme therefore provides very little subsidies for actual physical infrastructure, and embarks on social marketing techniques such as information, education and communication (IEC) to stimulate household demand for sanitation. Therefore, understanding the constraints as well as the determinants and motivating factors for adoption of improved sanitation practices is the key to evolving strategies for successful implementation of sanitation programmes in both rural areas.

3. Objectives of the Research Study

The aim of this study is to evolve comprehensive policies and strategies for improved sanitation in rural areas of Andhra Pradesh, with focus on equity in access and sustainability.

The five specific objective of the exercise are to:

- Assess the extent of actual adoption of sanitation systems (toilets) by individual households, schools, primary health centres and *Anganwadis* in rural areas, with special emphasis on adoption across income segments;

- Identify the determinants of successful adoption of good sanitation systems by rural households in the state, or in other words, under what conditions (physical environment, socio-economic and financial conditions, and cultural background) the households follow good sanitation practices[3]

- Identify the motivating factors for adoption of modern sanitation systems by the households[4]

- Understand the type and number of constraints for adoption of improved sanitation systems, or identify the stage of the adoption decision process of the non-adopters[5].

- Evolve strategies for promotion of environmental sanitation practices in the rural households, especially among the poor, with the following complementary objectives:

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[2] The Total Sanitation Campaign was rechristened as Nirmal Bharat Abhiyan (NBA) by the Ministry of Rural Development, Government of India in April, 2012, with major amendments in the provisions under the scheme, including the extent of subsidy and target beneficiaries.

[3] Good sanitation practices refer not only to adoption of a modern sanitation system (toilet), but also existence of conditions under which they can be used to promote environmental sanitation, and good sanitary hygiene practices.

[4] These motivating factors are different from determinants of adoption.

[5] The three stages in the adoption decision making process are preference stage, intention stage and choice stage.

- Identification of different types of sanitation technologies and systems that are suitable for various physical (climate, soils, depth to groundwater), socio-economic and cultural environments, with special emphasis on affordable technologies for poorest households

- Identify priority areas for concentrating efforts at promoting improved sanitation vis-a-vis geographical location, and target groups

- Identify the key public policy and programme intervention that would help boost adoption of improved sanitation

- Work out the operational plan, including institutional capacity building[6], for effective implementation of sanitation programme in rural areas

4. Approach, Methods and Tools

The objectives of the exercise, which is to be carried out in a participatory mode, can be put under three broad categories. 1. To orient the field level staff of the state water supply & sanitation department to undertake surveys to assess the performance of the sector. 2. Evolving comprehensive strategies for promoting improved sanitation in rural areas. 3. Building capacities of the state level officers of water supply and sanitation department to implement the strategies.

The first one would involve training cum orientation programmes for the field level. The second one, which is mainly a research exercise, would involve all the key stakeholders at various stages, including study design stage, survey report preparation stage, and at the stage of finalizing the strategies for promotion of sanitation, and this would be done through consultation workshops. The third one would involve organizing workshop for dissemination of findings of the research, vis-à-vis the strategies for promotion of improved sanitation practices.

As regards the research component, a major chunk of the data for the analysis required to be carried out to fulfil objectives 2 to 5 have to come from a detailed primary survey. The main purpose of the primary survey is to generate the data required for validation of the official statistics on adoption of improved Sanitation systems in rural areas of Andhra Pradesh. But, the scope of the survey would be expanded with the aim of understanding the determinants of adoption; the motivating factors for adoption; the constraints in adoption, particularly the stages of decision making process related to adoption of improved sanitation systems.

This means, the physical setting, socio-economic characteristics, and cultural background of the adopter households would be studied. The physical setting would include; amount of common land available per capita. Socio-economic characteristics would include: the occupational profile; economic conditions of the family and its caste; access to piped water supply; and number of school going children in the family. In order for analyzing the factors responsible for non-adoption, a sample of non-adopter households would also be covered in the survey.

[6] Institutional capacity building includes institutional reform; organizational strengthening, and training of human resources (Brown, 2004).

Objective I: *Assess the extent of actual adoption of sanitation systems (toilets) by individual households, schools and primary health centres in rural areas*

The "actual adoption" of improved sanitation by rural households under various programmes and schemes was assessed by studying a statistically significant sample of households which were reported to have adopted improved sanitation system. Various degrees of adoption of improved sanitation would be considered, including: construction of the toilet; physical access to the toilet; provision of access to water supply for maintaining hygiene; actual extent of use by the members of the household; hygiene practices followed by the toilet users; and, maintenance of the toilet.

The Nirmal Gram Puraskar villages were chosen as benchmark for assessing the degree of adoption of improved sanitation practices by the adopter HHs. The reasons for non-use of the toilets built by the households and schools, if found, were also investigated to ascertain whether they are technical, social or cultural.

"Statistically significant sample size" was determined for each district, based on the total households which are reported to have adopted improved sanitation system; and the variations in physical, and socio-economic conditions within the district. Districts, which have large number of reported adopters would require bigger sample. Again, districts, which are having internal variations in the above characteristics, should have bigger sample size, as different areas need to be represented adequately. The sample size for adopters thus fixed for each district was 270.

Stratified random sampling was used to select households from different income segments and social backgrounds in rural areas from each district. The following two economic categories such as APL, and BPL would be covered, and within each category different social and groups such as OBC, SC, ST etc., were covered. This was done to help understand the access equity issues in improved sanitation practices.

Objective II: *Identify the determinants of adoption of good sanitation systems by rural households in the state, or in other words, what are the conditions under which the households follow good sanitation practices.*

Findings of the adopter household survey with regard to characteristics of the HHs vis-à-vis physical environment, social, socio-economic and cultural background of "those who have successfully adopted" and "those who have not adopted", were used to identify the determinants of adoption. For this, multivariate analysis using a logit model was carried out with adoption or non-adoption as the dependent variable against the range of physical socio-economic factors (average family income, average number of school-going children, percentage families having access to piped water supply in the dwelling premises, overall family literacy, number of children below the age of five, caste and female literacy) that are expected to influence the same.

Objective III: *Identify the motivating factors for adoption of modern sanitation systems by the households*

The factors which motivate the households in adopting improved sanitation practices were identified through primary survey of the adopter households. The role of following factors was investigated: 1] social status of the family; 2] better hygiene and health benefits; 3] greater privacy for the adults, particularly women; 4] time saving; and 5] better living standards. The factors, which

high proportion of adopter households reported to have influenced their decision to go for toilets, were considered as motivating factors.

Objective IV: *Understand the type and number of constraints for adoption of improved sanitation systems, or identify the stage of the adoption decision process of the non-adopters*

For any non-adopter, the decision making with regard to adoption of a new sanitation system involve three stages, viz., preference stage, intention stage and choice stage (Jenkins and Scott, 2007). We identified "at what stage of decision-making the household is" (i.e., identifying the "decision stage determinants") to assess the actual demand for sanitation by the household. There are constraints for moving to every stage of decision making in favour of sanitation system. The constraints to move to the first stage are: satisfaction with the current sanitation practice; and lack of awareness of modern sanitation systems. The constraints for moving to the next stage (intention stage) are: lack of space; poverty, tenancy issues; and competing priorities of the household. The constraints for graduating to the third stage are: presence of temporary constraints (Figure 1).

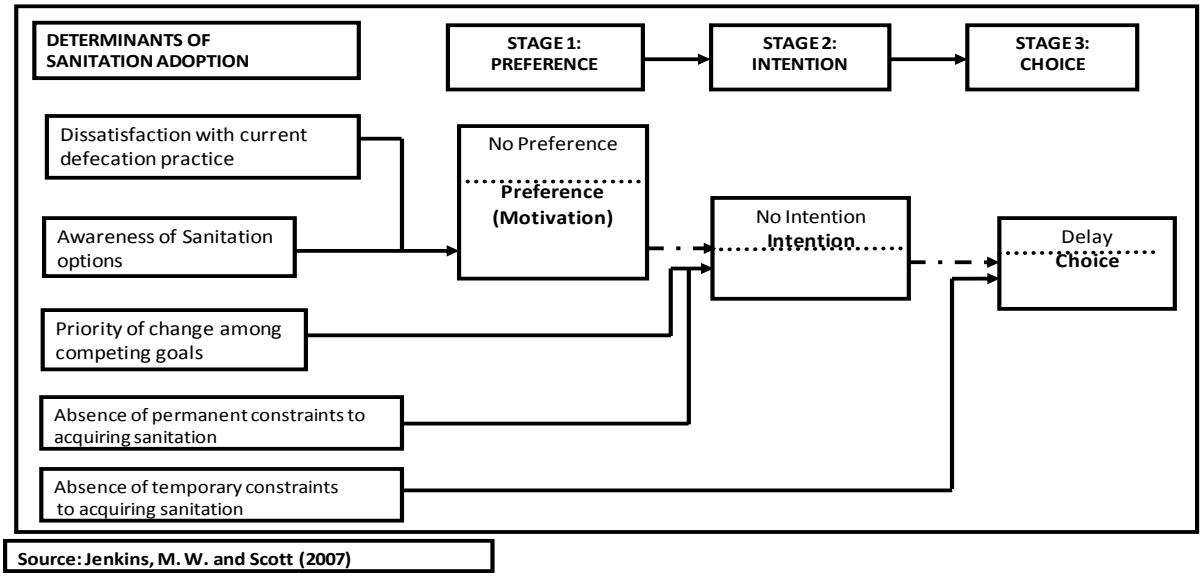


Figure 1: Decision stage determinants of sanitation adoption

Based on the identification of the "decision stage determinant" using the sample survey, the nature and types of constraints in generating demand for sanitation were identified. The estimation of actual demand was based on the number of households which reach the "choice" stage of decision making.

Objective V: *Evolve strategies for promotion of environmental sanitation practices in the rural households, especially among the poor*

Findings emerging from the analysis of primary data collected during the survey, the review of international experience with sustainable sanitation, and outcomes of the discussions during the stakeholder consultations formed the form the basis for evolving the sanitation strategies. In the

subsequent paragraphs, we would discuss how each one of the five complementary objectives was realized.

Findings of the survey with regard to actual adoption of sanitation systems exercise were used to: 1] select the types of sanitation technologies that are technically feasible, economically viable and socially acceptable, especially for the poorest HHs, in different physical environments, socio-economic settings and cultural backgrounds. This was supplemented by review of international literature on ecologically sound and socially and economically viable sanitation systems that suit different physical and socio-economic conditions.

The identification of priority areas for concentrating efforts on sanitation involved two steps. *First*: the figures on the extent of "actual" adoption of improved sanitation systems in different districts of AP were deduced from the validation survey results and district level official statistics on toilet/latrine adoption. Second, the regions which are "most vulnerable" to negative health impacts of poor sanitation were selected on the basis of various physical (climate, rainfall, soils and underground water table) and socio-economic characteristics of different districts, and the available scientific knowledge of the impact of poor sanitation.

The key public policy and programme interventions relating to sanitation at the state level were worked out on the basis of identification of motivational factors for adoption (Objective III); major constraints to improved sanitation adoption at the household level and at the community level (under Objective IV)[7]; and analysis of strengths, weakness, opportunities and threats (SWOT) of the existing sanitation programmes of the State.

Since type of water supply does have a direct impact on the degree of adoption of improved sanitation practices, the existing water supply policies of the state government for rural areas would be analyzed from the perspective of their effectiveness in promoting improved sanitation systems for the households, and public schools. As a matter of fact, sectoral approach to sanitation and water supply is an impediment to those who want to adopt modern toilets, which have utility only when connected to tap water supply. The water supply policies of the state were analyzed from the point of view of type of water supply schemes being promoted.

The operational plan for effective implementation of sanitation programmes, including institutional capacity building strategies, were worked out on the basis of findings emerging from the research vis-à-vis:

- The actual demand for improved sanitation by individual households and schools (outputs of analysis under Objective IV);

- The technologies most suitable for improved sanitation for different physical and socio-economic settings (survey findings on actual adoption plus the synthesis of international literature survey on sanitation). The suitability comes from technical efficacy, economic viability and social acceptability;

- Priority areas identified for concentrating efforts on promoting improved sanitation based on vulnerability assessment (complimentary Objective 2 of Objective V); and.

[7] The motivating factors, and the types and nature of adoption constraints identified through the "decision stage determinants" inquiry were used for working out the types of interventions for generating the demand for sanitation.

- Assessment of adequacy of existing institutional capacity for implementing the sanitation programmes in rural areas, comprising institutional framework[8], organizational strengths and human resource capabilities.

5. The Need for Validating Data on Adoption of Improved Toilets in Andhra Pradesh

There are several sources of data on the number of improved toilets in rural areas available for the state of Andhra Pradesh. Though pertaining to different points of time and with different level of details, they together do not throw up a definite picture about the state of sanitation in rural AP. There is a need to examine the accuracy and reliability of the data available from various sources.

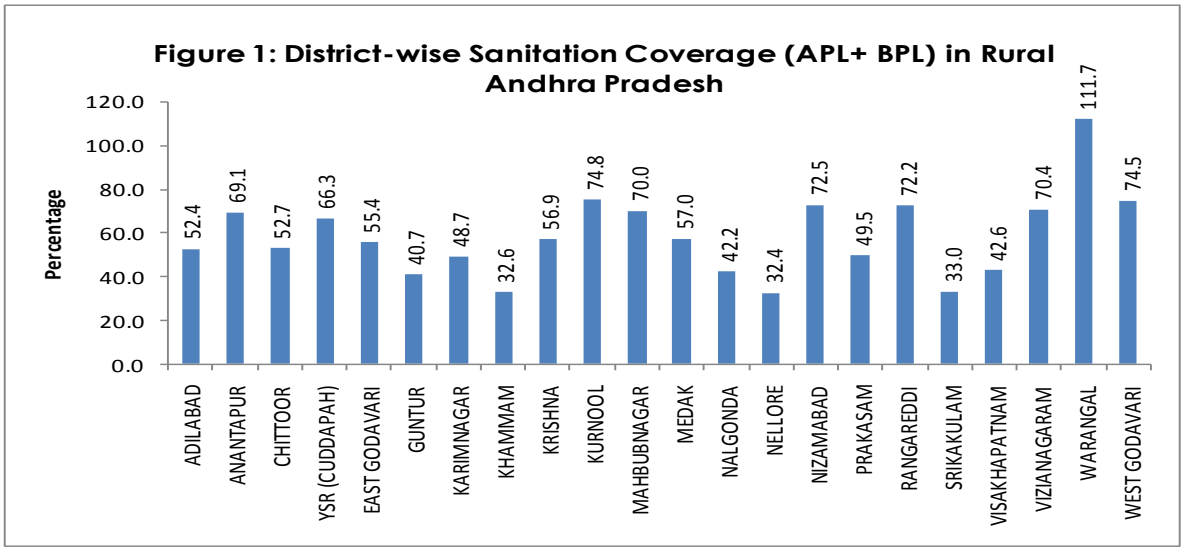
Status of Rural Sanitation: What Available Data Show?

With a rural population of 5.63 crore and 1.37 crore rural households (Census 2011 provisional figures), providing rural sanitation is a formidable task for the state. According official sources, it has already provided improved sanitation to around 74% of the total targeted rural households (TSC, Ministry of Drinking Water Supply and Sanitation, GOI). Following shows the current level of adoption of improved toilets in the state of Andhra Pradesh, according to various sources:

The state department of rural sanitation initiated maintenance of records of adoption of improved sanitation technologies by the rural households in 2001 under the Total Sanitation Campaign (TSC). The data are updated periodically and are available for every year based on field report from the respective village Panchayats. The data are also segregated for different economic segments viz., APL and BPL and different social groups, viz., SC and ST. However, the data is silent on how many of these toilets were actually built and how many of them were in use. The aggregate data, available at the district level as on 2011, are compared against the total number of HHs in those districts to find out the aggregate level of adoption.

Figure 1 shows the percentage of APL+BPL families which have adopted improved toilets, in different districts. This was worked out using the sum of the TSC's estimates of the toilets built under the programme and the number of toilets which already existed in the districts prior to TSC and then dividing it by the number of HHs in the rural areas as per the Census 2011 (source: based on TSC, November, 2011; Census 2011). The extent of adoption varies from a lowest of 32.4 % to a highest of 111.7 per cent. The state average is 57.5 per cent.

[8] The central sanitation programme of Total Sanitation Campaign (TSC), the incentives such as *Nirmal Gram Puraskar* etc. would be studied.



It is intriguing to find that the number of HHs adopting improved toilets is higher than the total number of HHs in the district of Warangal. Though there could be some error in the estimation of total number of HHs in the district[9], it cannot result in such a gross under-estimation of rural HHs. This could be either be the result of over-reporting of toilet construction in the district, which increases the value of the numerator, or due to the inclusion of a significant chunk of the villages as urban in the latest census or both. According to the 2011 census, the rural population in many districts has dwindled, Warangal being one of them. This is not a result of reduced fertility rates for these districts, but due to the population in several of the villages being considered as urban. Barring these issues of error in estimation, the TSC monitoring report claims 100 per cent coverage of targeted households in Warangal district.

These estimates of improved toilet coverage do not tally with estimates available from other sources. For instance, the third National Family Health Survey (NHFS-3, 2005-06) estimated that only 27 per cent of rural households have toilet facilities in Andhra Pradesh, while the corresponding figure from TSC during the same period was 35 per cent. If the latest figures of TSC sources are to be believed, a substantial progress seems to have been made during the past five years. But, a matching improvement in other indicators of social development is not visible in the state. For instance, the rural literacy, which is recognized as a powerful instrument to bring about changes in sanitation and hygiene behaviour, has only gone up from 54.5 per cent to 6.1.1 per cent during the last decade in Andhra Pradesh.

The estimates available from four other sources, viz., National Sample Survey (65th Round), District Level Household Survey (DLHS), National Family Health Survey, and JMP are provided in Table 1. They are available for some years in the time period from 1992 to 2008. By extrapolating these data, projection of the expected coverage of toilets in 2015 was made to be around 30%. The coverage required to be reached in different years (from 2008 onwards) to achieve the MDG target for the year 2015 (i.e., 53.1%), was also made through interpolation. But, it can be seen that the

[9] As we have used the 2001 census figures of average number of persons per HH for arriving at the total number of HHs in 2011 based on 2011 rural population figure.

target achievement claimed by TSC for the State for different years during the period from 2005 to 2010 are far higher than the coverage required for achieving MDG targets for those years (Figure 2).

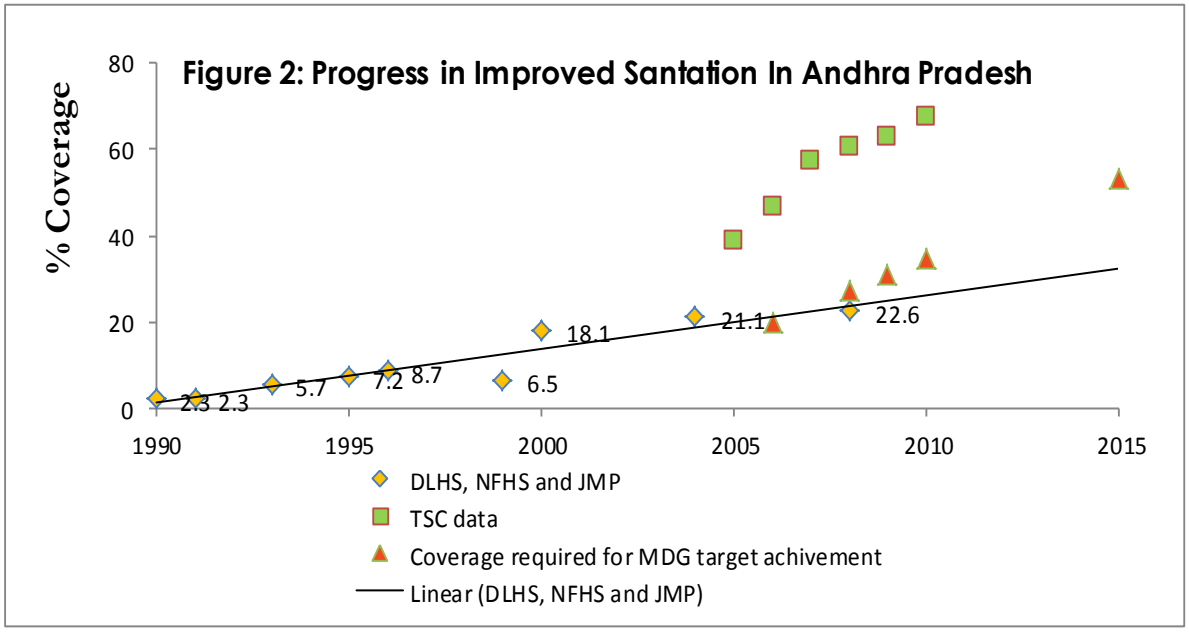


Table 1: Percentage of Rural Sanitation Coverage in Andhra Pradesh from various sources

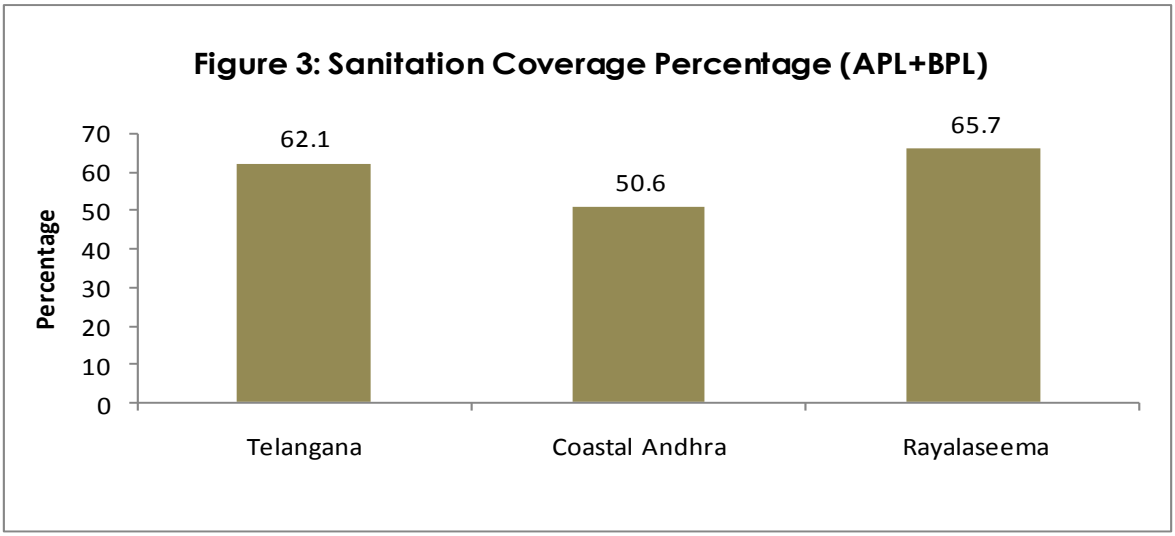
Sr. No	Source	Year	Rural Sanitation Coverage (%) in Andhra Pradesh	Remarks
1	TSC data, Ministry of Drinking Water Supply and Sanitation, GOI	2011	57.50	This is the percentage of the total rural households having improved toilets
2	National Sample Survey– 65th Round	2008 – 09	35.7	This survey covered only a total of 1,000 sample households
3	DLHS Report	2008	38.4	
4	Joint Monitoring Programme (2010) of UNICEF, and WHO	2008	31.0	This considered the total rural HHs doing open defecation, and therefore the actual number of households having toilets would be lesser, if we consider the fact that there is sharing

5	Social and Rural Research Institute (SRI) Report	2008	19 .0	19.0% is the average for five districts: Anantapur, Chittoor, East Godavari, Medak and Nizamabad
6	National Family Health Survey–3	2005 – 06	27.0	
7	TSC data, Ministry of Drinking Water Supply and Sanitation, GOI	2005 – 06	35.0	The data is quite old
8	Census of India, 2011		31.0	

Unfortunately, most of these estimates are point values, state level aggregates, and correspond to different points of time. They lack the level of details which is required for verification of their reliability or accuracy. One of them, i.e., NSS-65th is based on a very small sample, 1,000 households. The others are old, the oldest one corresponding to 2005-06. Therefore, we need to closely look at the TSC data, which is available even at the Mandal and Panchayat level, and also the most recent one.

Even if we assume that the estimates of new toilets built under TSC are reliable, there is a need to rework the estimates of number of toilets in villages for the present rural population, as per the latest Census of India (2011) for validating these data. Otherwise, this can lead to serious anomaly in the assessment of achievement in terms of the promotion of toilets in rural and urban areas.

Not notwithstanding such discrepancies in population count, the region-wise analysis clearly show some trend (Figure 3), which raises serious questions about the reliability and usefulness of the estimates available from TSC. Figure 3 shows that percentage adoption of improved toilets is highest in Rayalaseema, followed by Telangana. The extent of adoption is lowest in coastal Andhra,



which is comparatively more developed than the other two regions. Coastal AP is far most developed according to the social and economic indicators.

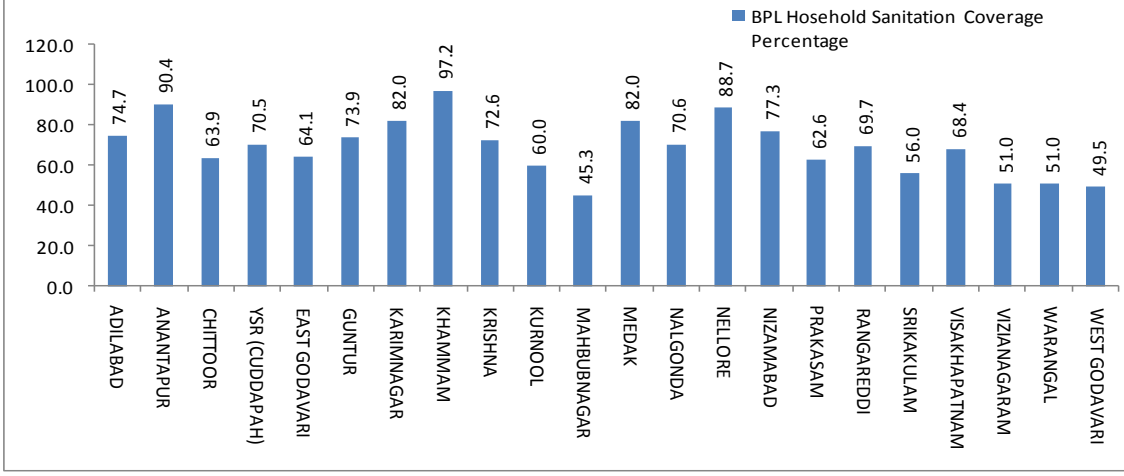
Particularly when there is a wide recognition that acceptance of improved sanitation is a behavioral issue, education and better awareness is expected to result in greater adoption of improved sanitation technologies and practices by the community.

According to 2011 census (provisional figures), highest literacy rate was found in West Godavari district (72.5 per cent) and lowest in Mahbubnagar district (52 per cent). Female literacy rate was also found to be highest in West Godavari district (69 per cent) and lowest in Mahbubnagar district (41 per cent), whereas male literacy rate was found to be highest in Chittoor district (77.7 per cent) and lowest in Mahbubnagar district (62.66 per cent). But, regression analysis between percentage households adopting improved sanitation (dependent variable) and literacy rate (independent variable) showed a weak polynomial relationship (R^2=0.11), higher (above state average). In fact some of the districts which had poor literacy rates show high rate of adoption of improved sanitation systems during the past one decade.

One reason for this unexpected trend in the extent of adoption of toilets could be that a significant number of rural HHs in coastal AP already had toilets prior to the launching of TSC, which does not get reflected in the official statistics relating to TSC. The figures of the status of rural sanitation would make sense, if those figures are also included.

Since we do not have data on the total number of APL and BPL households for each district in the state, it is not possible to arrive at the figures of extent of toilet adoption across economic segments. Nevertheless, it is useful to know what fraction of the toilet adopter households are from the BPL category. Figure 4 shows the total number of BPL households covered under TSC in each district as a percentage of the total number of HHs covered under TSC. The estimates did not consider the toilets which existed in the districts prior to the launching of TSC. The value ranges from a lowest of 43.5 per cent for Mahbubnagar to the highest of 97.1 per cent for Khammam. This means, at the state level, a significant chunk of the achievement in promoting sanitation has come

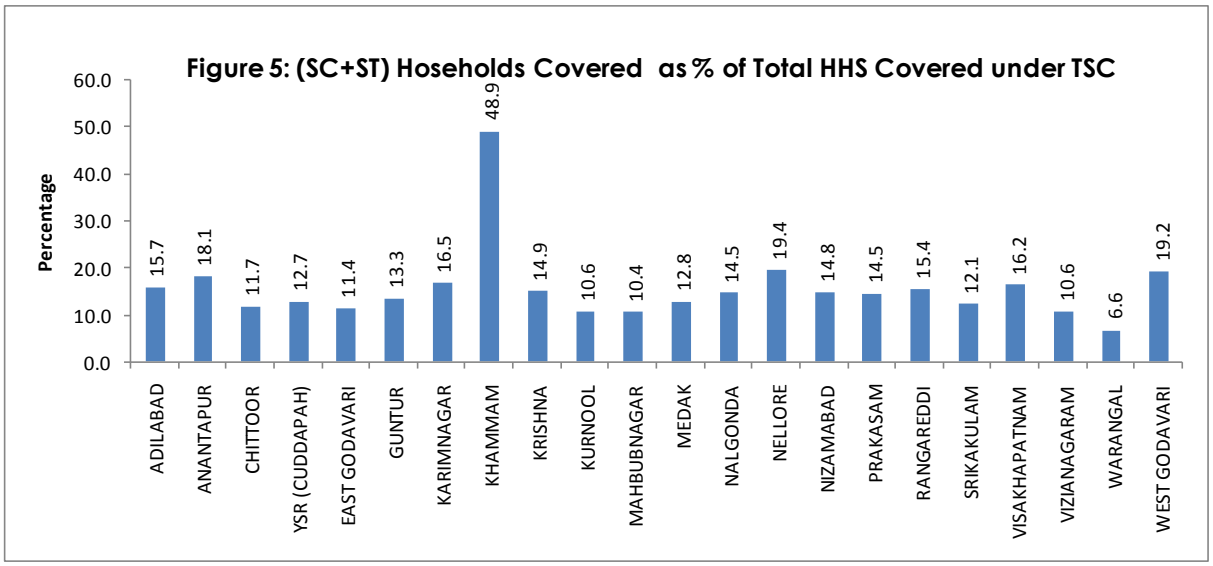
Figure 4: BPL Household Covered as % of Total Households Covered under Sanitation



from BPL families.

Official figures of achievement against the targets do not show much difference between BPL and APL households. As per the recent estimates available, 76 per cent of targeted BPL households, 71 per cent of targeted APL individual households, 91 per cent of targeted school toilet units and 46 per cent of targeted Anganwadis were covered under TSC since 2001. As per the same report, two districts in the state, namely Nizamabad and Warangal, have achieved a distinction of 100 per cent individual sanitation coverage. In district Anantapur, all the BPL households were reported to be covered with individual latrine, whereas in Khammam, Kurnool, Mahbubnagar and West Godavari districts, 100 per cent of the APL households were reported to be covered with individual sanitation facilities. Srikakulam and Guntur districts lie at the bottom of the tier with individual household sanitation coverage of only 34 per cent and 48 per cent, respectively.

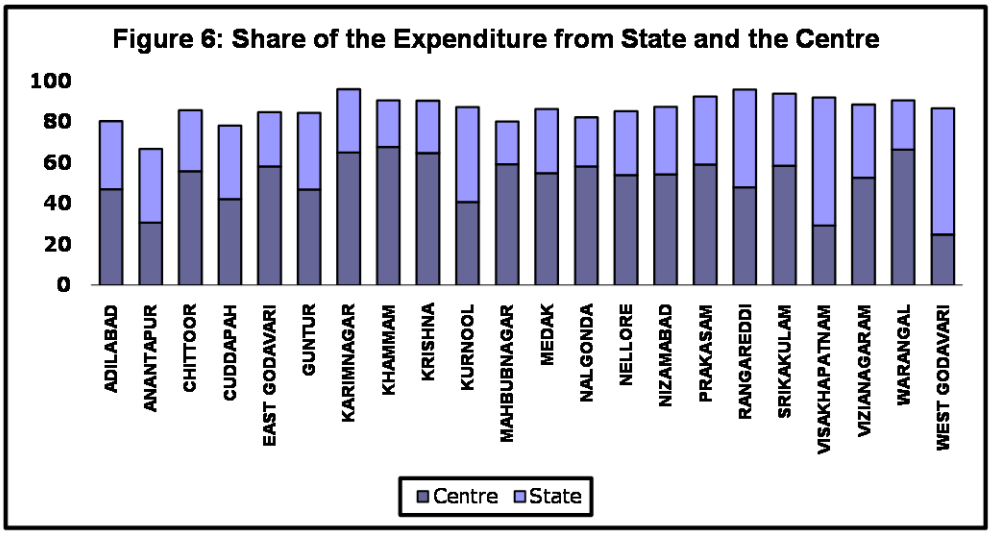
Figure 5 shows the total number of SC + ST households as a percentage of the total number of HHs who have adopted improved toilets. The values range from a lowest of 6.6 per cent for Warangal to 48.9 per cent for Khammam.



In terms of financial progress, only 61% of the approved outlay was released and only 74 per cent of the released funds were actually spent. A total of Rs. 803 crore was spent on providing latrines to about 76 lac households. Out of this expenditure, 49% was spent by central government, 37% by state and around 14% was beneficiary share. But, in terms of average expenditure per household, major variation was found across districts. It was highest in Visakhapatnam (Rs 2021), followed by Khammam (Rs 1814), West Godavari (Rs 1462) and Rangareddy (Rs 1418) districts. It was lowest in Warangal (Rs 283) and Vijayanagaram (Rs 696).

Variation was also seen in composition of expenditure amongst the state, centre and beneficiary households. The state average expenditure in providing improved sanitation was Rs 1055 per adopter household. In terms of share (Figure 6), central government share was found to be highest in Khammam (68%) and lowest in West Godavari district (25%). The state's share of the expenditure was highest in Visakhapatnam (63%) and lowest in Mahbubnagar district (21%). The highest contribution from beneficiaries was in Anantapur (33%) and lowest in Karimnagar (3.9%) (Source: TSC (Total Sanitation Campaign) Data (Andhra Pradesh) and Census of India 2011 data). Though there are guidelines regarding the financial incentives to be provided to the individual

households for construction of latrines, the expenditure pattern confirms that these guidelines are not strictly followed.



Inferences

The detailed database on improved toilets in rural AP is available only from TSC. Contrary to what has been normally observed in other parts of the country and even globally, no linkage seems to be existing between the socio-economic indicators and adoption of improved toilets among rural households in Andhra Pradesh as brought out by the inter-district and inter-regional comparisons of TSC database. While one could argue that this is because of the institutional support for sanitation offered to BPL families, what is important to note is that this support is too meager to make a difference. Had it been extremely critical for the BPL families, the rural households belonging to APL families might have already gone for improved toilets even prior to the Total Sanitation Campaign. But, this is not the case. On the contrary, the role of education and awareness to bring about behavioural changes is too important to be ignored.

The official statistics on the progress in TSC need revalidation in the wake of the following: a] the lack of correlation between socio-economic conditions and improved toilet adoption; b] a sudden jump in the number of improved toilets across districts after 2003; c] the total mismatch between TSC data on improved toilets and the data available from various other sources on the same; and, d] major variations in the unit costs of toilets across districts. There are two important issues to be addressed in validation exercise. The first issue is of getting realistic figures of the number of toilets built under TSC in the areas which are currently rural, and they need to be compared against the current rural population and households. The second issue is of having estimates of the number of toilets built in the rural areas prior to the launching of TSC.

6. Review of Literature on Sanitation

6.1 Studies on Dynamics of Adoption of Improved Sanitation and their Impacts

The review of literature on sanitation covered the following areas: behavioural science related issues; sanitary engineering related issues; public health impacts of improved sanitation; socio-economic dynamics involved in use and non-use of improved toilets; and, financial and economic aspects of promoting improved sanitation, including real costs and subsidies; factors influencing the performance of public utilities engaged in sanitation promotion.

A total of 11 studies were covered. They are as follows: 1] the validation of official data on adoption of improved toilets and WASH compliance in Gujarat; 2] assessment of decision stage determinants of household level adoption of improved toilets for deriving the demand for improved sanitation systems in rural areas of Ghana; 3] assessment of the actual cost of sanitation provision in Andhra Pradesh, against budgetary allocation under TSC from the government; 4] assessment of "slippage" in sanitation in India and the physical and socio-economic factors influencing it; 5] a review of sanitation strategies and policies in Karnataka state, to identify the strategic interventions for promoting sanitation in rural areas of the states; 6] comparison of cost of provision of WASH services against budgetary allocations in India; 7] study evaluating the pollution effects of pit latrines on shallow groundwater; financing of WASH in India; 8] understanding the factors determining the choice of sanitation technologies in Salvador, Brazil; 9] implications of subsidy provision for low cost sanitation system adoption in Madagascar; 10] the impact of improved sanitation on child mortality in Egypt; and, 11] performance benchmarking of government agencies in rural sanitation. The results are summarized in Table 2.

Table 2: Summary of Review

Sl. No	Paper/Article /Study	Objectives / Aims	Key Findings	Conclusions
1	Field data validation of WASH compliance in 12 districts of Gujarat, a Joint Internal Study by (WASMO/DRDA) supported by UNICEF	Physical access, status and use of home sanitation facilities among APL/BPL and across gender and age divides; and some critical hygiene practices Physical access, status and use of School sanitation facilities and some critical hygiene practices among boys and girls. Physical access, status and use of ICDS-AWC sanitation facilities and some critical hygiene practices among children	There is a marked difference in the extent of use of toilets and hygiene behaviour between different economic segments, here APL and BPL families for both men and women. There is marked difference in the use also between male and female within the same economic segment. This is evident in the following: use of toilets; hand washing practices, and child stool disposal. The extent of use was higher for APL families as compared to BPL families, and also higher for female members as compared to male members	Economic conditions, gender and age group have significant bearing on the use of improved sanitation systems and hygiene behaviour
2	Behavioural Indicators of household decision-making and demand for sanitation and potential gains from social marketing in Ghana (Jenkins and Scott, 2007)	Identifying the adoption decision stages viz., preference, intention, and choice of HHs to install a toilet in Ghana are defined, measured in a survey, and used to estimate sanitation demand, identify factors affecting demand at each stage, and classify households by adoption stage to identify targeted demand-stimulation strategies in Ghana The approach is broadly applicable where household sanitation coverage is low, but	• Results from a representative national sample of 536 households indicate that of 74% of households are without any home sanitation, 31% have some likelihood of installing a toilet within the next year, but only 6% are very likely to do so; 62% had not considered the idea. • Motivating and constraining factors are compared at each adoption	•Results show how satisfaction with existing defecation practices, motivations for improving sanitation, priority over competing household concerns, and situational and implementation related constraints affect preference for and likelihood of household toilet installation, and can lead to new demand for sanitation in Ghana. •Provides a quick and effective method to assess and understand what drives

		can also be adapted to areas where sanitation coverage might be high, but toilets (or latrines) unsafe or in poor condition. The model and survey tool is expected to serve three major purposes: • Measure baseline household sanitation adoption and demand patterns. • Predict changes in demand for sanitation improvements by mapping the decision-making process into behavioural stages, classifying households within this process, and understanding barriers to adoption at each stage. • Identify actions and policies to increase sanitation demand among households in different adoption stages.	stage and strategies likely to increase toilet installation in Ghana discussed.	household demand for improved sanitation, segment households by adoption stage, and pinpoint focused strategies to stimulate increased rates of preference, intention, and choice to improve sanitation. •In Ghana, categorizing the target population in terms of the adoption stages that generate new demand for home toilets provides useful information to identify policies and design interventions to stimulate higher rates of demand. •In particular, marketing strategies aimed at the preference and choice stages appear to be promising ways to increase household sanitation demand and coverage in Ghana.
3	Assessing sanitation costs and services in Andhra Pradesh (Snehalatha *et. al*., 2010)	In India, the Total Sanitation Campaign (TSC) was initiated in 1999 to ensure sanitation facilities in rural areas with the goal of eradicating open defecation. This programme is designed with cash incentives to generate competition between villages to be open defecation free. Some State governments have also initiated their own incentive programmes. Andhra Pradesh makes Shubhram awards, although these are not given out regularly. The objectives of the study were :	Data collected from 20 villages spread over two agro-climatic zones was analyzed and presented as a basis for this paper. • The analysis reveals that supply-side philosophy is evident in the case of sanitation sub-sector. • Capital maintenance expenditure was either absent or received negligible allocations. • Support costs that are especially important in sanitation are totally absent despite policy pronouncements after the Total	• Although the Total Sanitation Campaign was designed to address access and use of sanitary facilities, efforts seem to be limited compared to what is needed to achieve the desired impact. • A lot needs to be done to ensure that the facilities are used by households, especially Individual toilets. • IEC activities need to focus in such a way that the demand is generated for toilets and their use. • Solid and liquid waste management systems have not been established at village level, and this also requires attention. • The department of Rural Water Supply and

		• To describe the methodology used by WASH Cost to access sanitation costs and services delivered • To assess the level of sanitation service delivery and the costs of sanitation service delivery • To compare the costs and service levels between the Nirmal Gram Puraskar Award (NGP) "open defecation free status" villages and non-NGP villages.	Sanitation Campaign. • The influence of sector reforms, which suggest that at least 10% of allocations should be directed towards support costs, appears to be limited in the sample villages. • The substantial expenditure made by households on sanitation indicates that the allocations for infrastructure set in government guidelines are not enough. • The sanitation costs that are presented here are not the full coverage costs, as they reflect only the actual cost at the existing level of service coverage. • Assuming that each household will have its own individual latrine, the real life-cycle costs will be twice that of present estimates. The cost of toilet ranges from US$$150 to US$ 227 depending on the location and technology. • The underground drainage system costs about US$ 88 per capita and an open drainage US$ 26 per capita for the existing level of service. • These estimates indicate that the cost of providing sanitation could be as high as, if not more than, the costs of drinking water provision if comprehensive sanitation were to be provided beyond existing levels	Sanitation should give special focus to a sanitation mission with proper allocations to cover the solid and liquid management systems. • Government should encourage Panchayats to design comprehensive village water and sanitation plans, which can be implemented with proper follow up and with regular IEC activities. • Planning and budgeting should be based on a life-cycle approach with timely release of funds to sustain services and to avoid the ad hoc funding approaches currently practiced.

			to ensure environmental protection. • More funds need to be allocated for improved sanitation service levels. • These costs would be less for alternative options like soak pits, open drainage, recharge pits etc.	
4	'Slippage': The Bane of Drinking Water and Sanitation Sector (A Study of Extent and Causes in Rural Andhra Pradesh) (Reddy et al., 2010)	The broad objectives of the paper include: • Assessing the extent of slippage at the national and state level; • Identifying the causes of slippage at the macro / national level, *meso* (state) and at the micro (village) level; and • Providing some pointers for policy based on the analysis. The study relied mostly on the secondary data published by the Government of India at the national and state aggregates. Andhra Pradesh (AP) State has been selected for a more detailed analysis of factors at the *meso* level and micro level.	• Slippage is one of the main bottlenecks of achieving full coverage of water and sanitation services in India. • The extent of slippage is quite substantial even at the aggregate level. • The situation is alarming in some of the states where the extent of slippage is as high as 60 percent. • Slippage may not be directly related to source linked factors. • The marginal incidence of slippage (about 5%) in Karnataka, which falls under fragile resource regions, amply demonstrates there are factors other than infrastructure provision/ resource which determine slippage. • The regression estimates also reveal that source of water (resource) is not as important as that of rainfall and adult literacy. • While rainfall is a natural factor, adult literacy is a policy variable.	• Policies should be framed at the state level rather than following the blanket central policies or guideline. • Analysis of test bed areas also brings out the fact that policy makers should look beyond the often repeated supply sided strategies. • As evident from the experience of Andhra Pradesh, the demand side and governance factors play an equally, if not more, important role in addressing the sustainability issues. • So far the experiences are that large investments in water sector would not automatically lead to increase in coverage. • The sector also needs a sound policy and capacity so that money is spent effectively and leads to increased water security. • The policy should also address resource sustainability and behavioural change goals instead of relying upon a one-sided target driven approach. • In accordance with the above the drinking

			• Population could support better management of the resource along with better revenue generation. • Access to tap may not necessarily result in sustainable service delivery. • The rainfall and literacy factors do not seem to be working in the case of Kerala, which is a high rainfall state, with hundred percent literacy • Decentralized water governance in the provision of sustainable WASH services is important.	water policy states that: "some, for all, forever and together". The intension of such a policy is equity by meaning "for all", sustainability by meaning "forever" and efficiency improvement by meaning "together" being providers and users. • An appropriate strategy of integrated water resource management framework with complete involvement of water providers and users together would be effective. • This approach identifies barriers in meeting the demand and potentials to improve the access within the systems and institutions, at user, service provider and water resource manager level (IRC, 2008). • General improvement in literacy would go a long way in minimizing slippage. • Higher literacy also helps in stronger decentralized service delivery of WASH services. • This emphasizes the need for strong IEC activities at different levels for capacity building in ensuring functional efficiency of the program. Water quality is another aspect that needs policy attention. • The new guidelines of Rajiv Gandhi National Drinking Water Mission give high priority to water quality as well as decentralization. • How these guidelines are interpreted and implemented at the state and local level needs to be taken care off.

				• Decentralisation of WASH service delivery should adopt a model that rationalizes the existing functions. • The approach should be „bottom-up", as most of these activities currently are carried out at the village level mainly by Community Based Organisations (CBOs in AP). • Besides, given the capacity of PRIs, their involvement in the activities would be different from one function to another. • Such differentiation not only addresses the issue of over burdening the PRIs but also negates the arguments regarding lack of capacity with PRIs. WASH service delivery, which falls under the core/basic functions, is the function PRIs have been given mandate from its inception. • In this scenario PRIs, given their long experience in handling these schemes would be the dominant bodies in terms of planning, implementation and monitoring of these functions (strong linkage) facilitated by the department. • Members of the CBOs like village water and sanitation committee (VWSC) representing Standing Committees will act as pressure groups for efficient implementation and equitable distribution of the benefits
5	Sanitation Strategies in Karnataka: A Review (Veerasekharappa and	Contains review of policies, strategies and programmes implemented in Karnataka.	• Apart from coverage, when it comes to use of latrines, many households do not use even the	• The IEC is more effective if the village as well as the household has achieved a critical minimum level of development.

	Bhide, 2009)	Following are the objectives of the study • To examine strategies in provision of latrines • To examine the constraints in evolving demand for toilets; and • To examine stakeholders role and impact in provision of sanitary services.	existing ones. • A field study by the State government pointed out that 13 per cent of constructed latrines were mis-utilized and 3 per cent non-utilized. • Mis-use of latrines stands higher in Bijapur (69 per cent), Gulbarga (56 per cent) and Raichur (51 per cent). • While in Raichur, around 40 per cent of the latrines were found to be in use as bathrooms, in Gulbarga 34 per cent were put to other uses (GOK, DES, 1998). • As revealed by an impact study, many latrines constructed under IRWSS as well as under housing programmes (Janata, Ashraya) were being used as storage rooms (Veerasekharappa, 1999). • Another study found that out of 19 villages covered in the study, six villages in Gulbarga, Dharwad and Belgaum districts do not have even a single latrine (STEM, 2001). • The studies on individual sanitation facilities have revealed that demand and inclination to have IHLs largely depends on social and economic factors. • Use of private latrines is found only among Brahmin, Lingayats, Vokkaliga and Muslims (NICD,	• IEC materials have to be designed according to village requirements, at project initiation stage and at the intervention. • The variation across households in deriving benefits from the programme depends on the design of the project as well as awareness of the household. • Wherever the provisions of sanitation services were linked with the village/community contribution or private household connection (PHC) for water, the demand for sanitation is very insignificant. The VWSC committee or persons involved in the process of implementation at the grass root level were found functioning as licensing authorities instead of promoting the latrine construction. • This discouraged many poor from approaching authorities for sanitation services. • The current awareness campaigns have not led to a change in the mind-set of the households/people to accord high priority to latrine construction in all the cases where such campaigns were held. • Due to lack of efficiency in the implementation process, community contribution did not take place to the expected level (implementation delays discouraged construction) • Past experiences suggest that participation of bureaucracy and politicians in the latrine

			1991). • This study was reviewed by an ISEC study which came to the conclusion that there is a positive relation between caste hierarchy and adoption of private household sanitation facilities and connection of water tap (Veerasekharappa, 2003). • Another argument explaining the relatively poor demand for the IHL was that, in rural area 85 per cent of the households do not assign high priority to latrine construction. • Thus, despite the subsidy, the target achievements are minimized. • In the last seven years, there has been an addition of only 20 per cent coverage of households under rural sanitation-an average of 3 per cent per year. • Financial expenditure shows that the amount spent each year on allocation is insignificant. For instance, under total sanitation project the total budget was Rs 594 crore for the year 2005-06 and the amount released Rs 130 crore. • The amount spent by March-end of 2006 is Rs 11 crore and by March 2007, Rs 73 crore in cumulative. • Thus, the implementation of the programme by government is very	construction programme should be minimized. • As the space/land is major constraint in the construction of IHLs, the community sanitary complexes need to be promoted, based on the experiences of projects initiated in Tamil Nadu and Sulabh toilets.

			tardy	
6	Financing the WASH Sector in India Cost of provision and budget Allocations (Reddy and Jaya Kumar, 2011)	• The main objective was to assess the status of resource provision or budget allocations in comparison with resource requirements for achieving sustainable service delivery. • Major issues in this regard include the rationale for present level of resource allocation vis-a-vis requirements, allocations towards drinking water vis a vis sanitation / hygiene; distributional aspects of expenditure in terms of capital costs, working costs, etc. • The trends in WASH expenditure in lieu with coverage and access in detail during the recent years at the all India level and also in one of the states i.e., Andhra Pradesh were examined.	• Budgetary allocations towards rural WASH sector are not only inadequate to meet the requirements but also declining in relative terms (Actual requirements are higher by 4 to 10 times) • Sanitation sub-sector gets very low allocations and the actual expenditure is too scanty. • Even the limited allocations towards WASH sector are heavily biased in favour of infrastructure (plan expenditure).	• There is a need to reassess the real cost of providing sustainable WASH services in the lines suggested in the new guidelines, which would require a multi fold increase in allocations. • Adapting to the life-cycle cost approach in tune with the new guidelines, which is comprehensive incorporating resource protection, rehabilitation, support costs, etc., along with the infrastructure costs, would help in estimating the costs realistically and ensuring sustainability. • The poor sanitation conditions do not augur well in a country, which takes pride in the fact that India is among the fastest growing economies. • Unless there is a substantial shift in the policy towards sanitation in terms of allocations and planning, sanitation would continue to be a nagging problem resulting in huge economic losses through adverse health impacts. • In this context, mainstreaming sanitation rather than treating it as a by-product of drinking water with appropriate policy and institutional initiatives would go a long way in addressing the problem. • In the absence of a balance between supply side and demand side approaches, the effectiveness of the investment in infrastructure would be limited. • Though governance issues like

				decentralization involving PRIs in the management of drinking water, etc., are emphasized at the policy level very little is being done at the implementation level in terms of fund allocations. • Such anomalies or imbalances need to be corrected in order to ensure water security at the household level.
7	Pollution effect of pit latrines on shallow wells at Isalelgbehin community, Abeokuta, Nigeria (Joseph and David, 2011)	• The study addressed the pollution effect of pit latrine on shallow wells with the aim of analyzing the physico-chemical and bacteriological components of the water at Isale Igbehin, Abeokuta.	• Findings showed that all the 12 samples tested positive to coliforms count while 5 of the samples tested positive to faecal coliforms. • Half of the samples produced foul odour as 4 samples tasted sour. • Most of the physico-chemical parameters fell within World Health Organization and European Union permissible standard for potable water. • Significant relationship exists between the bacteriological and some of the physico-chemical parameters. • The polluted water in most of the locations is capable of resulting in health problems, therefore not good for human consumption.	• This study examined the pollution effect of pit latrine on shallow wells at Isale-Igbehin, Abeokuta, Nigeria. • The result shows that shallow wells can be polluted by pit latrine. • Though some of the physiochemical properties analyzed fell within the WHO and EU permissible limit for potable water standards, the bacteriological analysis has shown that such water is harmful to human health. • All the samples tested positives to coliforms count while Samples 1, 3, 6, 7 and 10 tested positive to faecal coliforms. • This shows that the water from the shallow wells could lead to outbreak of diseases including cholera, dysentery, diarrhoea, hepatitis among others. The authors recommend the following: • Prompt well water quality assessment should be undertaken; • The public health workers should ensure that the distance of pit latrine to shallow wells meet the recommended distance of

				30 m by WHO; • Government should ensure adequate and efficient public water supply through the provision of pipe borne water; • Public enlightenment campaign on the effect of contaminated water and the danger of sitting shallow wells close to pit latrines be embarked upon by the government and the media (print and electronic), schools, religious bodies etc.
8	Demand for Sanitation in Salvador, Brazil: A Hybrid choice approach (Santos *et al*., 2011)	• The objective of this study was to understand the choice of sanitation technology by residents in the city of Salvador, Brazil. • A unique hybrid choice model that incorporates a set of latent attitudinal variables and explains how the demographic factors within a household influence choices was proposed. • The substantial difference of hybrid choice model from descriptive frameworks is that it integrates choice and latent variables (such as attitudes and preferences) allowing to model explicitly the cognitive process that influences sanitation adoption, draw conclusions from cognitive variables associated with individuals' socio-economic and demographic characteristics, and establishes a causal pathway among these variables.	• The results show that the attributes of health protection, accessibility, privacy, and house modernization were what households cared about when opting for flush toilet and sewerage connection, rather than the high cost and consequent household socio-economic status associated with them. • The hybrid model is statistically consistent with these findings, and seems to fill the gap between behavioural theory and discrete choice models applied to sanitation.	• In rural Benin, Jenkins (1999) found that without strong drives (perception, attitude and other latent construction) for a latrine, the household would be uninterested in a change of sanitation practice. • A lack of such drives, not the presence of constraints alone (costs of connection, for instance) was the main reason for non-adoption. • The presence of one or more drives had a strong influence on adoption. • In the sample, at about 34% of individuals had moved to another neighbourhood, what can be an indicator of a high percentage of rented houses. • Authors did not conduct any further assessment using this information and therefore this could be considered a potential limitation for the interpretation of results. • However, authors believe the Hybrid Choice Model used to estimate demand for sanitation in Salvador is consistent in

				demonstrating the importance of latent variables underlying revealed preferences, opening the black box of consumer choice, and contributing to understanding of sanitation demand.
9	The effect of water and sanitation on child mortality in Egypt (Hala Abou-Ali, 2003)	• The aim of this study was to understand and explain the determinants of under-five mortality. • The objective of this paper is to is to quantify the mortality risk decrease for children under the age of five years that would result from certain improvement in water and sanitation services, using the Demographic and Health Survey in Egypt from 1995 (DHS, 1995) and transition rate models. • The three-part model used allows the control of censored data together with the accounting of household unobserved characteristic.	• Living in urban areas decreases the mortality risk by around 30 per cent as opposed to living in rural areas. • Taking interactions between water supplies and urban city into account, it was found that residential water in urban areas has a significant role in mortality risk reduction in different age groups as compared to its role in rural areas. • The mortality is reduced in the infant and childhood cases by 61 and 90 per cent, respectively, which suggests an important role of policy in eliminating the urban-rural disparities. • A mother who has completed secondary school and higher reduces infant mortality by 63 per cent as opposed to an illiterate one. • In research concerning child mortality, education is thought to be one of the most important factors in reducing the level of child mortality. • Cochrane (1979, pp. 93-98) found, from surveying 16 studies on the subject, that female education	• Using DHS Egypt 1995 and a three-part model while studying child mortality, this paper assesses whether improvements in water and sanitation services are leading to a decrease in mortality of children under the age of five. • The analysis is conducted using a probit model specification for the neonatal case. Non-parametric, semi parametric and parametric duration model specifications are used for different age intervals including infant and children less than five years. • One of the problems in studying child mortality is that biological and social entities usually differ in ways that are not fully captured by the model. • This unobserved heterogeneity can produce misleading estimates of hazard functions and attenuated estimates of covariate effects. • Thus, the transition regression models are estimated with and without heterogeneity. • Assessment of model fit by means of Cox-Snell residuals and likelihood ratio tests reveals that a Weibull model with gamma heterogeneity better explains the second

			increases the chances of infant and child survival in two thirds of the studies. • The SLI generally marks a significant effect on the neonatal and childhood mortality reduction. • Moreover, it is widely believed that male mortality is higher due to biological disadvantages. • This is apparent in the neonatal case where the gender effect is significant and positive marking the male disadvantages. • However, the study showed higher female mortality indicating gender discrimination together within the infant and childhood cases. • When the offspring is male he has an advantage of a decreased risk of death than being a female ranging from 30 to 34 per cent. • In the absence of social security males are seen to be a long-term investment to depend on in older days (Dasgupta, 2002).	and the third part of the model. • The three-part model uncovers some interesting differences between the impacts on the neonatal, infant and subsequent survival amongst certain environmental and socioeconomic determinants. • The results show a negative relationship between access to municipal water and mortality. • The advantages of having a modern facility, prevails in the childhood case with a 68 per cent reduction in mortality risk. • In a quite similar setting with an application to Eritrea, Woldemicael (1998) shows that household environment (water supply and toilet facility) is large and statistically significant during the post neonatal and childhood periods while the effect totally disappears during the neonatal period. • Trussell and Hammerslough (1983) in a hazard model analysis for child mortality in Sri Lanka found that improvement in the type of toilet facility reduces mortality while the source of water supply was found insignificant. • Ridder and Tunali (1999) found that access to piped water and toilet facilities did not have much of an impact on the child mortality risk in Malaysia. • Moreover, the analysis with the extended dummies of the place of residence show

				that living in Upper Egypt implies a relative risk of dying ranging between 88 and 160 per cent higher than living in another area. • First of all, the services in that area are not well taken care of or may not exist. • Taking water supply for instance, municipal water is only available to 67 per cent of the residents of this area against 99 and 86 per cent in urban governorates and Lower Egypt residents, respectively. • Second, this region also marks the highest rate of illiteracy together with low standard of living. • Last but not least, the recently completed report 'Poverty reduction in Egypt-Diagnosis and strategy' indicates that about 17 per cent of the Egyptian population was poor in year 2000. • By region, only five per cent of the population of Cairo was poor, while poverty rates in several governorates in Upper Egypt exceeded 30 per cent GOE/World Bank (2002)). • In general, there is a disparity in rural-urban mortality that largely results from a combination of poor water and sanitation services, higher illiteracy rate and lower standards of living. • Mother education showed to be of importance to reduce child mortality. • The results also exhibit gender discrimination with preference to male offspring.

				• This finding confirms the ones of Ammar (1954), Ayrout (1963) and others that Egypt is a strongly patriarchal society in which the male children receive preferential treatment from an early age. • Though Casterlin et al. (1989) discuss this phenomenon their sample does not show evidence to confirm it. • In the light of these results increasing awareness of the Egyptian population relative to health care and hygiene is a prerequisite to decrease child mortality risk. More concern should be given to the region of Upper Egypt. • Furthermore, if water infrastructure is extended as much as possible to the whole country then child mortality would be reduced. • In addition to the direct benefits in terms of increased health and reduced mortality, there are also possible indirect effects, such as a reduced fertility and population growth. • Indeed, in line with the theory of the effect of infant and child mortality on fertility as argued by Wolpin (1997), a high child mortality may lead to a high fertility where mothers give birth to many children suspecting that the probability of losing some of them is high. • This fact is corroborated with Al-Qudsi's (1998) findings for the Arab countries that infant mortality has a positive influence on

				fertility.
10	The implications of a household sanitation subsidy scheme for future work in Antananarivo, Madagascar (Garbutt, 2010)	• The purpose of this exploratory study was to provide an assessment of the impact of the sanitation subsidy scheme on the community, evaluate future financing options and provide recommendations for improving sanitation conditions in the same communities. • This research aimed at advancing general academic knowledge of the impact of sanitation subsidy schemes but is also designed to provide context-specific information which will be useful for WSUP's future strategy.	• A number of motivations other than health benefits were found in this study. • These included the cognitive connection to an improved home and cleaner lifestyle and the increased safety of children to use the latrine. • Barriers other than cost included the lack of power to make the decision as the household's current latrine was shared or they rented their house. • Also cases of insecurity of land tenure could prevent households from making long-term investments. • General observations found that the WSUP project covers both rural, peri-urban and urban areas with a high variance of local infrastructure. • Subsidies to small-scale independent providers will have a limited effect on improved sanitation coverage as the remoteness of many of the • Fokontany gives little sustainable incentives for latrine providers to set up sales outlets in these areas. • However, people in these communities often commute long distances to work in the city, where	• The study found that open defecation is still practiced, posing a great risk to public health in WSUP's project areas. • A comparison between the socio-economic status and the amount of subsidy received showed limited targeting accuracy. • Monthly expenditures on mobile phone credit and electricity give an indication of an ability to pay for latrines in small monthly instalments. • An expectation of future assistance demonstrates the dependency on subsidies and combined with competing household priorities results in low demand for improved sanitation. • Therefore the highest priority of WSUP's future strategy should be to invest in a community-led approach with two main objectives of eradicating open defecation and raising demand for improved latrines.

			many of the service providers are currently based. • The WSUP program used existing structures such as the Fokontany Chief and staff for the implementation of the project. • However, they also set up sanitation clubs without an understanding of the varying roles of other community based organizations between the different Fokontany (For example, the social committee often has the responsibility to do health sensitizations. resulting in very few sanitation clubs remain) • The range of income generating activities and complex social arrangements means socio-economic status is difficult to measure. • Monthly expenditures on mobile phone credit and electricity give an indication of an ability to pay for latrines in small monthly instalments, but fluctuations in income levels must also be considered. • The average of the willingness to pay of households is enough to pay for a concrete san-plate and supports at the current market price after one month of saving, but	

			not enough for a full improved latrine. • However a discrepancy in the triangulation of this data, and the scope for bias means that this is likely to be an overestimate. • Furthermore, there was a high range in stated willingness to pay • Households often stated that they were not used to saving, none had any recent experience of having a loan and there was limited knowledge of the local microfinance agency. • Most interviewees prefer to pay at the Fokontany office • An expectation of future assistance, by both beneficiaries and non-beneficiaries of the program, demonstrates the significant dependency on subsidies. • This result, combined with competing household priorities and other barriers explored in this research prevent households from taking the initiative to invest and build their own latrine. • An intensive information campaign is required to explain the change of program and raise demand for improved latrines. • However, the study also found that open defecation is still practiced,	

			which causes a great risk of faecal-oral transmission of diarrhoeal disease. • The public health risks are increased further by the lack of hand-washing facilities near any of the latrines observed. • Therefore the benefits to human health, the main driver behind WSUP providing improved sanitation, are lost.	
11	Bench Marking Local Government Performance on Rural Sanitation: Learning from Himachal Pradesh, India (Kumar and Singh, 2010)	In India, TSSM developed a performance monitoring and benchmarking model to strengthen outcome-based management of the rural sanitation sector. This model has been adopted by the Government of Himachal Pradesh to monitor performance across all 12 districts in the state in relation to rural sanitation and to benchmark the same on a monthly basis. The model was designed to meet the following objectives: • Benchmarking performance should enable comparison. On the one hand, this helps to motivate poor performers to come up in a league table. On the other hand, it acts as encouragement for the better performers to maintain and improve their position. • Benchmarking should enable policy	• Performance benchmarking enables districts to understand their performance and motivates them to improve. It helps to flag areas of strength, areas that need improvement, and linkages between them. • Through performance benchmarking, inputs, outputs and processes can be linked to outcomes in monitoring rural sanitation sector performance in India. • The use of performance benchmarking weighted scoring is designed to put heavier emphasis on, and therefore encourage, achievement of outcomes. • Benchmarking should enable policy makers and nodal agencies to monitor performance on a rational basis and thereby channel	• The benchmarking model has currently been adopted in one state in India, and advocacy is underway with other states and the national government to adopt the same. • Within the three current TSSM project countries (India, Indonesia and Tanzania), Indonesia has developed a performance benchmarking system along the lines of the model conceptualized in India. • Going forward, scaling up the model requires not only advocacy with clients to institutionalize the key principles but also state of the art technological support to manipulate data and store it in a format that is easy to retrieve.

		makers and nodal agencies to monitor performance on a rational basis and thereby channel resources and efforts on the basis of identified strengths and weaknesses.	resources and efforts on the basis of identified strengths and weaknesses. • The comparison of performance provides an incentive to be on the "top of the league table." • Periodic monitoring helps to flag gaps in data accuracy and timeliness of data reporting. • Benchmarking needs to be linked to an incentive in order to drive Performance improvement.	

6.2 Impacts of Poor Sanitation on Health

The key factors influencing the human health impacts of poor sanitation are of three types: physical, socio-economic; and cultural. The physical factors include rainfall, climate, soils and geo-hydrology. There are sufficient amount of international evidence which link these physical factors to the health impacts of poor sanitation, such as open defecation and on-site sanitation. These works include both theoretical and empirical data based studies.

Physical Factors

Contamination takes place in the event of a pathway existing between a source i.e., on-site sanitation system and a receptor i.e. groundwater body. Groundwater pollution due to on-site sanitation systems has been dealt by many workers (Gerba and Bitton, 1984; Hageton, 1984; Chidavaenzi *et al*, 2000).

Concern about groundwater pollution due to on-site sanitation system relates primarily to unconfined and, to a lesser degree, to semi-confined aquifers. If groundwater supplies are drawn from deep and confined aquifers, on-site sanitation does not pose a significant hazard. Recent studies by Lawrence et al. (2001) highlight the role of hydrogeology in determining the degree of contamination of groundwater from on-site sanitation. Studies carried out in USA on groundwater pollution from septic tank effluent have been a major source of information. However, effect of the difference in the design and construction of septic tank disposal systems, and the proposed sanitation systems may be significant. The studies carried out were in Columbia in sand-clayey sand (Kligler, 1921), Alabama in fine-sand medium (Caldwell, 1938). Besides studies were conducted in sandy clay in Texas (Brown *et al*., 1979) and fractured rocks in Colorado (Allen and Morrison, 1973).

The majority of the field studies were confined, mainly to fine-grained sediments, which are of low risk, and consequently most suitable for on-site sanitation. There is a need to obtain more information on other soil types. There is a need for a classification of hydro-geological environments in relation to pollution risk. This would be of great value in the appraisal and implementation of on-site sanitation schemes. The factors affecting the pollution of groundwater from on-site sanitation, which are well documented, are as follow: depth to water table; hydraulic loading; the structure and texture of soils in the unsaturated zone; and presence of fissures in the case of hard rock formations. Their role is discussed below.

- The chances of contamination increase significantly in geological settings where the water table is very shallow (1m-15m)

- The unsaturated zone represents the first line of defence against aquifer pollution. Soil provides a very effective natural treatment system. It has ability to remove faecal micro-organism and chemical/biochemical compounds. The nature of the geological strata and thickness of the unsaturated zone determine risk of pollution. While natural flow rates in the unsaturated zone of almost all formations does not normally exceed 0.3 m/day (Lawrence *et al*., 2001), it can be more than an order of magnitude higher in case of fractured formations. Flow rates in excess of 5 meter/day may occur in fissured rocks and coarse gravel (Franceys *et al*., 1992) and the potential for groundwater contamination under these conditions is extremely high. Thus rock type, especially the grade of consolidation and presence of fractures, are key factors in assessing vulnerability of aquifer to pollution.

- The key factor in reducing micro-biological contamination of groundwater is the maximization of effluent residence time in the unsaturated zone. Many contaminants, especially the micro-organisms are rendered harmless or reduced to low concentrations by natural processes when the movement of the contaminants in the sub-surface is slow. The natural treatment processes, such as filtration, are more efficient in fine-grained unstructured soils. Structures such as root channels, animal burrows, natural voids and fissures commonly lead to short-circuiting of the unsaturated zone with consequent reduction in the residence time and natural treatment. This may lead to greater risk of groundwater pollution.

- Clogging of the filtration surface in the latrine pit enhances bacteria and virus removal processes so that the risk of pollution from microorganisms diminishes after the first 100 days or so of pit usage. But, it can reduce the infiltration of the effluent, thereby affecting the capacity to reduce the BOD, COD nitrate etc.

- More specifically, the risk of microbiological groundwater pollution will be minimal where more than 2 m of fine unsaturated soils are present beneath the latrine pit, provided the hydraulic loading in the pit does not exceed 50 mm/day.

- In the saturated zone, pollutants move with the groundwater causing a pollution plume to develop from the pollution source. Contamination removal processes take place in the saturated zone but at a lesser rate compared to unsaturated zone since groundwater moves more rapidly. Within the saturated zone, dispersion and dilution play an important role in reducing the concentration of the contaminants.

Improper design, construction, operation or maintenance of on-site sanitation systems can lead to failure due to the loss of infiltration capacity, with consequent surfacing of effluent. Such failures are quite frequently reported. In well-designed septic tanks, the solid matter does not represent a significant hazard, but the soak pit causes both microbiological and chemical contamination. There is potential threat to groundwater where hydraulic loads are high and they exceed natural attenuation potential in the sub-surface. However, an equally important and more insidious failure is that of inadequate effluent purification.

The organic matter gets filtered while passing through the soil formations. They also get adsorbed and digested through aerobic and anaerobic processes. The microorganisms such as bacteria, virus and fungi get adsorbed.

Adsorption of both viruses and bacteria is highest in soils with high clay content, and is favoured by a long residence time – that is, when flow rates of effluent are slow. Since the flow is much slower in the unsaturated zone than in the saturated zone, the contact time is longer between soil and effluent and thereby increasing the chances of adsorption. Adsorbed microorganisms can be dislodged, for example by flushes of effluent or following heavy rainfall, and may then pass into lower strata of the soil.

Both viruses and bacteria live longer in moist conditions than in dry conditions. Bacteria live longer in alkaline soils than in acidic soils. The bacteria also survive well in soils containing organic material, where there may be some regeneration.

The survival of bacteria and virus in soils also depend on the temperature. The reduction of polioviruses held for 84 days in loamy sand was less than 90% at 4°C, but 99.99% at 20°C. Also it was found that aerobic inactivation was more rapid under non-sterile versus sterile conditions, and that anaerobic conditions led to a reduction in inactivation. In nutshell, while the formation conditions influence the removal process, the survival of these microorganisms in the formations depend on the temperature, pH value, moisture content etc. But, the dominant factors for bacteria survival are temperature and moisture (Gerba *et al*., 1975).

Socio-economic Factors

The socio-economic factors include: educational status of the families, the income status, whether rich or poor; access to public health infrastructure and population density. For instance, in the Indian context, a study using the use of data from NFHS-3, employing the Concentration Index, found that a negative gradient exist between family's socio-economic status, measured in terms of family asset index, and the prevalence of chronic childhood malnutrition (for children below the age of five), (Kanjilal *et al*., 2010). In communities, which are educated, would be more cautious about the health impacts of poor sanitation facilities, and would exercise enough precaution, to prevent the negative health outcomes of poor sanitation[10]. Similarly, comparatively rich people would be able to develop immunity to the negative health impacts such as diarrhea and cholera through nutritional intake, and accessing health facilities quickly in the wake of outbreak of epidemics, whereas the poor may fall victim to diseases due to lack of ability to access medical facilities. People living in congested localities would be more prone to vector borne diseases, due to the favourable environment for vector breeding, and through faster transmission of the disease through vectors. People living in remote localities with poor access to transportation networks would be more liable to risk of mortality than those with good transportation network.

Cultural Factors

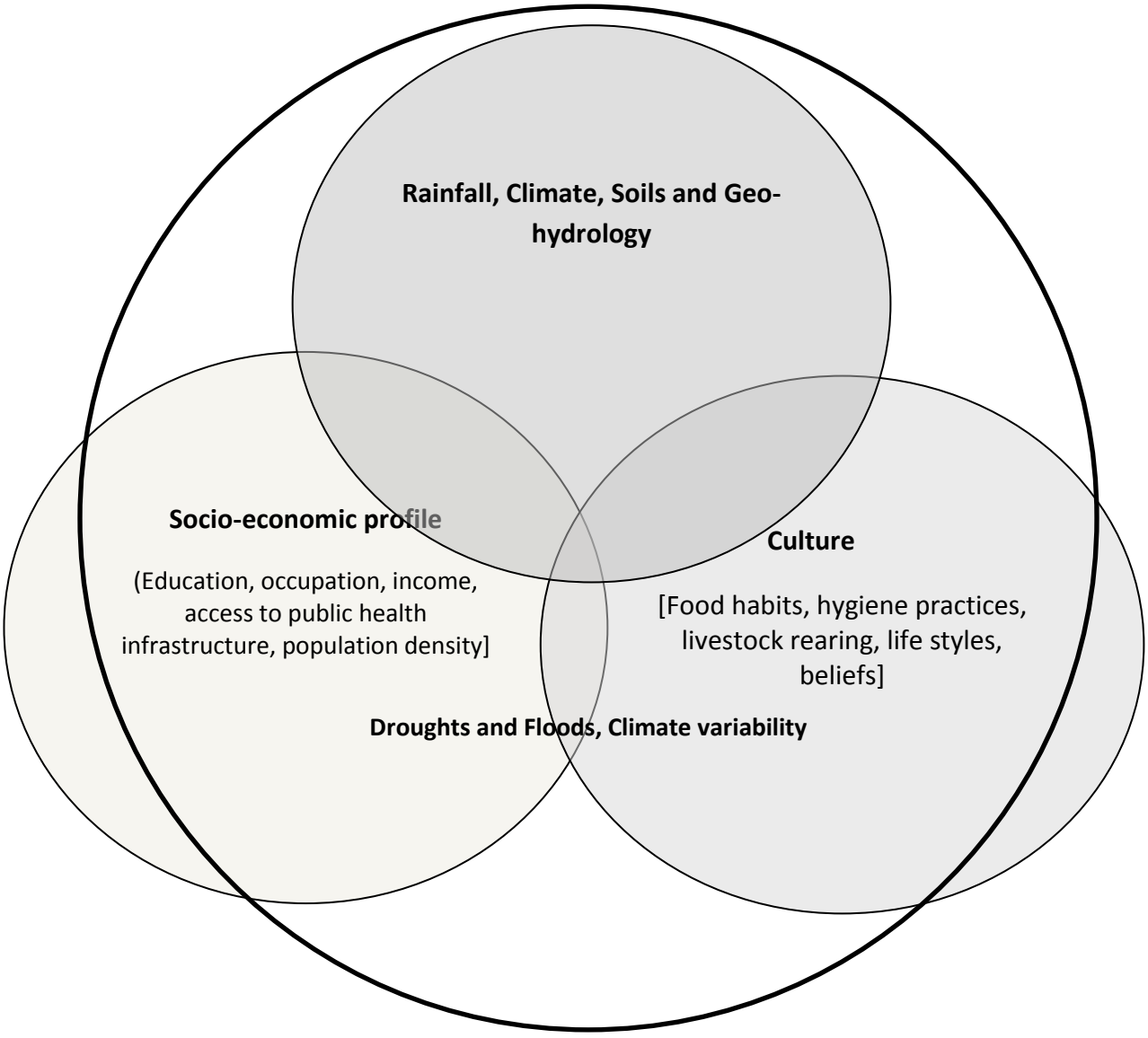
Poor sanitation can be result of cultural factors too. Cultural beliefs and practices can hinder the introduction of sanitation technologies, systems and practices (Okot-Okumu & Oosterveer, 2010). The cultural factors also include food habits, practices related to personal hygiene and sanitation, the practices of animal rearing, and overall lifestyles. It is now established fact that irrespective of the economic status, certain communities show higher degree of nutritional deficiency than certain other communities—which is not explained by their ability to access nutritional food. Community's own perception of hygiene is also important. In some communities, keeping toilets close to the dwelling is considered to be very un-auspicious and unhygienic. In some agricultural communities, keeping cattle, agricultural harvest etc. close to the dwelling is considered a sign of prosperity.

From the individual context, latent variables (such as attitudes and preferences) can be linked to choice of sanitation technologies. Now, conclusions can be drawn from cognitive variables associated with individual's socio-economic and demographic characteristics of his/her individual preferences and attitudes, and causal pathways can be established amongst these variables.

Climate Extremes

[10] One good example of this is the practice of boiling drinking water from open wells which are contaminated from septic tanks and leaching type toilets.

The droughts and floods are the over-arching factor. The ways in which droughts and floods can influence human health impacts of poor sanitation are very complex and not amenable to simple and straightforward analysis (Hales *et al*., 2003; Kovats, 1999). Flood can cause changes in water contamination by faecal matter, and increase the risk of diarrheal diseases (Hales *et al*., 2003). The contamination can occur through surface conveyance of faecal matter and also in groundwater as recharge would increase. As temperature and moisture influence bacteria survival in soils (Gerba *et al*., 1975), prolonged rainfalls can provide favourable environment for bacterial contamination of groundwater. The health risks can increase due to overall poor health, resulting from population displacement, shortage of food supply etc. (Kovats, 1999). Droughts can increase food shortage and malnutrition, drinking water shortage, and increase the health risks associated with lack of water for hygiene (Kovats, 1999).



6.3 Findings Emerging from the Review

First of all, as the large body of scientific literature reviewed here suggest, there are physical, socio-economic and cultural factors that influence the impact of poor sanitation, which are compounded by climate extremes--floods and droughts.

There could be temporary and permanent constraints to adoption of improved toilets, even when households are aware of the health benefits of using them. Therefore, while addressing behavioural issues are vital, that alone will not help solve the problem of poor adoption of improved toilets by households in all situations. Lack of finance, competing priorities and lack of space for construction of toilets are some of the permanent constraints, which prevent HHs from moving from "preference" stage to the "intend" stage of decision making. Marketing strategies aimed at those households which are at the intent and choice stage, vis-à-vis adoption decision, appears to be promising ways to increase household sanitation demand and coverage (Jenkins and Scott, 2007).

That said, the financial support under Total Sanitation Campaign, which was designed to address issues of poor access to and use of sanitary facilities, seem to be limited compared to what is needed to achieve the desired impact. The funds allocated for TSC are not sufficient to cover the life cycle costs of sanitation systems. There is absence of funds to cover capital maintenance and support costs, even as per government guidelines. The individual household's private investments for improved toilets far exceed the government allocation (Snehalatha *et al*., 2010). The budgetary allocations towards rural WASH sector are not only inadequate to meet the requirements, but also declining in relative terms and the actual requirements are higher by 4 to 10 times (Reddy and Jayakumar, 2011).

Even when toilets are built, lack of proper usage is an issue (Veerasekharappa and Bhide, 2009). But, as evident from recent survey in Gujarat, this is not amenable to aggregate analysis as the degree of use of toilets, hygiene behaviour such as hand washing before and after toilet use, and disposal of child stool are influenced by economic status of the HH, the gender (whether male or female), and age group (adults, aged, children etc.). Rich households tend to use modern toilets more than the poor households, and the same trend is visible in hygiene behaviour. The degree of use of the facility is higher among women irrespective of whether they belong to poor families or rich families (WASMO/DRDA, 2010). The differences in toilet use and hygiene behaviour across social groups are, however, not analyzed in these studies.

Mis-use of sanitation systems is another issue. The extent of misuse is also an inverse function of the socio-economic condition of the households, as indicated by the survey in Karnataka, with the socio-economically backward districts showing very high degree of mis-use of improved toilets built with government subsidy (Veerasekharappa and Bhide, 2009). But, such details are not available in the official statistics of improved toilet adoption in rural areas by the state government of AP.

Slippage is one of the main bottlenecks of achieving full coverage of water and sanitation services in India. The extent of slippage is quite substantial even at the aggregate level. Adult literacy is an important factor that reduces the slippage in Sanitation, and was found to be more important than the provision of water supply infrastructure, and resources (Reddy *et al*., 2010).

The study on demand for sanitation at Salvador, Brazil, showed health protection, accessibility, privacy, and house modernization to be the motivating factors for households to opt for flush toilet and sewerage connection, rather than the high cost and consequent household socio-economic status associated with them (Santos *et al*., 2011). On the other hand, the study in Madagascar found a number of motivational factors other than health benefits. These included the

cognitive connection to an improved home and cleaner lifestyle and the increased safety of children to use the latrine (Garbutt, 2010). Whereas studies in India seem to suggest social and economic factors such as income and adult literacy are the driving the demand for improved sanitation systems--the contextual determinants (source: based on Reddy *et al*., 2011; Veerasekharappa and Bhide, 2009; WASMO/DRDA, 2010). The study in Egypt established the impact of literacy of female head of the household on reducing child mortality (Hala, 2003), whereas several studies highlight the role of improved sanitation on reducing child mortality, which even outweigh improved water supply (Trussel and Hammerslough, 1983).

Benchmarking of rural sanitation works enables district officials to understand their level of performance and motivates them to improve. It helps to flag areas of strength, areas that need improvement, and linkages between them. Through performance benchmarking, inputs, outputs and processes can be linked to outcomes in monitoring rural sanitation sector performance in India (Ajit Kumar and Singh, 2010).

Design and construction of improved toilets should consider the local ecological factors, as suggested by a study on the impact of pit type latrines in Nigeria which showed that the shallow groundwater was highly contaminated by the leaching biochemical matter from pit type latrines, which were located in the close vicinity of open wells, used as drinking water source (Joseph and David, 2011).

7. Research Design, Sampling and Survey Locations

Based on the review of the studies on various aspects of sanitation including outcomes of various surveys on improved toilet facilities in rural AP, the following inferences can be drawn for design of the proposed research study.

Given the wide anomaly in the data on sanitation situation in rural AP available from different sources, validation of the data is necessary. Since the TSC data is detailed and available for each and every village in the state, this is amenable to validation. This validation should be done for each district, given the wide variation in the potential anomaly in the data across districts. Assessment of adoption of improved toilets cannot be based on simple figures of how many households had built toilets and how many are functional. Instead, it should involve many other dimensions such as how many of the toilets are used; difference in usage across income segments (APL/BPL) and also across castes (Brahmins, SC/ST, OBC); the number of family members using the toilet within the HH; the gender differences in the usage; the differences in the usage across age groups; reasons for non-usage; and, the slippage over time. Validation survey should cover all these aspects for individual households. This could provide leads on reasons for discrepancy in the data on toilet facilities amongst different sources.

Social and economic status of household, such as the adult literacy, particularly female literacy and overall economic conditions are found to positively influence adoption decisions vis-à-vis improved toilets, subsequent use of these toilets and hygiene behaviour. Therefore, it is necessary that a survey to assess the actual extent of adoption of improved toilets should have adequate representation of HHs belonging to different income segments (APL/BPL) and castes and communities (farming community, working class, etc.) with different occupational and educational status. Capturing these social and economic variables in the survey of adopters and non-adopters is also necessary to statistically analyze their influence on the extent of adoption. This would help in policy formulation.

Now, presence of adolescent girls in the family would increase the concerns of child safety among adults particularly in families with literate adults, and therefore could raise the motivation for adoption of improved toilets near the dwelling premises. Thus, presence of female child can act as a contextual determinant for adoption of improved toilets. Hence, this attribute also need to be captured for explaining adoption trends.

Over and above this, physical factors such as rainfall, climate, soils and geo-hydrology influence the health impacts of poor sanitation and therefore, the health benefits of improved sanitation would be different across agro climatic regions. Hence, it is also necessary that the HH chosen for the survey have adequate representation from different agro climates. The influence of cultural differences on adoption decision, and hygiene behaviour would automatically get captured, once all the nine agro climatic regions are covered.

Since studies in different locations have shown different motivating factors for adoption, it is important to consider the entire range of factors for investigation, in order to correctly identify the actual motivation in a particular household context. This is because, the aspects of improved toilets which the HHs think are beneficial (i.e., whether accessibility, security or lifestyle or health benefits) depend on their socio-economic profile (number of female members, especially children, the occupational profile of the heads of the households, overall income status etc.) and they could change significantly across HHs[11].

Hypothesis

1. In families with literate adults, especially adult women, not only the adoption of improved toilets would be high, but also their maintenance and usage would be high.

2. In humid and high rainfall areas with shallow groundwater conditions, the communities will show greater tendency to adopt improved sanitation systems

3. The factors such as greater privacy, greater safety of children, health benefits and cleaner lifestyle are key motivating factors for adoption of improved toilets by HHs.

4. The hygiene behaviour is influenced by the age, over and above literacy of the adults, especially female members.

5. Among permanent constraints to adoption of improved toilets, lack of financial resources and competing priorities are the most important ones.

Assumptions

1. In houses, with literate adults, especially adult females, the concerns of child health protection and children's security will be more.

[11] For instance, in a household with aged members, accessibility of the sanitation facility would be a very important consideration. For a well to do family, social status and the cognitive connection to an improved source and improved lifestyle could be important considerations.

2. In humid and high rainfall areas with shallow groundwater conditions, the health impacts of poor sanitation would be severe, and therefore the health benefits of adopting improved toilets would be high.

7.2 Sampling Procedure

Multi-stage random sampling was used for selection of sample households. First of all, a total of 10 districts from the entire state were chosen for the survey (refer to chart 1a). These districts represented all the nine agro-climatic zones in the state. They also covered all the geo-hydrological regions such as hard rock basalt, crystalline rock formations, and coastal alluvium. From each district, a total of 10 villages were chosen for the survey. The villages were selected in such a way that they represent a good geographical spread within the district. From each village, a total of 27 adopters and 9 non-adopters were chosen from the list of households available with the TSC randomly. But, while selecting, effort was made to see that APL and BPL categories, different income segments within each category and different castes are covered adequately. The total sample size for the entire state was 2700 for adopters and 900 for non-adopters. A physiographical map of Andhra Pradesh in which the talukas selected for the sample survey are shown is given in Map 1. As is evident from the map, the geographical distribution of survey location is good enough to cover different physiographic units of the State, such as coastal areas, hills, plateau and plains.

Further, a total of 72 schools were selected for school sanitation survey from the 10 districts covering a total of 212 toilets, and a total of16 Anganwadis from six districts were also selected (Chart 1b).

Map 1: Physiography of Andhra Pradesh with Locations of Sample Survey Talukas

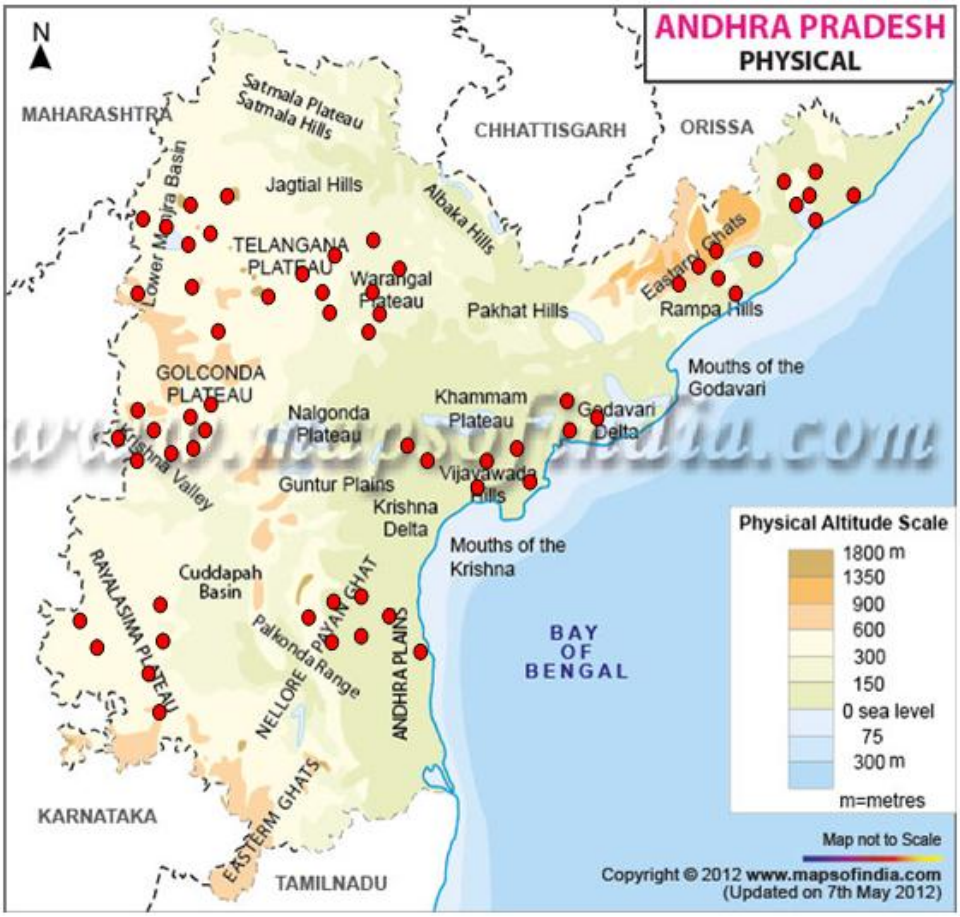
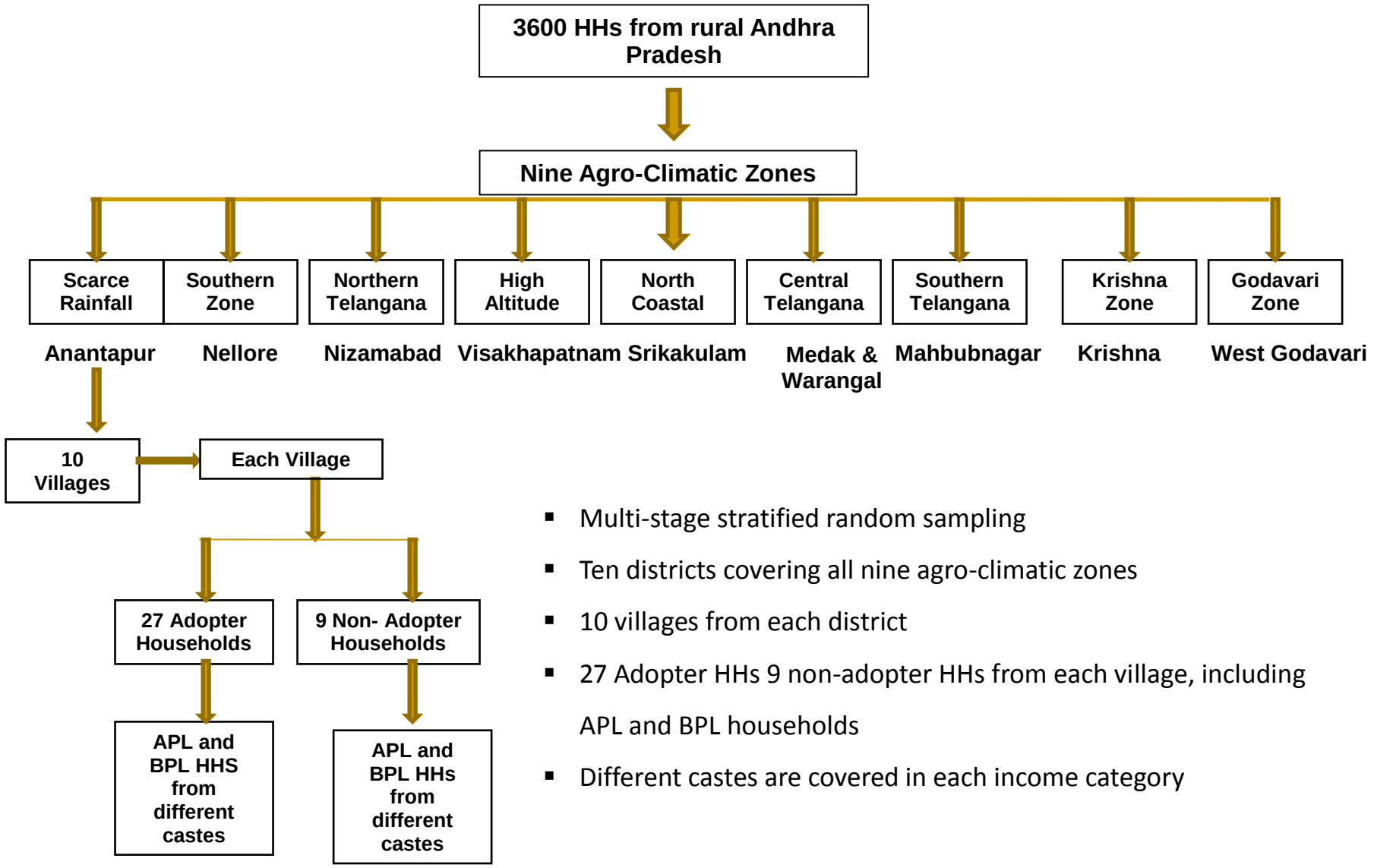
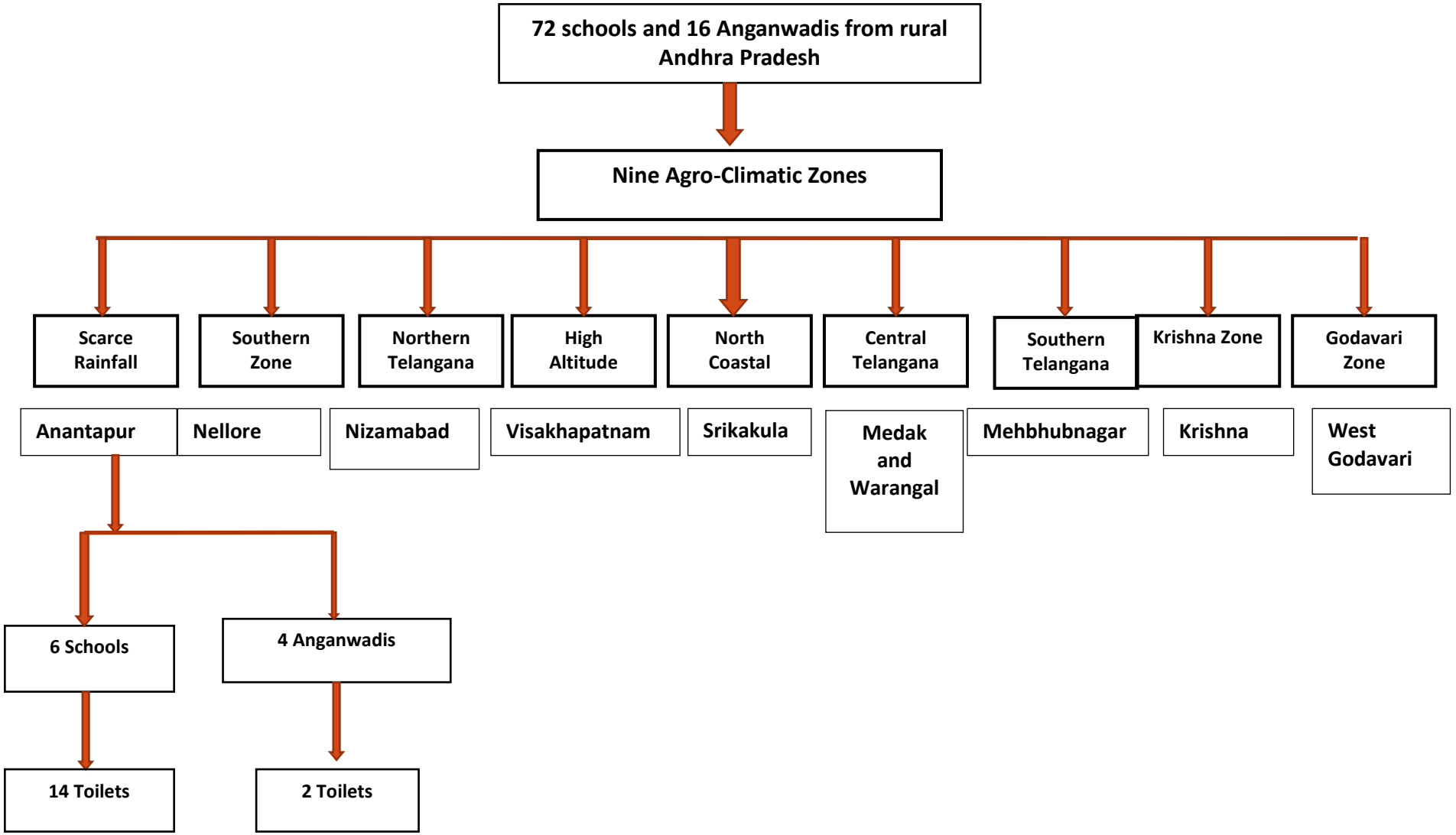


Chart 1a: Multi-stage stratified random sampling for rural HH survey



- Multi-stage stratified random sampling
- Ten districts covering all nine agro-climatic zones
- 10 villages from each district
- 27 Adopter HHs 9 non-adopter HHs from each village, including APL and BPL households
- Different castes are covered in each income category

Chart 1b: School Sanitation Survey: Sampling Procedure



8. Results and Discussions

8.1 Institutional and Policy Framework for Promotion of Rural Sanitation in AP

The frame **w**ork set by Government of India formed the basis for drinking water and sanitation in the State of Andhra Pradesh. Mostly, the State governments covered drinking water programs under various schemes such as Accelerated water supply scheme, Swajaldhara and sector reforms in drinking water. Piped water and decentralization of WASH services are cornerstones of the rural water supply and sanitation policy.

A separate department of the government of AP, namely, the Department of Rural Water Supply and Sanitation (RWSS) and the Water and Sanitation Mission jointly manage water supply and sanitation sector in the State. The governance and management structures for water supply and sanitation consists of four levels namely State, District, Mandal and Village.

A Principal Secretary along with the Secretary (who is also the Mission Director for Water Supply and Sanitation), in addition to providing policy support, heads the engineering and technical staff of the department, which provides the techno-managerial services relating to water and sanitation. The Principal Secretary provides administrative sanction of works above Rs. 10 lac.

This has subordinate units at three different levels, i.e., at the State level (Head office), at the District level (which includes Circles and Divisions) and at the Mandal Level (Sub-division). The State level unit has an Engineer-in-Chief, who is the head of the techno-managerial staff, assisted by 3 CEs, of which one is for CCDU. The office of the Engineer-in-Chief of RWSS is responsible for overall control of RWS works, and technical sanction of all works, and administrative approval of works up to Rs. 10 lac. The Chief Engineers are responsible for technical sanction of works above Rs. 50 lac, monthly review of works, and achievement of physical targets.

The Circle office at the district level prepares the annual budget and annual administrative reports and provides technical sanction of works up to Rs. 50 lac. The Division office with an Executive Engineer works as technical advisor to the ZP; technically sanctions of works up to Rs. 10 lac and undertake monitoring of works. The Sub-divisional office at the Mandal level, with DEE, AEE and AE, undertakes monthly review of works, and provide technical sanction of works up to Rs. 2 lac.

The Principal Secretary and the Secretary, also provides the overall governance of the sector from the top, with its next highest level, i.e., State Water and Sanitation Mission (Level 1) playing such roles as policy guidelines, budgetary allocation, approval of schemes, programme review, monitoring and evaluation of physical and financial progress, and integration and cooperation of the capacity building programmes. The governance wing has four more levels in the vertical hierarchy namely; District Water Supply Mission (Level 2), District Water Supply and Sanitation Committee (Level 3), Mandal Water Supply and Sanitation Mission (Level 4), and village Water Supply and Sanitation Committee (Level 5).

Whereas at district level the Mission is headed by Chairman of the respective ZP, with such responsibilities as review and implementation of the schemes at District level, receipt and management of programme funds, preparing District annual plans, and District-level IEC. The planning and coordination of schemes, review and approval of schemes for the GPs, interaction with SWSM ad community mobilization are the responsibility of the District Water Supply Committee (DWSC).

The next level in the hierarchy, the Mandal Water and Sanitation Committee, headed by the Mandal Parishad President, is responsible for planning and coordination of schemes at the Mandal

level, maintenance of scheme funds, and maintaining the supply of spares for scheme-related programmes.

The Village Water and Sanitation Committee, headed by the Sarpanch, is responsible for the review of progress in implementation of schemes at the village level, proposing schemes to the DWSC and undertaking IEC campaigns.

8.2 Extent of Actual Adoption of Toilets in Rural Andhra Pradesh

8.2.1 Presentation of District-wise Outputs on Adoption and Actual Usage

Results of the survey carried out to validate the data generated by TSC on adoption of improved household latrines in rural areas in 10 districts of Andhra Pradesh are presented in Table 3. The survey used a total sample size of 2700 rural households from 10 districts of AP, with 270 HHs from each district. The districts were chosen in such a way that all the nine agro climatic regions were represented. From Central Telangana region, two districts were chosen while from the remaining regions, only district each was selected for the survey. A total of 10 villages, geographically well spread, were selected from each district, with a total of 27 HHs from each village. The households were picked up randomly from the (TSC) list of adopters belonging to different income segments (APL and BPL) and caste groups from the Mandal Panchayat. Hence, the sampling procedure was multi-stage random sampling.

The total number of toilets in the district is estimated using the following formula:

Total no. of HHs reported to have IHHLs as per TSC list in the district X Fraction of the total surveyed HHs from TSC list actually having toilets.

The estimated number of toilets in the district tally with the TSC figures in three out of the ten districts, viz., Medak, Srikakulam and Krishna, as all the surveyed households were found to be having toilets. But, at least for four districts, there are some notable variances in the data on individual household latrines between the sample survey estimates and TSC. In Nizamabad, the estimated number of toilets is merely close to half the figure provided by TSC database. Whereas the estimated number of toilets is only 67.7 per cent and 74.1 per cent of the TSC figures in the case of Mahbubnagar and Warangal, respectively. From the estimates of IHHLs in each district worked out using the sample, the extent of improved toilet coverage in rural areas of each district was worked out using the census 2011 data on number of rural households.

As per the estimates, the extent of coverage of latrines varies from a lowest of 29.4 per cent in Nellore, a coastal district in Southern Zone to a highest of 82.8 per cent in Warangal. In four out of the 10 districts, the extent of coverage is less than 40 per cent, and only in two districts, viz., Warangal and Medak the figure exceeds 60 per cent. Overall, for the 10 district, the extent of adoption of IHHL is 38 per cent, against 57.5% as per TSC data. But, as per the Census 2011, the extent of IHHL adoption in rural Andhra is only 30.8 per cent.

Table 3: Estimated Extent of Adoption of Toilets Vs TSC Data on IHHL in Rural Households

District	Agro-Climatic Zone	Percentage HHs from the TSC list	Total No of Toilets Reported	Estimated Total No of Toilets	Extent of Adoption of Toilet as	Extent of coverage of Rural	Extent of Coverage as Per

		actually having toilets as per primary survey	in the District as per TSC	actually constructed in the District	per TSC data	HHs with IHHLs as per primary survey	Census 2011 (Rural)
Medak	Central Telangana	100	281276	281276	61.0	61.0	31.8
Nellore	Southern Zone	95.2	162410	154614	30.9	29.4	25.5
Nizamabad	Northern Telangana	52.8	290278	153266	73.9	39.0	29.4
Warangal	Central Telangana	74.1	705182	522539	111.7	82.8	29.7
Visakhapatnam	High Altitude Zone	98.9	252919	250136	45.0	44.5	21.4
Srikakulam	North Coastal Zone	100	194553	194553	34.4	34.4	12.8
Anantapur	Scarce Rainfall Zone	84.4	366557	309374	62.4	52.7	22.0
Mehbhubnagar	Southern Telangana	67.7	487787	330231	71.0	48.0	17.9
Krishna	Krishna Zone	100	316437	316437	47.4	47.4	56.2
West Godavari	West Godavari	98.9	302689	299359	38.7	38.3	58.9
Overall					57.3	48.0	30.6

Source: based on primary survey data and TSC data and Census 2011 figures of no. of rural HHs

8.2.2 Condition of the Infrastructure

The condition of the infrastructure built for sanitation is as important as the having a latrine, as it is also indicative of whether the family is inclined to use the new facility and improve sanitation. This question is particularly important for BPL families as they could avail of the government scheme which provide subsidy for construction of toilet. In many situations, the households do not build the complete superstructure, and try to save some cash from the funds being released by the government under the TSC scheme. In many cases, the roof is not constructed and some case, even the walls are not constructed. This would affect not only the life of the toilet, but also the ability of the members of the household to use the facility. In certain other cases, the infrastructure is kept for purposes other than sanitation. Such uses include use of the facility as bathroom, storage space for firewood and fodder. Such incidences were rampant in Krishna and Nizamabad. This makes them unfit as toilets. Our analysis shows that in significant number of cases, the latrines do not have superstructure (Table 4). The proportion of latrines having no superstructure is as high as 59% in the case of Medak, followed by Warangal (38%).

Table 4: Physical Condition of the Infrastructure (Household Latrine)

Name of the District	Percentage HHs having constructed toilets as per Primary Survey	
	With Super Structure	Without Super Structure

Medak	40.7	59.3
Nellore	94.6	5.4
Nizamabad	80.3	19.7
Warangal	62.2	37.8
Visakhapatnam	87.1	12.9
Srikakulam	85.8	14.2
Anantapur	98.2	1.8
Mahbubnagar	81.9	18.1
Krishna	96.0	4.0
West Godavari	97.0	3.0
Overall	80.40	19.60

Source: based on primary survey of individual adopter households in sample villages

As Table 4 shows, the proportion of toilets with superstructure ranges from a highest of 98.2 per cent in the case of Anantapur, 97% in West Godavari, 96% in the case of Krishna and 94.6% in the case of Nellore, the districts which had low rates of adoption of toilets as on today, to a lowest of 40.7 per cent for Medak, which had a relatively high rate of adoption of improved toilets (61%). In the case of Warangal, which currently had an adoption rate of 82.8 per cent, the proportion of toilets having no superstructure is 62 %. These two districts had very low rate of adoption of toilets as per 2001 Census, of 15.8 % and 15 %, respectively for Medak and Warangal. Against, the districts of Krishna and West Godavari had relatively high level of adoption of toilets as early as 2001. This trend seems to suggest that the districts which are reported to have made big progress in adoption of IHHLs in the past 10-12 years, this physical progress came at the cost of quality.

Further analysis was done to see how many of the toilets had water and electricity connection. The results are presented in Table 5. Here again, Medak had one of the lowest proportion of toilets with water connection, next only to Nizamabad with had only 4.2 per cent of the toilets with water connection. The proportion was very low for Warangal and Mahbubnagar. In West Godavari, Krishna and Nellore, a large proportion of the toilets had water connection.

As regards electricity connection, nearly 40 per cent of the toilets in Medak had. Nizamabad had the lowest proportion of toilets with electricity connection (0.70 per cent) amongst all the 10 districts surveyed. The second lowest was in Warangal, and the third lowest in Mehbhubnagar. Overall, nearly 54% of the toilets had water connection and 56% had electricity connection.

Table 5: Proportion of the Sample Toilets Having Water and Electricity Connections

District	Latrines with direct connection of	
	Water (%)	Electricity (%)
Medak	6.7	40.0
Nellore	85.6	84.0
Nizamabad	4.2	0.7
Warangal	13.9	15.4
Visakhapatnam	72.5	96.2
Srikakulam	53.6	59.8
Anantapur	47.4	46.1
Mahbubnagar	18.6	36.6
Krishna	92.6	80.0

West Godavari	98.9	58.4
Overall	53.8	55.9

Source: authors' own analysis using data from primary survey

8.2.3 Variation in the Level of Use across Age groups

Having a toilet in the household premise does not guarantee that the household uses it as there are reasons other than health benefits which sometimes motivates the family to go for an improved toilet. Also, within the same household, some members may not use the toilet. The use of improved latrines is a behaviour issue. Within the same family the attitude towards toilets can vary between members. The extent of use of toilets by the members of the household, in terms of the number of people who use it, is therefore important. Table 6 presents the outputs for the entire household considering the persons belonging to different age groups. However, the children below the age of five are excluded from this estimate. The extent of use of toilets is highest in west Godavari, Anantapur, Warangal and Medak. The use of toilets is lowest in Krishna district (16.8%), followed by Nizamabad (26.8%). In Srikakulam, the extent of use of toilets is at the medium level. What is interesting to see is that even in districts where the infrastructure used for toilet is not in good shape (without any proper superstructure) like in Medak and Warangal, the extent of use of toilets is high. Overall, 75% of the people in the surveyed households were reported to be using the toilets.

Table 6: Extent of Use of Latrines amongst Households Having IHHL

District	Total no. of people access to improved latrines as per primary survey	Total no. of people using improved latrines as per primary survey	Percentage people using improved latrines
Medak	1365	1277	93.6
Nellore	968	841	86.9
Nizamabad	683	183	26.8
Warangal	778	759	97.6
Visakhapatnam	823	611	74.2
Srikakulam	997	669	67.1
Anantapur	968	955	98.7
Mahbubnagar	770	661	85.8
Krishna	1141	192	16.8
West Godavari	928	917	98.8
Overall			75.0

Source: authors' own analysis using data from primary survey

How various potential benefits of improved toilets would be affected to a great extent will also be determined by the age of the person. For instance, accessibility is a big issue for aged people (above 65), as not as much an issue for the children and middle aged adults. Time saving might be an issue for school going children and working adults. Therefore a segregated analysis of the extent of use of toilet by different age groups was carried out for each district. The results are presented in Table 7. The results show that there is some variation across age groups in each district. But, no

consistent trend seems to emerge across districts. The overall figures for different age groups in the State however show that people in the age group of 15-65, and above 65, the extent of use (78% and 79%, respectively) is much higher than that of 6-14 (61%).

Table 7: The Extent of Use of Improved Household Latrines in Various Age Groups

Name of District	Percentage of HH members using the latrine			Overall for the District
	6 – 14 years	15 – 65 years	Above 65 years	
Medak	87.2	95.0	96.3	94
Nellore	88.4	87.2	0.0	87
Nizamabad	23.3	26.9	63.6	**27**
Warangal	97.4	98.2	87.8	98
Visakhapatnam	83.8	72.4	86.2	74d
Srikakulam	71.8	68.1	12.5	67
Anantapur	98.7	98.7	97.0	99
Mahbubnagar	46.9	91.5	83.0	86
Krishna	7.6	22.3	100.0	17
West Godavari	97.3	99.1	100.0	99
Overall	**61.0**	**78.0**	**79.0**	**75.0**

Source: authors' own analysis using data from primary survey

Variation in Level of Use across Gender and Income Groups

Generally, it is believed that women members of the households would show greater keenness to shift from the practice of open defecation and adopt improved toilets as compared to their male counterparts if given an opportunity, due to reasons such as privacy. Hence, naturally, one would expect a difference in the pattern of use across gender. Our analysis does show consistent variation in the extent of use of toilet between male and female members of the households across districts, wherein the use of toilets is greater among women. The only exception was in Warangal, where male members of the households use toilets more than female members, though the difference is marginal (Table 8). Overall, more than 76 per cent of the female members of the adopter households use toilets, whereas a little less than 74% of the male members use the toilets.

Table 8: Variation in the Use of Toilet across Gender

Name of District	Extent of Use of Improved Latrines by	
	Male	Female
Medak	91.6	95.6
Nellore	86.7	87.0
Nizamabad	25.6	28.1
Warangal	98.3	96.8
Visakhapatnam	72.0	76.6
Srikakulam	65.3	68.9
Anantapur	97.8	99.6

Mehbhubnagar	78.8	93.5
Krishna	15.4	18.4
West Godavari	99.0	98.6
Overall	73.70	76.40

Source: authors' own analysis using data from primary survey

Segregated analysis of data on the use of toilets by different income groups was carried out to find out whether there is any marked different in sanitation practice with change in economic conditions of the adopter family. Analysis included persons in all age groups. The outputs do not show any consistent trend in the extent of use of toilets across districts between APL and BPL families. While in some districts, the extent of use of toilets by members of APL households is slightly higher as compared to BPL households, in certain other districts, the extent of use by members of BPL households is slightly higher. But, overall, there is marginal difference with APL families showing higher degree of use of toilets. In the case of APL households the extent of use by family members is 72.6 per cent, whereas it is 71.8 per cent for BPL households.

Variation in Level of Use across Caste Groups

Caste-wise segregation in the extent of use of toilets in different districts is presented in Table 9. It shows that across districts, the members of upper caste use the toilets more than their counterparts in any other category, with nearly 88.3% of the members using it. This is followed by Scheduled Tribes (ST) with 86.6% of the family members using toilets. The lowest level of use was found among the Schedules Castes (61.7%). A very high level of use of improved latrines by members of scheduled tribe as compared to scheduled caste members can be explained only after further field investigations.

Table 9: Variation in Level of toilet Use across Caste Groups

	Level of use of individual latrines by various caste group			
	General	SC	ST	OBC and others
Medak	98.8	86.3	85.2	95.6
Nellore	91.0	69.9	100.0	91.5
Nizamabad		36.4		25.0
Warangal	95.4	94.7	100.0	98.6
Visakhapatnam	94.8	79.7	44.4	70.2
Srikakulam	85.4	47.9	23.1	68.4
Anantapur	99.0	98.4	100.0	98.5
Mahbubnagar	94.5	84.8		83.3
Krishna	18.3	25.8	100.0	5.3
West Godavari	100.0	100.0	100.0	98.6
Overall	88.3	61.7	86.6	75.3

Note: General category includes all upper castes; OBC and others include some of the families which haven't reported to be belonging to any caste category, in addition to other backward castes

Use of Latrines by Children

Data on use of toilets by children below the age of five were separately analyzed to see in how many cases, the children actually use the toilet or the stool is dumped in the toilet and in how many cases, open defecation is practiced. Overall, it appears that open defecation is rampant among children below the age of five. The extent of use of toilet (including dumping of stool in the toilet by the adults who take care of the children in that age category) varies from a lowest of 1.5% in Mehbhubnagar to the highest of 100% in Krishna. In Krishna, Vishakhapatnam and Nellore, the use of toilets by children is comparatively high. Open defecation by children below the age of five is rampant among adopter households in Mehbhubnagar (98%), Medak (97%) and Nellore and Warangal (50% each). Overall, a little less than half (47%) of the children below the age of five belonging to the adopter families were reported to be practicing open defecation.

Table 10: The Extent of Use of Toilets by Children (below the age of five) including Stool Dumping

Name of the District	Total no. of children (0-5 years) access toilets as per primary survey	Percentage children using toilets / stool dumping inside the toilet	Percentage of Children doing open defecation
Medak	121	3.3	96.7
Nellore	54	50.0	50.0
Nizamabad	62	66.1	33.9
Warangal	36	50.0	50.0
Visakhapatnam	40	67.5	32.5
Srikakulam	70	94.3	5.7
Anantapur	75	100.0	0.0
Mehbhubnagar	66	1.5	98.5
Krishna	13	100.0	0.0
West Godavari	35	91.4	8.6
	Overall	53.1	46.9

Source: authors' own analysis using primary data

Variation in the Practice of 'Hand-washing after Toilet Use' across Age Groups

From the point of view of personal hygiene, hand-washing after defecation is more important than the method of sanitation practiced (i.e., whether open defecation or use of dry latrines or use of improved toilets), even if the individuals concerned uses modern toilets. Hand-washing become effective in disinfection if done with soap and sufficient water. Now, since adoption of toilet calls for behavioural changes, it is important to know whether the same has affected the members of the family in terms of changes in hygiene practices, i.e., whether the family members are fully aware of the health impacts of poor hygiene practices, so as to derive the full benefits of adopting improved toilets.

This is particularly because these improved toilets in rural areas still involve the use of hand, and this can result in the contamination of water, food and vessels carrying food with faecal matter and bacteria, when come in contact with hand. Therefore, it is important to know the extent of use of sanitation related hygiene practices prevalent among those who use toilets. The outputs on the extent of use of hand-washing practices amongst three different age groups are provided in Table 11. It does not show any consistent trend in terms of difference in hand washing practice between age groups, across districts, though in the age group of 15-65, the practice is followed by a slightly

larger percentage of the population in all the districts. But, overall, the practiced of 'hand-washing with soap and water', is highest in the age group of 15-65 (42). It is lowest in the age group of 6-14 (31%).

Overall, there is sharp difference in the occurrence of this practice across districts. It is lowest in Krishna and West Godavari (0.4% and 0.50% respectively) followed by Nizamabad (3.3%). In Nizamabad, only 1/4th of family members of the adopter households do hand washing with soap after using the latrines. One explanation for the low prevalence of hand-washing practice in the coastal districts of Krishna and Nellore, which are generally considered to be more progressive than the districts in Telangana and Rayalaseema, could be that very few people in these districts actually use their toilets (16.8% and 26.8%, respectively for Krishna and Nellore). Instead, people often use flowing streams and wetlands for defecation. Nevertheless, in the case of West Godavari district, a good explanation for non-prevalence of hand washing after toilet use could not be found.

Table 11: Difference in Hand washing Practice across Age Groups

Name of District	% of HH members washing hands with soap and water after toilet use			Overall
	6-14 years	15-65 years	Above 65 years	
Medak	91.8	91.9	86.8	91.7
Nellore	15.2	25.9	0.0	24.6
Nizamabad	0.0	4.2	0.0	3.3
Warangal	50.0	70.3	31.7	65.3
Visakhapatnam	5.1	17.1	0.0	15.1
Srikakulam	6.2	15.1	12.5	13.2
Anantapur	96.1	100.0	93.9	99.2
Mehbhubnagar	62.5	63.3	33.3	63.0
Krishna	0.22	0.58	0.0	0.4
West Godavari	1.35	0.39	0.0	0.5
Overall	31.0	42.0	42.0	40.0

Source: authors' own analysis using data collected from primary survey

Variation in the Practice of Hand-washing Before Eating Food

Hand-washing before the intake of food can provide a good safeguard against direct entry of faecal matter or pathogens present in the faecal matter, if present in the hand, into food stuff and then later on into the intestine. Hand-washing done with soap is the most effective way to destroy the pathogens, if present in the hand used for eating food. Nevertheless, the people in rural areas use a variety of methods including use of sand, ash or hand washing using water.

It is interesting to find that those districts where the practice of hand-washing after toilet use was found to be extremely low, the practice of 'hand-washing before eating food' was found to be quite high. Around 91% and 92% of the members of the households (except those in the age group of 0-5) covered in the survey were found to be doing hand washing before food in Krishna and West Godavari district, respectively. But, in another coastal district of Nellore, where the prevalence of hand-washing (with soap and water) after toilet use was as low as 25%, the practice of hand-washing before food is not very much prevalent. Only 16% of the members of the households practice hand-washing before taking food. But, in the case of Nizamabad and Vishakhapatnam, the

prevalence of hand-washing before food is also low (53% and 52%, respectively) like in case of hand washing after the use of toilets (3% and 15%, respectively).

Table 12: Prevalence of Hand-washing Practice in Different Age Groups

District	Percentage of HH members washing (with water alone) hands before eating food			Overall in the district
	6- 14 Years	15 – 65 Years	Above 65 Years	
Medak	92.6	99.2	92.5	98
Nellore	20.5	15.5	0.0	16
Nizamabad	51.2	54.5	27.3	53
Warangal	94.74	98.56	73.17	97
Visakhapatnam	53.54	51.37	58.62	52
Srikakulam	65.55	67.72	12.50	65
Anantapur	96.1	99.9	93.9	99
Mahbubnagar	88.5	94.01	100.0	93
Krishna	95.3	90.4	100.0	92
West Godavari	88.5	91.6	78.6	91
Overall	80.0	77.0	69.0	77.0

Source: authors' own analysis using data from primary survey

Linkage between Sanitation Related Hygiene and Access to Water Supply

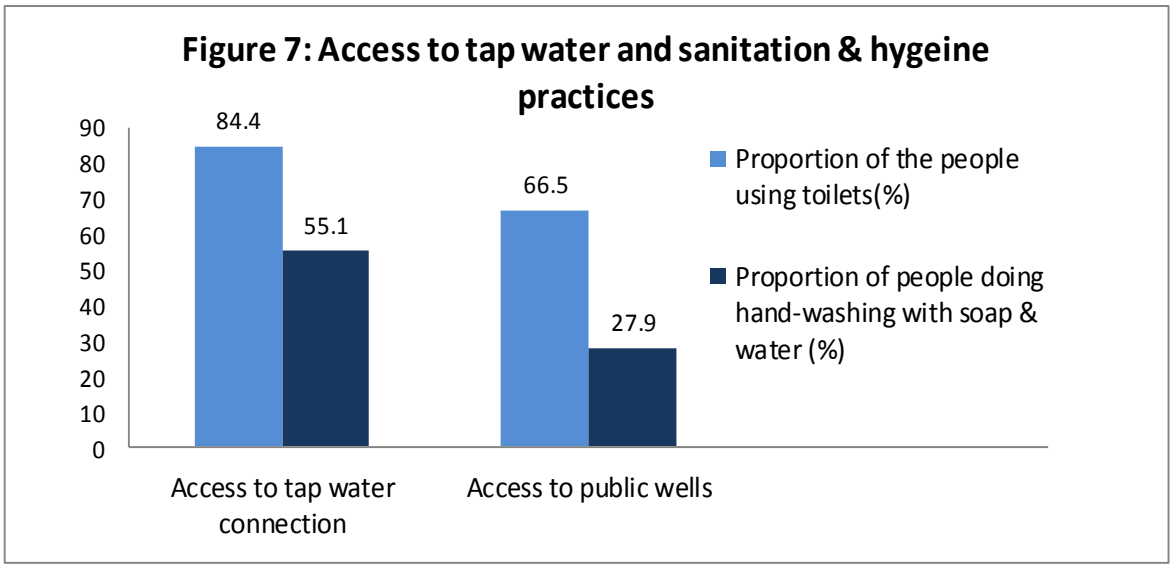
It has long been argued that one factor which restrains the rural households from using modern toilets is the need for collecting large quantities of water for flushing, and that one way to overcome this constraint is to provide household tap water connection so that storing large quantities of water becomes easy. Similar argument is being made in the context of hand-washing practices observed, particularly hand washing with soap. Many adopter households surveyed had piped water connection. On the other hand, there are many adopters which public water sources, such as wells. This makes it possible to examine the link between access to tap water connection and the extent of use of toilets and hand washing practices by members of the household.

As Table 13 shows, the proportion of people using toilets is higher among those who have access to tap water connection (84.4%) as compared to those who have access to only public wells (66.6%). The difference is statistically very significant. This means those who have access to tap water show greater tendency to use improved toilets, as compared to those who have to depend on distant sources of water supply. Similar trend was seen in the case of sanitation related hygiene practices. The prevalence of 'hand-washing' was much higher (83.9%) among these having tap water connection as compared to those who depend on public water sources (53.6%). Among those who have tap water connection, more than 55% do 'hand washing with soap and water', as compared to around 28% in the case of people who have poor access to water supply. A little more than 24% of those having tap water connection also use hand washing with water, against nearly 20% for their public well counterparts. These results indicate a significant influence of access to water on sanitation and hygiene practices. The graphical representation of the results is shown in Figure 7.

Table 13: Sanitation related Hygiene Practices Vs Access to Water Supply

Type of access to water supply	No. of family members having access	Proportion of the people using toilets	Proportion of people doing hand-washing with water	Proportion of people doing hand-washing with soap & water	Proportion of people doing 'hand-washing' after defecation
Access to tap water connection	3871	84.40	24.20	55.10	83.90
Access to public wells	6003	66.50	20.20	27.90	53.60
Overall	9874	73.50	21.80	38.50	65.40

Note: hand-washing includes the following: hand washing with ash; hand washing with only water; and hand washing with soap & water.



Overall Sanitation Performance in Rural Areas

Sanitation performance in rural areas cannot be assessed on the basis of simplistic considerations of whether the households have built toilets or not. The condition of toilets is important to ascertain their sustainability. Equally important is the extent of use of these toilets by the members of the households. There are other considerations such as disposal of liquid and solid waste generated in the village, especially that constituted by domestic sewage and garbage. However, collection of data relating to these features is cumbersome, and was not carried out under this study. Here, we have considered only the first two attributes such as the extent of coverage of rural HHs with toilets having superstructure; and the extent of use of the toilets by the members of the adopter households.

The findings are presented in Table 14. It shows that Anantapur and Warangal are the best performer in terms of coverage of rural households with toilets having proper superstructure. Further, in terms of extent of use improved latrines by rural population (excluding 0-5 age category), they score the highest point. The lowest scoring districts are Nellore, Nizamabad, Krishna and

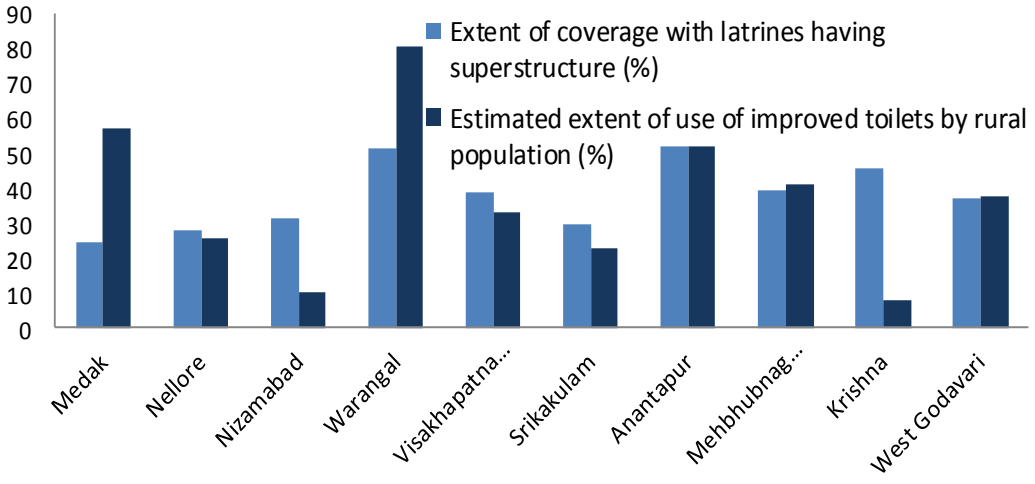
Srikakulam. The graphical representation of the district-wise sanitation performance is given in Figure 8.

Table 14: Performance of Districts in Rural Sanitation

Name of the District	Sanitation performance in rural areas			
	Extent of Coverage of Rural HHs with IHHLs	Extent of coverage with latrines having superstructure	Actual extent of use of latrines by members of adopter HHs	Estimated extent of use of improved toilets by rural population
Medak	61.0	24.8	93.6	57.1
Nellore	29.4	27.8	86.9	25.5
Nizamabad	39.0	31.3	26.8	10.5
Warangal	82.8	51.5	97.6	80.8
Visakhapatnam	44.5	38.8	74.2	33.0
Srikakulam	34.4	29.5	67.1	23.1
Anantapur	52.7	51.8	98.7	52.0
Mehbhubnagar	48	39.3	85.8	41.2
Krishna	47.4	45.5	16.8	8.0
West Godavari	38.3	37.2	98.8	37.8
Overall	48.0	38.40	75.0	32.0

Source: authors' own estimates based on primary survey data and Census 2011 (for no. of rural households), and TSC data on adoption of improved toilets in rural areas

Figure 8: Rural sanitation performance in sample districts



8.3 Status of School Sanitation in Andhra Pradesh

8.3.1 Schools Surveyed for Sanitation and Hygiene

The survey of schools covered a total of 72 schools from the 10 sample districts selected for the rural household sanitation survey, which were reported to have toilets as per the TSC data. As Table 15 shows, the field visits showed that 69 of them actually had toilets. Out of these 72, 44 were primary schools, 10 upper primary schools and 18 higher schools/ZP schools. The 44 primary schools had 86 toilets in total; the 10 upper primary schools surveyed together had a total of 34 toilets; and the 18 higher schools/ZP schools together had a total of 94 toilets. The district-wise break up of number of schools in different categories and the total number of toilets found in these schools are given in Table 16.

Table 15: Total No. of Sample Survey Schools Having Toilets against TSC Reporting

Name of the District	Total no. of Schools (reported to have toilets as per TSC) in the Sample Survey	Actual number of Schools found to have toilets as per primary survey
Visakhapatnam	9	9
Srikakulam	10	10
West Godavari	7	7
Krishna	4	4
Nellore	8	8
Anantapur	6	5
Nizamabad	6	6
Mehbhubnagar	7	7
Warangal	9	8
Medak	6	5
Overall	72	69

Source: Primary survey

Table 16: District wise break up of no. of Schools Surveyed and number of School Toilets

Name of the District	Total Number of Primary schools covered in sample survey	Total No. of toilets in primary schools as per the sample survey	Total No. of Upper Primary schools in the sample survey	Total No. of toilets exists in Upper Primary school as per sample survey	Total No. of Z. P /Higher Schools covered in sample survey	Total No. of toilets exist in Z.P. High school s as per the sample survey
Visakhapatnam	7	23	1	2	1	7
Srikakulam	2	3	1	1	7	24
West Godavari	6	7	1	4		
Krishna	3	7			1	5

Nellore	5	6			3	17
Anantapur	4	3	1	2	1	8
Nizamabad	3	7	1	6	2	16
Mehbhubnagar	4	5	1	4	2	11
Warangal	7	13	1	4	1	6
Medak	3	12	3	11		
Total	44	86	10	34	18	94

Source: authors' own analysis using primary data collected from sample schools

Table 17 presents the overall status of the school toilets from different categories put together in terms of their functionality is presented district-wise. Overall, only 48% of the toilets are fully functional. Nearly 42% of them are partially functional. Ten per cent of the toilets are dysfunctional. In districts such as Srikakulam, Warangal and Nizamabad, a small proportion of the toilets are fully functional, with the percentage of functional toilets varying from 3 in Nizamabad to 17 in Warangal to 32 in Srikakulam.

Table 17: Status of the Toilets in the Schools Covered in the Sample Survey

Name of District	No of Toilets	Functionality of Toilet (%)		
		Fully	Partially	Dysfunctional
Visakhapatnam	32	38	63	0
Srikakulam	28	32	43	25
West Godavari	11	100		
Krishna	12	100		
Nellore	23	96		4
Anantapur	13	77		23
Nizamabad	29	3	69	28
Mehboobnagar	20	50	50	
Warangal	23	17	74	9
Medak	23	52	48	
Overall	214	48	42	10

Source: authors' own analysis using primary data collected from sample schools

Table 18 shows the proportion of boys and girls from the surveyed sample in each district using the school toilet. Overall, a proportion of girls using the toilet is far higher than that of boys. While only 22 per cent of the boys surveyed were reported to be using the school toilet, it is 64 per cent of the girls. In many districts, the boys covered in the sample survey were not reported to be

using the toilet. Further, there is some different in the extent of use of toilets between primary school and secondary school in the case of boys. The proportion of boy students using the toilet is more in the primary school category (31% against 10.6%).

Table 18: Proportion of Boy and Girls from Primary and Secondary Schools using the School Toilets

District	No. of Boys in the Sample	No. of Girls in the Sample	Total No. of boys Using Toilets	Proportion of boys using the toilet (Primary) %	Proportion of boys using the toilet (Secondary) %	Total No. of girls Using Toilets	Proportion of Girls using the toilet (Primary level) %	Proportion of Girls using the toilet (Secondary) %
Visakhapatnam	20	21	13	75	25.0	13	58.8	75.0
Srikakulam	18	30	0	50	7.1	17	60.0	56.0
West Godavari	10	16	10	57.	100.0	16	100.0	66.7
Krishna	6	11	3	0	0.0	7	25.0	100.0
Nellore	17	19	0.0	75	0.0	10	54.5	100.0
Anantapur	10	15	0.0	0	0.0	5	10.0	80.0
Nizamabad	14	11	0.0	0	0.0	10	100.0	80.0
Mehbhubnagar	11	17	0.0	0	0.0	12	90.0	42.9
Warangal	12	12	0.0	0	0.0	12	100.0	100.0
Medak	4	9	1.0	75	25.0	1	16.7	0.0
Overall	122	161	27	30.9	10.6	103	62.0	63.9

Source: authors' own analysis using primary data collected from sample schools

As Table 19a suggests, in some districts, voluntary cleaning of toilets by school children was reported, through the percentage was significant only in the case of Vishakhapatnam, West Godavari and Medak in the case of boys and Vishakhapatnam, West Godavari, Srikakulam and Medak in the case of girls. Overall, 34% of the girls were reported to be involved in cleaning of toilets, whereas the percentage is only 22 in the case of boys.

Table 19a: Voluntary Cleaning of Toilet by School Children

Name of District	%of boys involve in voluntary cleaning of toilets	%of girls involve in voluntary cleaning of toilets	Remarks
Visakhapatnam	70	55	
Srikakulam	5.5	34	
West Godavari	30	50	
Krishna	0	0	
Nellore	12	11	Health committee exists.
Anantapur	0	0	
Nizamabad	0	0	
Mehbhubnagar	0	0	

Warangal	0	0	
Medak	50	22	
Overall	22	34	

Source: authors' own analysis using data from survey of schools

As regards sanitation related hygiene practices, the practice of hand washing with soap and water (after defecation and also before food) was found to be prevalent in the case of 88 per cent of boys and 93 per cent of the girls surveyed. A little more than 10 per cent of the boys and 7 per cent of girls do hand-washing with just water or water and sand. The district wise break-up of the percentage of boys and girls using different hand washing practices across districts is presented in Table 19b. Overall, the hygiene practices followed by school children are very good.

Table 19: Prevalence of Hand Washing Practice (after defecation and before food) among Boys and Girls

District	Total No. of students		Prevalence of hand washing practice among children					
			Just water		Soap and water		Sand and water	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
Visakhapatnam	20	21	5	5.5	95	88.9		5.0
Srikakulam	18	30	23.5	23.3	76.5	73.3		3.3
West Godavari	10	16	10	31.3	90	68.8		
Krishna	6	11		9.1	100	90.9		
Nellore	17	19	11.8	5.3	88.2	94.7		
Anantapur	10	15	10	13.3	90	86.7		
Nizamabad	14	11			100	100		
Mehbhubnagar	11	17	27.3	5.9	72.7	94.1		
Warangal	12	12	8.3		83.3	100	8.3	
Medak	4	9			100	100		
Overall	122	151	10.8	12.0	88.3	93.0	0.80	1.0

Source: authors' own analysis using data from survey of schools

Data on access to water supply for the toilet and the maintenance funds and availability of staff for maintenance were compiled and analyzed. The results are presented in Table 20. It shows that overall, only 36% of the sample schools have direct water connection. Nearly 34% of the schools have budget for maintenance of the toilets and a little more than 50% of the schools have part time staff to clean the toilets.

Table 20: Access to Water and Maintenance of Toilets

District	Sample size of schools	Proportion of School toilets having direct water connection (%)	Proportion of schools having budget for maintenance of sanitation (%)	Proportion of schools having part-time staff to clean toilets (%)

Visakhapatnam	9	56	33	67
Srikakulam	10	30	20	20
West Godavari	7	29	57	57
Krishna	4	25	0.0	75
Nellore	8	38	38	50
Anantapur	5	25	17	34
Nizamabad	6	50	60	67
Mehbhubnagar	7	57	29	86
Warangal	8	44	75	75
Medak	5	0.0	0.0	0.0
Overall	69	36.0	34. 0	51.0

Source: authors' own analysis using data from survey of schools

Sanitation Facility in Anganwadis

As regards sanitation in Anganwadis, a total of 16 Anganwadis from six districts were surveyed. The survey showed that only seven of them have toilets. The data relating to sanitation infrastructure in these Anganwadis are compiled and presented in a summarized form in Table 21. Of these, only five are functional. On an average, each Anganwadi has a total of two staff members, catering to a total of 362 children. Therefore, on an average, there is one staff for every twelve children, though the ratio varies widely across districts from as high as 1 staff for five children in Mehbhubnagar to one staff for 20 children in Anantapur. Only six of the Anganwadi toilets have direct water connection, and only four have piped water supply. None of the toilets has electricity connection.

Table 21: Status of Sanitation Infrastructure in Anganwadis

	Total Size of sample taken from TSC	No. of Anganwadis having Toilets	Total No. of Anganwadi staff	Total No. of Children in the Anganwadis	No. of Toilets with superstructure	Total no. of functional toilets	Total No. of toilets having electricity	Total no. of toilets having water connection	No. of Anganwadis toilets with piped water supply
Krishna	3	1	6	37	1	1	0	0	0
Anantapur	4	2	8	159	1	1	0	2	1
Nizamabad	3	1	6	84	1	1	0	1	1
Mehbhubnagar	3	2	5	27	1	1	0	2	1
Warangal	1	0	2	26	0	0	0	0	0
Medak	2	1	4	25	0	1	0	1	1
Overall	16	7	31	362	4	5	0	6	4

Source: authors' own analysis using data from survey of Anganwadis

8.4 Determinants of Adoption of Improved Toilets by Rural Households

A multivariate analysis using a 'logit model' was run to identify under what conditions, a rural household is most likely to adopt an improved toilet, in the given circumstance. The model used the following variables to begin with, for the analysis: 1] the per capita annual income of the HH; 2] caste profile of the family (whether belonging to the forward caste); 3] number of literate adults in the family against the total family size; 4] number of literate female adults in the family; and 5] number of school going children. These variables could predict adoption of toilets by individual households with 74.9 per cent probability. However, the effect of two independent variables viz.,' literate women in the family' and number/percentage of school going children on adoption was found to be negative as per the model predictions, when both were considered in the model along with the other three variables. But when only four variables were considered in the model (after excluding the variable, 'number of school-going children'), the effect of all of them including 'literacy of adult women', was found to be positive.

Subsequently, the model was run with the variable, 'number of children below the age of five' in place of 'number of school-going children', along with the other variables used in the previous logit model. The results from the logit model are presented in Table 22. The effect on toilet adoption was found to be positive for all five variables. Here again all these variables together could explain adoption of IHHL to an extent of 74.9 per cent. The effect of income was the lowest, with every 10,000 rupee increase in per capita income changing the probability of finding an adopter household by nearly 75 per cent (with a beta coefficient of 7.5 X 10^-5); whereas being in a forward caste family could increase the chance of the household having a toilet by 62 per cent as compared to a backward caste family (beta coefficient is 0.62). Presence of a literate woman in the family could increase the chances of having a toilet by nearly 25 per cent. Whereas an increase in percentage of literate adults in the family by around 20 (increase in literate adults by one person) would increase the chances of adoption of toilets by around 8 per cent.

The data used in the logit model (Sample Size= 2,446) covered 10 districts, comprising all the three regions of Andhra Pradesh, viz., Rayalaseema, Coastal Andhra and Telangana and all the nine agro climatic regions in the State. While we have chosen 2700 households for adopter category at the time of starting the survey, many of them turned out to be non-adopters after field visit and hence were subsequently removed from the sample. Therefore, the adopters here are those who actually built individual household latrines, and not those reported by the TSC. The data considered for running the logit model also included 900 non-adopters from the 10 districts, with 90 HHs from each district.

Table 22: Results from Logit Model on Adoption Determinants

Independent Variables	*Beta* Coefficient	S. Error	Wald	Df	Level of Significance	R	Exp (B)
Per Capita Income (Rs)	7.5E-05	1.49E-05	25.55	1	0.000	0.0924	1.00
Caste (1,0)	0.6262	.1624	15.0465	1	0.0001	0.0688	187
Family Literacy (%)	0.0041	.0019	4.9114	1	0.0267	0.0326	1.004
Children Below 5 (#)	0.0347	.0762	0.2079	1	0.0484	.0000	1.035
Female Literacy (1,0)	0.2400	.1250	3.6875	1	0.0548	0.0247	1.2712
Constant	0.0996	0.1288	0.4474	1	0.5036		

The results show that the household socio-economic dynamic could significantly influence the adoption decision of the family with regards to toilets. Those families which are socio-economically backward (in terms of caste, income and literacy) would require greater incentive to adopt toilets as compared to those who are literate, economically well off, and socially backward.

A far more straightforward analysis was carried out using five distinct socio-economic variables, in which the average values of these variables were compared for adopter and non-adopter households. The variables used are: per capita family income; no. of children below the age of five; no. of literate women in the family; percentage population in general category; and average no. of literate adults in the family. The results are presented in Table 23. It shows that the values of all the five variables are consistently higher for adopter households as compared to the non-adopter households across the districts. The values are consistently higher for the adopters, when the state-wide data are compared.

Table 23: Comparison of Socio-economic Attributes of Adopter and Non-Adopter Households

Name of the District	No. of children below the age of five		% Population in General Category		No. of Literate Women in the Household		No. of Literate Adults in the Family		Annual Family Income (Rs)	
	Adopter	Non-adopter	Adopter	Non-adopter	Adopter	Non-adopter	Adopter	Non-adopter	Adopter	Non-adopter
Medak	0.46	0.5	21.1	14.1	0.8	0.7	3.8	3	29544	25685
Nellore	0.21	0.19	24.1	7.1	0.46	0.32	1.72	1.41	22627	19571
Nizamabad	0.44	0.33	0.0	0.0	0.92	0.28	3.09	1.6	26275	16476
Warangal	0.18	0.28	20.9	7.6	0.81	0.7	2.67	1.12	22083	19489
Visakhapatnam	0.15	0.22	18.1	14.0	0.64	0.59	2.1	2.42	21862	15161
Srikakulam	0.27	0.36	9.6	1.1	0.54	0.46	2.02	2.14	23958	19950
Anantapur	0.33	0.45	28.5	14.6	0.82	0.69	2.98	2.54	34939	29579
Mehbhubnagar	0.36	0.28	20.8	6.7	0.94	0.24	3.21	2.39	35055	25622
Krishna	0.05	0.01	11.1	13.4	1.16	1.23	4.08	4.17	23744	24756
West Godavari	0.13	0.1	0.7	2.8	0.81	0.68	2.5	2.1	18801	16597
Overall	0.25	0.27	15.7	8.3	0.8	0.6	2.8	2.3	25520	21323

Source: authors' own analysis based on primary data from survey of adopters and non-adopters

8.5 Motivation for Adopting of Improved Toilets

Health benefits, time saving, improvement in living standards, accessibility and self-esteem and privacy are generally the most important reasons for adopting improved latrines. But, village situations are often complex, and the motivating factors can change according to the socio-cultural environment and overall socio-economic profile of the region, apart from the socio-economic condition of the household in question. In very poor localities, the general feeling of self-esteem etc. would be low. In some comparatively rich localities, even those who are economically poor might invest in improving their living standards. A total of eight factors were identified as the motivating factors for the households to adopt improved latrines.

The significance of each one of these factors in terms of 'number of households which recognize them varies across districts. The results are presented in Table 24. Its graphical representation is given in Figure 9. The table shows that the 'health benefit' is a motivating factor for largest proportion of the households across the sample districts to opt for improved latrines. However, the proportion of the people who consider this as a factor varies across the districts: from as low as 4.3% for Nellore to as high as 97.4 % for Warangal. 'Privacy and self-esteem' appear to be another motivating factor for the second highest proportion of households to go for toilets. But, the proportion is as low as 0 per cent for Nellore to the highest of 98.7 per cent for Anantapur. This is followed by 'accessibility', and time saving which 38% and 30%, respectively of the households consider as reasons.

Figure 9: % adopter HHs who consider health and privacy benefits as reason for constructing toilets

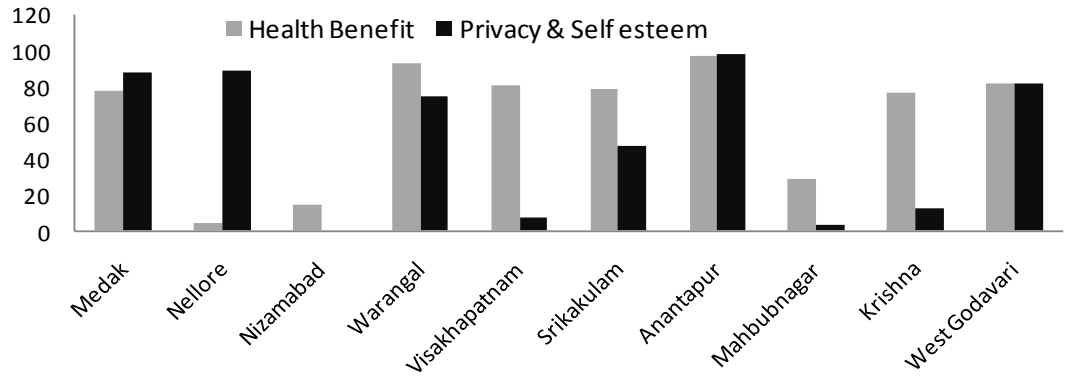


Table 24: Factors Driving Households to Adopt Individual Latrines

District	Percentage Households Reported to Reasons							
	Social status	Health benefits	Privacy and Self Esteem	Accessibility	Lifestyle Improvement	Time Saving	New Social Norm	Availability of Financial Aid
Medak	0.40	78.1	87.8	2.2		1.5		
Nellore		4.3	89.5	0.8	4.7			0.8
Nizamabad	7.10	14.1				7.7		
Warangal	57.2	93.5	74.6	66.7	34.8	76.1	2.5	10.4
Visakhapatnam	16.2	81.5	7.2	4.2	13.6	11.3	2.3	0.4
Srikakulam	7.20	79.2	47.5	26.4	5.7	17.4	1.9	
Anantapur	31.6	97.4	98.7	44.7	36.4	66.7	18.4	48.7
Mehbhubnagar	80.3	29.0	2.70	56.8	2.2	4.4	3.8	0.5
Krishna	86.3	77.41	11.9	96.7	12.2	84.1	1.9	0.7
West Godavari	20.2	82.4	81.6	77.5	54.7	49.4	6.7	
Overall	30	66	53	38	17	33	4	6

8.6 Constraints to Adoption and Future Demand for Toilets

8.6.1 Analysis of decision stage determinants vis-à-vis adopting toilets

We have surveyed a total of 900 non-adopters of improved latrines to find out at "what stage there stand" in terms of decision making in favour of adopting an improved toilets. There are three important stages in decision making vis-à-vis adoption of any new technology. There are preference stage, intention stage and choice stage. Depending on the type and nature of constraints the households is faced with, the decision stage would keep changing and therefore are called decision stage determinants. Those who have known the benefits of improved latrines and are dissatisfied with the prevailing mode of sanitation, but show "Medium" or "Low" likelihood of going for a toilet in the next one year, and would remain in 'preference stage'. They could be facing permanent constraints due to lack of space, funds, ownership of house etc. Those who do not have these permanent constraints are identified as those "who reported to have "High" likelihood of constructing a toilet in the next one year, and they would enter the "intent" stage. From among these, those who show high likelihood of constructing a toilet in the next six months would enter the choice stage. They are unlikely to face any temporary constraints like competing priorities and non-suitability of time and season.

For estimating the future demand for improved toilets, only those who are in the choice stage of decision making are considered. It is expected that they would construct toilets in the next 6 months or so. It is very likely that those who are in the intent stage would go for construction of toilets in the next one year or so. Table 25 shows the percentage of households in various stages of decision making in favour of construction of improved toilets in each district.

Table 25: Decision Stages of Non-Adopters vis-à-vis Adoption of Improved Latrines

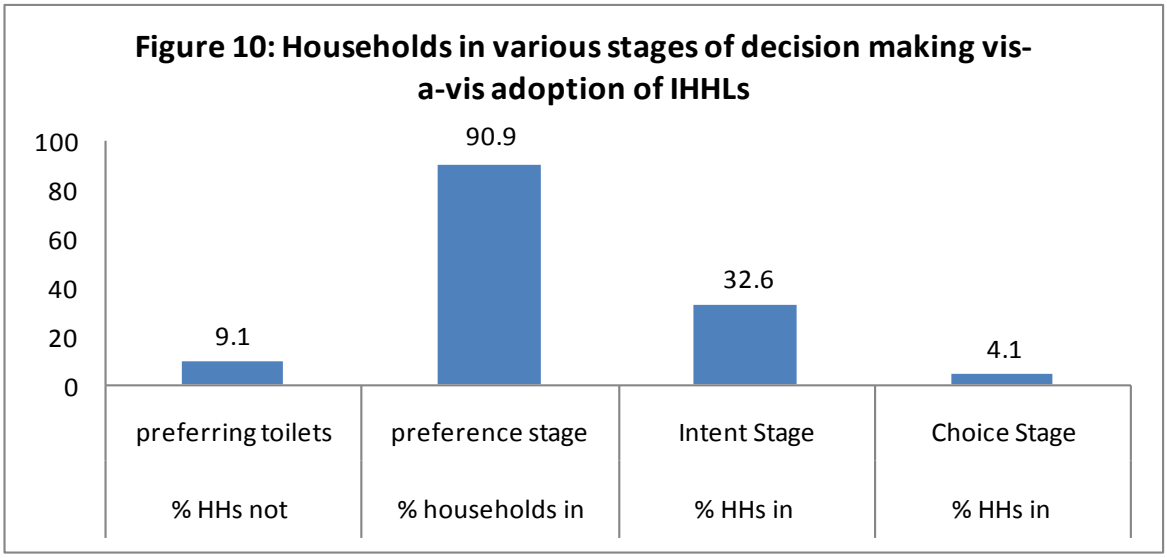
Name of the District	Total Number of HHs surveyed	% of total Households in Various Stages of Decision Making			
		Not in Preference Stage	Preference Stage	Intent Stage	Choice Stage
Medak	92	1.10	98.9	0.0	0.0
Nellore	112	5.40	94.6	91.1	0.0
Nizamabad	83	13.3	86.7	36.1	15.7
Warangal	92	23.9	76.1	20.7	1.1
Visakhapatnam	93	19.4	80.6	9.7	2.2
Srikakulam	90	25.6	74.4	47.8	8.9
Anantapur	89	0.0	100	100.0	14.6
Mehbhubnagar	90	0.0	100	0.0	0.0
Krishna	82	0.0	100	0.0	0.0
West Godavari	72	0.0	100	0.0	0.0
Overall	895	9.10	90.90	32.6	4.1

Source: authors' own analysis based on analysis of primary data from non-adopter households

As Table 25 shows, there is a sharp reduction in number of households as one move from the preference stage to choice stage (see also Figure 10). While 90.9 per cent of the families prefer an improved latrine in their dwelling premise, only 32.6% of the total HHs (or 36 per cent of those who are in the preference stage) are actually free from any permanent constraints to go for a toilet in the next one year, and therefore are in the 'intent' stage. In a few districts such as Medak,

Mehbhubnagar, Krishna, and West Godavari, no households appear to be in the 'intent' stage. Whereas in Anantapur, all the households appear to be in the 'intent' stage, and the proportion is as high as 91% for Nellore. The remaining 58.3% have several permanent constraints. More importantly, only 4.1 per cent of the total households surveyed (or 12.6 per cent of those who are free from permanent constraints) show the high likelihood of actually going for a toilet in the next six months, or are free from temporary constraints. The remaining 28.5 per cent of the households face temporary constraints.

Figure 10: Households in various stages of decision making vis-a-vis adoption of IHHLs



The types of permanent constraints faced by the 58.3 per cent sample households are shown in Table 26. As Table 26 indicates, amongst all the four constraints, the highest percentage of HHs reported poverty as a constraint in constructing a toilet. The second dominant constraint in terms of the number of HHs reported is 'space availability', though only 9.6 per cent of the HHs reported this as a reason. It is important to remember here that the same household has reported more than one constraint faced by them in constructing a toilet and as a result, the total percentage.

Table 26: Types of Constraints faced by Non-Adopters who are in the Preference Stage

Name of the District	Total Number of HHs surveyed	% of HHs having preferred, but have permanent constraints	Households, who prefer improved toilets, but have permanent constraints as % of total HHs			
			Space un-availability	Tenancy	Poverty	Other reasons
Medak	92	98.9	6.5	0.0	92.4	0.0
Nellore	112	4.5	0.0	0.0	3.6	0.0
Nizamabad	83	50.6	7.2	31.3	3.6	2.4
Warangal	92	55.4	20.7	13.0	54.3	2.2
Visakhapatnam	93	70.9	3.2	0.0	68.8	2.2
Srikakulam	90	26.6	7.8	1.1	17.8	0.0

Anantapur	89	0.0	0.0	0.0	0.0	0.0
Mehbhubnagar	90	100.0	3.3	0.0	96.7	0.0
Krishna	82	100.0	24.4	19.5	89.0	1.2
West Godavari	72	100.0	30.6	5.6	88.9	11.1
Overall	895	58.30	9.6	6.6d	49.8	1.7

Source: authors' own analysis based on analysis of primary data from non-adopter households

The household which have no permanent constraints in adopting latrines but face temporary constraints account for 28 per cent of the total non-adopter households. The district wise break-up of the types of temporary constraints faced by these households are given in Table 27 (Column 2). We have classified these temporary constraints under five different categories. The proportions of households which face each type of constraint in each district are given in Column 3-7. Column 8 in Table 27 gives the percentage of households which do not face any constraint in going for a toilet, and who are in the choice stage. They actually represent the demand for toilet in near future.

Table 27: Proportion of the households Facing Temporary Constraints and those in the Choice Stag as a percentage of Non-Adopters

Name of District	% HHs having no permanent constraints, but temporary constraints	Households having temporary constraints in going for a toilet in the near future, as a percentage of total HHs					No constraints
		Expenditure anticipated in agriculture	Expenditure anticipated in business	Time needed to acquire knowledge	Looking for appropriate site	Season not appropriate	
Medak	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nellore	91.1	21.4	0.0	69.6	0.0	0.0	0.0
Nizamabad	20.4	9.6	3.6	1.2	2.4	3.6	15.7
Warangal	19.6	14.1	6.5	3.3	d0.0	4.3	1.1
Visakhapatnam	7.50	7.5	0.0	0.0	1.1	0.0	2.2
Srikakulam	38.9	21.1	7.8	1.1	12.1	13.3d	8.9
Anantapur	100.0	85.40	34.8	22.5	7.9	30.3	14.6
Mehbhubnagar	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Krishna	0.0	0.0	0.0	0.0	0.0	0.0	0.0
West Godavari	0.0	0.0	0.0	0.0	0d.0	0.0	0.0
Overall	28.50						4.1

Source: authors' own analysis based on analysis of primary data from non-adopter households

8.6.2 Demand for Toilets in Rural Andhra Pradesh

Our analysis based on data collected from non-adopters shows that the demand for toilets would be very low in near future, i.e., next six months. The overall demand was only 4.1%. But, district-wise analysis display significant variations in demand. The demand is as high as 15.7% for Nizamabad and 14.6% for Anantapur. But, in most other districts, the demand is estimated to be zero. But, the demand is dynamic in nature. With changes in socio-economic dynamic of the household, in terms of economic condition, literacy levels etc. Further, what we have estimated is the demand in the next 6 months. But, nearly 32.6% of the households indicated the high likelihood

of constructing a toilet in the next one year from the date of doing the survey, and they are in the "intent" stage. A large number of respondents from Anantapur (100%), Nizamabad (20.4%), Srikakulam (38.9%) and Warangal (19.6%) belong to this category. Their situation could change with completing of agricultural seasons or with new income opportunities from business or with changes in knowledge levels through IEC programmes etc.

8.6.3 How to Remove the Constraints to Increase the Demand of Improved Toilets?

There are two types of constraints which need to be removed for the households to go for constructing improved toilets. The first type of constraints is that which is permanent. The second type of constraint is that which is temporary in nature. The permanent constraints such as poverty, tenancy and lack of space cannot be removed through WASH interventions, which are based on Information, Education and Communication. They need strategic interventions, and practical and policy measures. Since the permanent constraints have their origin in economic disadvantage or resource crunch, the policy instrument should be designed to reduce the cost of constructing toilets, and increase the benefits of adoption. We would be discussing them separately in last section on strategies for improved sanitation.

8.7 Issues in Governance and Management of Water Supply and Sanitation in AP

The above description of the governance and management structure for water supply and sanitation in the state bring out the following issues:

1] The department of water supply and sanitation has its presence only up to the level of the Mandals

2] Though devolution of funds, functions and responsibilities relating to water supply and sanitation are envisaged under the 73rd amendment to the constitution, the GPs are ill-equipped to maintain drinking water facilities and its supply, and therefore decentralized management is still a distant dream

3] The Panchayati Raj institutions are not able to intelligently use its powers to decide on the nature of scheme it wants; nor can it influence the functioning of the Water Supply and Sanitation Department to get a scheme of its choice implemented and hence their effective role in governance of water supply is questionable

4] The issues related to the effectiveness of the GPs in regulating water resource development activities.

As regards the first point, each Mandal level office of DoRWSS has only one Asst. Executive Engineer and one Asst. Engineer. Each Mandal in the State has nearly 25 villages. With such a staffing, it will not be possible to attend to the tasks required to be performed in the villages where the schemes run.

To elaborate on the second point, the GPs have no technical manpower available at the village level to carry out operation and maintenance of schemes nor do they have the managerial skills to engage technically qualified people from outside to carry out these functions. The problem

becomes much larger for regional water supply schemes, which are technically more sophisticated than individual village water supply schemes.

As regards the third point, the Village Water Supply and Sanitation Committee is a sub-committee of the Gram Panchayat, with elected representatives from the village wards. The VWSSC, by design, lack professional skills that are required to review plans, designs and cost estimates, and supervise the quality of implementation of the schemes which come under its purview. The Committee's function is mostly limited to proposing schemes.

As regards the last point, the AP Water Land and Trees Act (APWALTA) had been in effect since 2003. The regulatory powers vis-a-vis water resources development and management lie with the Gram Panchayats. But, it lacks the institutional backup to enforce any regulation. One of the problems is the lack of well-defined rights in water, particularly in groundwater. It is even not clear what is to be achieved through regulation, in the absence of a regulatory framework. As a result, the GPs are not effective in regulating groundwater development, with the result that the rich continue to drill bore wells and tap excessive amounts of water for irrigation, threatening the sustainability of bore well based water supply schemes. On the other hand, many schemes of the rural development department, particularly the unscientific water harvesting and watershed development programmes being undertaken by the PRIs, are not in conformity with the goal of sustainable drinking water supplies.

9. Major Findings

- As per our estimates, the extent of adoption of improved toilets in the sample districts of AP varies from a lowest of 29.4% in Nellore to the highest of 82.8% in Warangal. The overall extent of adoption for the 10 districts covered in the sample survey is 48%, against 57.3% as per TSC data, and 30.6% as per Census 2011.

- The district level estimates arrived at from sample survey and the estimates available from TSC show significant variance. The highest variation in adoption estimates between TSC and survey results was found in Nizamabad, followed by Mahbubnagar and then Warangal. In three districts, the TSC reporting was found to be correct. They are Medak, Krishna and Srikakulam. The overall accuracy for the 10 districts covered is 83.7%.

- In eighty per cent of the cases where the toilet was actually built, the infrastructure is in good shape, with superstructure. This means, overall, only in 67% of the cases reported by the TSC, toilets with superstructure exist.

- The highest percentage of toilets with superstructure was found in Anantapur, and lowest in Medak (40%).

- Across the State, the extent of use of toilet is 75%, though there is variation across age groups. It is highest in the age group of 15-65 (78%) and above 65 age (79%); and lowest among children in the age group of 6-14 (61%). There is some marked difference in the extent of use of toilets between male and female, with consistently higher extent of use by female members of the households in all districts, except Kurnool. Further, there is variation across caste groups, with the highest among upper castes (88.3%) and lowest amongst

scheduled castes (61.7%). There was no marked difference in the use of improved latrines across income segments.

- Overall, 40% of the members of the adopter households practice hand-washing with soap and water after toilet use. There is no consistent trend in the practice found across age groups when we move from one district to another. But, overall, there is a sharp variation in the practice of hand-washing (among all age groups) across districts. It is lowest in West Godavari, followed by Krishna and Nizamabad. It is highest in Medak, Anantapur and Mahbubnagar. But, across the State, it is highest in the age group of 15-65 and above 65 (42% each), respectively), and lowest among children in the age group of 6-14 (31 %.)

- The degree of access to domestic water supply does influence the sanitation and hygiene behaviour of the adopter households. Sharp differences in use of toilets and the prevalence of 'hand washing practice' (after defecation) was observed between those who have access to tap water connections and those who depend on public water sources for domestic water supply. While 84.4% of those who have access to tap water use toilets, only 66.5% of those who depend on public wells use toilets. Similarly, prevalence of doing hand-washing is much higher among those who have access to tap water, than those who depend on public wells.

- The difference is sharper when it comes to hand washing with soap and water, with 55 per cent in the case of HHs with tap water connection against 28% for those who depend on public wells.

- Among the adopters, the prevalence of hand washing (before food) is most common in the age group of 6-14 (80%), followed by 15-65 (77%), and lowest in the age group of above 65 (69%). It varies significantly across districts, lowest in Nellore (16%), Vishakhapatnam (52%) and Nellore (53 per cent). The prevalence of hand-washing (before food) was found to be highest in Anantapur district.

- Cost of construction of latrine varies from Rs. 7,150 in Medak to Rs. 11,400 in Nellore. The labour component varies from a lowest of 18 per cent in Nizamabad to 41.6% in Nellore. In lieu of the fact that in many cases, the toilets were not constructed with proper superstructure, these figures do not fully reflect the actual cost of construction of a proper individual household toilet, and the costs can further go up.

- The best performing districts in terms of the extent of coverage of improved toilets with good superstructure is Anantapur. Again, if we consider the extent of use of improved toilets by the members of rural households, Anantapur and Warangal have the highest score.

- Overall, health benefits (66%) and privacy & self-esteem (53%) appear to be the factors maximum people consider as motivating for adopting an improved toilet. The other factors are accessibility (38%), time saving (33%), social status (30%) and better living standard (17%).

- As the logit model using data from 2446 households indicated, there are five important socio-economic parameters which drive adoption of improved toilets at the HH level are the economic condition of the family, overall adult literacy, presence of literate (adult) females in the family, caste and number of small children below the age of five. These factors create conditions for households to get motivated for adopting improved sanitation methods. Every 10,000 rupee increase in per capita income increases the probability of a household adopting a toilet by nearly 75%; whereas being in a forward caste family could increase the chance by 62% as compared to a backward caste family. Presence of a literate woman in the family could increase the chances of having a toilet by nearly 25%. Whereas an increase in percentage of literate adults in the family by around 20 would increase the chances by around 8%.

- The estimated demand for improved latrines among non-adopters is quite low (4.1%), though there is significant variation across districts. But, if we consider the fact that nearly 32.6% of the non-adopters do not have any permanent constraints in building toilets, they will become adopters in near future, once the temporary constraints are removed.

- The key constraints to adoption are poverty, space un-availability and tenancy. Amongst these three constraints, poverty appears to the most dominant one.

- As regards school sanitation, out of a total of 72 schools surveyed, 69 were found to have toilets. Out of a total of 214 toilets from a total of 69 schools found to have toilets, 48% were found to be functional, 42% partially functional and 10% dysfunctional.

- Out of the 69 schools which were found to have toilet facility, 36% have toilets with direct water connection, 34% have funds for maintenance of toilets, and 51% have temporary staff for cleaning the toilets. Nearly 51% of the boys and 22% of the girls interviewed (including primary, upper primary and secondary/ZP schools) were reported to be engaged in voluntary cleaning of toilets.

- Nearly 22% of the boys and 64% of the girls from the schools were found to be using the school toilets. The practice of 'hand-washing after toilet use and hand-washing before eating food was found to be prevalent among 93% of the girls and 88% of the boys interviewed.

- The districts which are most vulnerable to the negative consequences of poor sanitation and which require attention are: Krishna, Srikakulam and Nellore. These are two reasons for this increased vulnerability. First: these districts fall in relatively high rainfall region, with comparatively higher (relative) humidity, shallow groundwater table and coastal alluvial soils which increases the vulnerability of groundwater from pollution from poor sanitation. Second: the extent of use of improved toilets by rural population (estimated) is very low in these districts (8%, 23.1% and 25.5%, respectively).

10. Strategies for Promoting Improved Sanitation in Rural Andhra Pradesh

Promotion of improved sanitation in Andhra Pradesh calls for fulfillment of the following conditions. First: the sanitation technology promoted through subsidies has to be viable from the social, economic and ecological points of view. Second: the regions suffering from the negative consequences of poor sanitation and which urgently require improved sanitation systems are to be targeted through promotional schemes including subsidies. Third: the subsidies must be adequate enough, reflecting both the actual cost of building the system and welfare benefits from adopting improved sanitation. Fourth: sufficient economic incentives are to be provided to people, who otherwise do not find sufficient tangible benefits from using improved toilets in the short run. There has to be a proper operational mechanism for implementing the said strategies.

10.1 Which Regions to Target for Promoting Sanitation?

The regions which require 'targeting' for sanitation provision are those where the likely negative impacts of poor sanitation would be higher, and where adoption of improved latrines is poorer. By doing such targeting, the benefits and welfare impacts (in terms of public health) of improved sanitation can be maximized. There is abundant of scientific research available from across the world which suggests that the negative consequences of lack of proper sanitation depend on a variety of factors, viz., the climatic condition, soil characteristics, depth to water table condition and flood proneness of the area.

These factors vary widely in the state. For instance, the state has nine different agro climates. The inland areas are semi arid to arid, while the coastal areas are humid. The rainfall is also higher in the coastal areas, as compared to the inland areas. The coastal areas, particularly the deltaic plains of Krishna and Godavari, are highly flood prone. They are endowed with alluvial soils, moderate to high rainfall; shallow groundwater table and humid climate. They provide the most favourable environment for negative health impacts of unsanitary conditions. This is due to the bacteria would survive in moist soil. Due to good infiltration capacity of the alluvium and shallow water table, the bacteria could move vertically faster along with the downward moving water to reach the groundwater table, which result in quick contamination of groundwater with pathogens (faecal coliform bacteria and virus). Such regions in the state, should, however be mapped to identify the vulnerable areas. They should receive the spotlight for promoting improved sanitation.

Having discussed the factors influencing vulnerability, we can also look at the regions where the adoption of improved latrines is low. Our survey shows that the extent of adoption of improved latrines is lowest in Nellore (29.4%) and very low in Srikakulam (34.4%), West Godavari (38.3%) and Krishna (47.4%) districts. These districts also fall in the coastal zone, which is inherently vulnerable. Out of these four districts, Krishna district has the highest prevalence of open defecation by the members of households (83.2%) which own the facility, followed by Nellore and Srikakulam. The extent of use of toilets by rural population in these districts was estimated to be as low as 8% for Krishna, 23% for Srikakulam, and 25.5% for Nellore. The extent of use of toilets by rural population is very high in West Godavari (37.8%). Therefore, Krishna, Nellore and Srikakulam districts should receive highest priority in terms of efforts to improve sanitation.

10.2 Practical Interventions for Boosting Adoption of Improved Toilets

10.2.1 Provision of Subsidized, High Quality Toilets with Proper Targeting and Monitoring

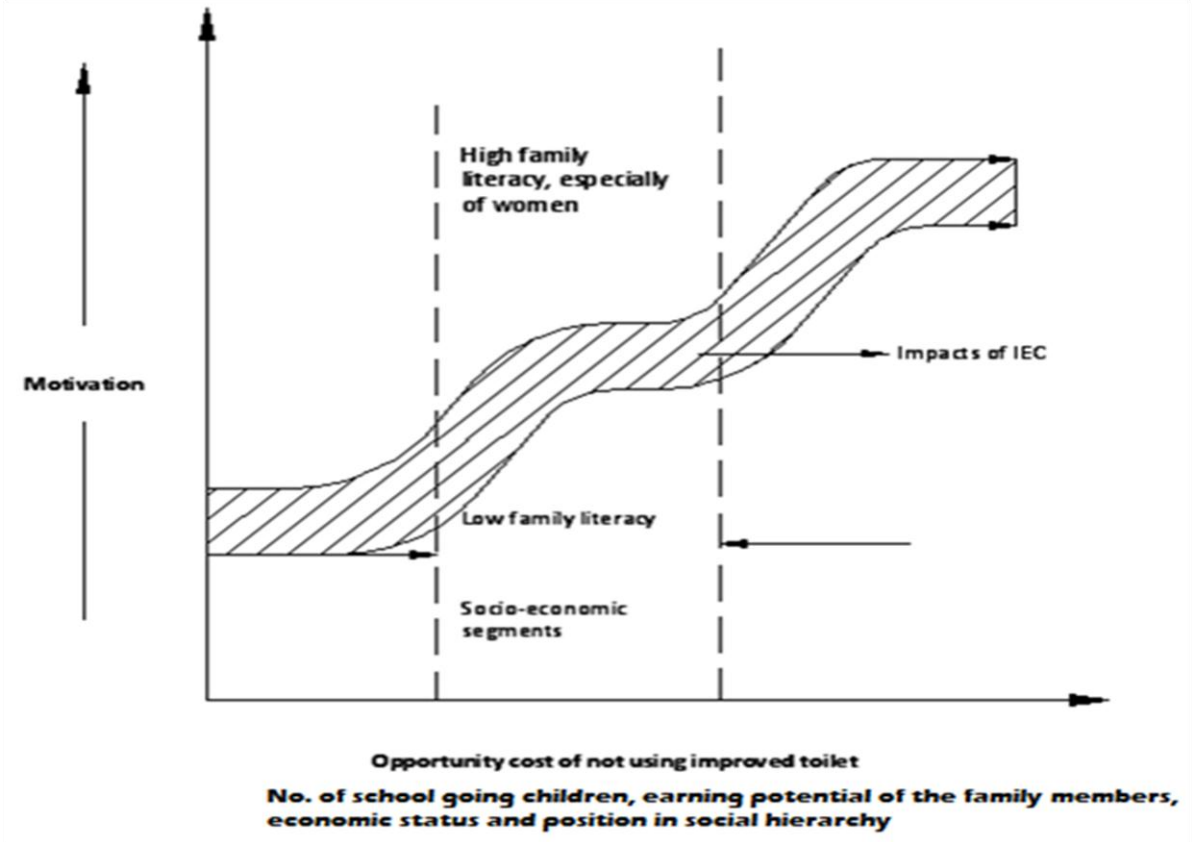
There is a strong need to use economic principles in allocating resources for promoting improved sanitation at the household level. Household decision to go for a toilet is largely an economic decision of the head of the households along with the female counterparts, which is driven by the perceived benefits of time-saving, improved health, good living standards, protection from vector-borne and water borne diseases and prevention of loss of employment, and the ability to bear the cost of building a toilet. What is important to remember is that these benefits are high under certain conditions, and fully realized under certain other conditions.

For instance, the benefits are high when: 1] the earning potential of the household is high and the members do not have time to waste, going out in the open for defecation; 2] the family has children, particularly those in the age group of 0-5, which makes It vulnerable to negative health consequences of poor sanitation; and, 3] the overall educational status of the family is good, which makes toilet a necessity for maintaining a dignified lifestyle. But, certain benefits are better recognized when the members of the household, especially women, have education. Education help the family recognize the health hazards of practicing open defecation. It also helps them appreciate the value of time and indirect economic gains from time saving. Or in other words, the opportunity cost of not having toilets in the dwelling premise is significant for a household under the above said conditions, and these costs are fully recognized or appreciated under certain other conditions.

Sometimes, it is also a social decision, driven by the desire to maintain status in the society. But, this again is linked to the caste, economic progress and or educational status of the family, and the number of women members in the household etc. What is achieved through the provision subsidy is a reduction in the private cost of building toilets for the adopter families, thereby increasing the extent of net economic benefits, even while other socio-economic factors remain the same. This would increase the chances of adoption of toilets to an extent. This means that the extent of subsidy for construction of toilets should be decided by the socio-economic characteristics of the families, if we want to provide equal opportunities to socio-economically backward and forward households.

This was explained by the multi-variate analysis involving data from 2446 households across AP, which showed the following variable to be the major determinants of adoption of improved toilets: 1] the per capita income of the family; 2] the caste profile of the family, i.e., whether backward or forward caste; 3] the overall literacy of the adults in the family; 4] the literacy of the female adults in the family; and 5] number of children in the age group of 0-5.

Figure 11: Framework for Analyzing Sanitation Behaviour of Households



The above analysis suggests that subsidy for toilet construction would be justified when the earning of the adult members of the family is not good, or the economic condition of the family does not allow investing in a toilet with own money, or the family belongs to a backward caste, but the other 'conditions' mentioned above are present. These conditions include presence of educated adults and school going children in the family. As the analysis of adopter households clearly indicated, if the family members, especially women have good education, the extent of use of improved toilets is very high. But, it is also evident from the diagram that if these conditions are absent, greater efforts through IEC will be required for the families to recognize the value of practicing improved sanitation, apart from providing subsidies.

But, as field experience suggests, 'subsidy for toilet construction' needs to be exercised with a lot of caution, and system for regular monitoring needs to be in place to ensure that the infrastructure is properly used and the desired welfare benefits are produced. The most important aspect is that the infrastructure built is of good quality and as per standard specifications of a toilet--having sufficient pit size, made of standard materials, with adequate space and strong superstructure and good ventilation) and is easily accessible from the dwelling. Overemphasis on target achievement would only lead to misuse of funds by the intended beneficiaries, without producing the desired results.

Large number of households takes the benefit of subsidy schemes to construct the toilet at a very low cost, but still do not use them for the intended purpose because of the competing priorities. As past survey in Karnataka and the present survey in Nizamabad and Krishna districts of Andhra Pradesh have shown, the economically backward families, especially those belonging to OBCs, scheduled caste and scheduled tribe, use the space created for keeping small ruminants, agricultural implements and sometimes grain bags. The 'modus operandi' used by Gujarat Green

Revolution Company can be used to offer subsidy benefits to the households for toilet construction as well. Gujarat Green Revolution Company provides subsidy for purchase of drip and sprinkler irrigation systems to the farmers. Not only that the subsidy is directly given to the farmers, but the amount is released in many installments over a period of 2-3 years. This has led to real adoption of MIs in Gujarat, with the state making remarkable achievements in MI promotion.

In the case of toilets for rural households, the subsidy can be released in a few installments over a period of 1-2 years, based on the report of monitoring obtained by authorized persons in the field. This would create incentive among the households, who had invested their own funds for construction, to use the system properly and would help prevent mis-appropriation of public funds. Over and above, installment payment of subsidy benefits would make sure that only those families which are actually concerned about improved sanitation and hygiene would be approaching the agency for availing of the scheme.

But, there are long-term strategic interventions to promote improved sanitation in rural areas. They are: enhancing the literacy levels of the rural households, particularly educating girl children; improving the livelihood opportunities for adult members of rural households. This would automatically increase the opportunity cost of defecating in the open, help family members realize the health benefits of improved sanitation. At another level, better education would make the family members more conscious about their dignity.

10.2.2 Providing Household Connections of Water Supply?

The motivation to use a toilet for personal hygiene and sanitation is largely behaviour-related, and therefore can change from person to person. Within the same family, the understanding of the health benefits of proper use of toilet would change. Also, the ability to use the toilet would differ across the age groups. If the water supply source is distant, then the young members of the family may not always find it convenient to use the toilet as considerable amount of water would be required for flushing. But, such constraints would be non-existent if water supply is available within the dwelling premise. Same is the case with hand washing. If water is available within the dwelling premise or if tap connection is available, then the motivation to do hand washing would be higher, irrespective of the age. Our analysis has shown that access to water supply has a significant bearing on sanitation and hygiene practices. Thus, if the rural households are to derive maximum benefit out of having improved latrines, it is important to offer piped water supply, along with providing hygiene education.

10.2.3 What IEC Education Can Do?

It is important to recognize the fact that one cannot motivate people through IEC campaigns to construct improved latrines. One can only create conditions under which people get motivated IEC education cannot alter the socio-economic conditions of the households, which actually determine the opportunity cost of not having toilets. IEC can only change the way some of these costs are appreciated by the members of the households, the most important of which is the health consequences of not having proper sanitation. Some of the other costs are safety and security of women and children, school children's delay in attending classes, and reduced ability of adults in reporting for work on time. IEC can also help people to derive maximum benefits out of having an improved latrine, by providing knowledge and information about the benefits of best hygiene

practices such as 'hand washing'. Therefore, it can make a difference for those HHs which have already built toilets, but do not use them and practice open defecation.

It is important that the IEC programmes lay stress on outcomes (of adoption of improved latrines) which are easily perceived and which people can relate to. More importantly, the economic gains, which the individual households can accrue in the short run, need to be highlighted in such programmes, rather than the welfare gains, which the society at large can accrue in the long run. The IEC materials should be tailor made, keeping in mind the socio-economic profile of the target communities. For instance, in congested localities, which do not have sufficient open space, the IEC campaign can highlight on the benefits of privacy.

10.3 Policy Interventions

10.3.1 Indirect Economic Incentives and Disincentives

One of the reasons for non-adoption of improved toilets is that the households are not able to foresee any tangible benefits. While many households cite lack of finance as the vexing constraint for adopting toilets, this needs to be put in a right perspective. The fact is that such households do not find tangible benefits in the immediate future from construction of toilets that can offset the likely investments for the same. This partly explains the reason why many households invest in costly gadgets such as televisions, mixer grinders, washing machines and mobile phones, but hesitate to invest for building a decent toilet. In the case of these gadgets, there are strong and tangible benefits. While some of them are economic (in terms of reducing transaction cost in business and labour), some of them are psychological, releasing mental stress.

The economic incentive can be affected in the following way. The households in rural areas enjoy concessions in public (Panchayat, Municipality) schools for their children's education. Such concessions can be increased for the families belonging to economically backward classes, if they build or already have improved toilets. Toilet construction itself might attract government subsidies. Therefore, it is all the more important that the caution which needs to be exercised in advancing subsidy benefits for toilet construction, is exercised here also. The emphasis should be on quality of the infrastructure and its proper use. While one could argue that those households having school going children are likely to have toilets, it often is a necessary condition and not a sufficient condition for adopting improved toilets. Nevertheless, the cases in which the HH has school going children, but does not have toilets will be less as compared to those having no school going children, if other important factors remain the same.

In the case of APL households, presence of individual household latrines should be made compulsory for enjoying the benefits of educational concessions for children, being provided by the government. This would work as a disincentive for such families for not keeping individual latrines.

Another area in which rural households enjoy concessions from the government is for medicare. The benefits of health insurance being offered by the state government (*Arogyashree*) could be increased for BPL families having improved toilets, in the form of higher medical insurance coverage.

The uniqueness of both the schemes is that they produce larger social benefits through improved human development along with private benefits to the family members, which are beneficiaries of the scheme. But, the use of the market instruments such as incentives (for poor families) and disincentives (for APL families) should be employed only in regions, which are extremely vulnerable and where the social costs of practicing open defecation are very high.

10.4 Operational Plan

Identifying the most vulnerable region for lack of improved toilets is the first step towards improving sanitation in the state. We have already seen that the coastal alluvial districts with shallow groundwater table and good rainfall are the most vulnerable in terms of negative consequences of poor sanitation. More funds should be earmarked for these districts for two reasons. *First*: the coverage of improved latrines in rural areas is very low. *Second*: the unit cost of constructing an ecologically sound latrine in these areas is much higher than that of inland hard rock areas. The other steps include making the right technological choice of latrines to suit the physical environment, and strengthening institutional capacities and improving the governance of rural water supply and sanitation.

10.4.1 Ecologically Sound Latrines[12]

From the point of view of designing improved latrines which are also ecologically sound, two distinct regions exist in Andhra Pradesh. The first is the hard rock plateau region, underlain by crystalline formations or basalt. Rainfall is low to medium and groundwater table is generally deep in this region. The soils are also stable. The latrine pits are not susceptible to filling and there is less likelihood of groundwater contamination from toilet effluent. The conventional pit type latrines being constructed under TSC would work in such regions. Nearly 85% of the geographical area of Andhra Pradesh falls in this category. The second type of region is the coastal alluvial plains and the flood plains of the major east flowing rivers. The rainfall is high in these regions, soils are sandy, and groundwater table is very shallow. The coastal flood plains are also vulnerable to floods resulting from high rainfalls in the upper catchments and cyclones. Special types of latrine technology here will be required in this region, to prevent bio-chemical and bacteriological contamination of groundwater from on-site sanitation. Some of them are discussed below.

Raised or Step Latrines

A raised or step latrine is most appropriate option for on-site sanitation in areas with high water table. The latrine pit should be dug at the end of the dry season to maximise the available depth of unsaturated soil. The pit can be lined with fired clay bricks, porous concrete, precast concrete rings or ferro-cement. The lining can be extended above ground level to provide the required pit volume. The excavated material can be used to build up a mound or embankment around the latrine. This embankment (excluding the top 1.5 m) can be used for seepage of the effluent from the pit if it is formed with permeable soil, is well compacted with a stable side slope not exceeding 1:1.5 and is thick enough to ensure that the effluent does not seep out of the sides of the mound. The slab should be constructed at least 0.5 meters above the highest water level. In the case suitable fill material is not available to build up an embankment, it may be necessary to make the lining impermeable by plastering the inner and outer sides of the pit/tank with cement.

The raised pit latrine is a relatively expensive option and in areas which are prone to heavy flooding the pit may be rendered useless due to filling up of the pit with silt during the rainy season, if not lined with cement or concrete.

[12] Sarah Parry-Jones and John Pickford based on Franceys *et al*. (1992), Lewis *et al*. (1980) and Pickford (1995). Source: http://www.lboro.ac.uk/well/resources/fact-sheets/fact-sheets-htm/%23lcsasg.htm.

Shallow Unlined or Lined Latrines

Shallow pit latrines of around 1.5m depth can be constructed relatively cheaply. This may be the best option available to households in areas where latrines are prone to flooding and filling with silt. If land is readily available then an unlined pit would generally be abandoned when it becomes full and the household would dig a new one on their plot. If land is costly, or if the pit is lined, then householders may consider emptying out a pit when it is full. There is obviously a health risk associated with manual excavation and disposal of the contents. However, even if the faeces are not adequately disposed of (i.e. buried), the single point source of pollution of the latrine contents is preferable to the multiple pollution of open defecation.

Aqua-Privy Latrines

An aqua-privy consists of a latrine constructed above or adjacent to a watertight tank which collects the liquid effluent from the toilet. The excreta along with the water which is used for flushing fall into the tank through a vertical pipe. This pipe should extend at least 75 mm into the liquid so that a water seal is formed. In order to maintain the water seal, the fluid level in the tank must be maintained and this requires a bucketful of water each day to compensate for evaporation losses. The overflow pipe should be connected to a soak away, drainage trench or sewer. Since this type of latrine has a very low water usage the volume of effluent discharging from the tank will be small, but the effluent will be very concentrated. The tank needs to be periodically de-sludged and therefore the tank must be provided with removable cover.

10.4.2 Institutional Capacity Building in Sanitation Sector

Institutional capacity building in water sector refers to a road map with three important aspects, viz., i] Institutional reform; ii] Organizational change; and iii] Human Resource development. One major route to building institutional capacity in sanitation sector is to strengthen or reorient the organizations involved in promoting sanitation at the state, district, Ma*n*dal and GP levels. Since the key role of these agencies is to monitor the progress achieved in implementing the sanitation programme at the level of schools/Anganwadis and village households[13], performance monitoring and evaluation remains the key instrument for bringing about the change.

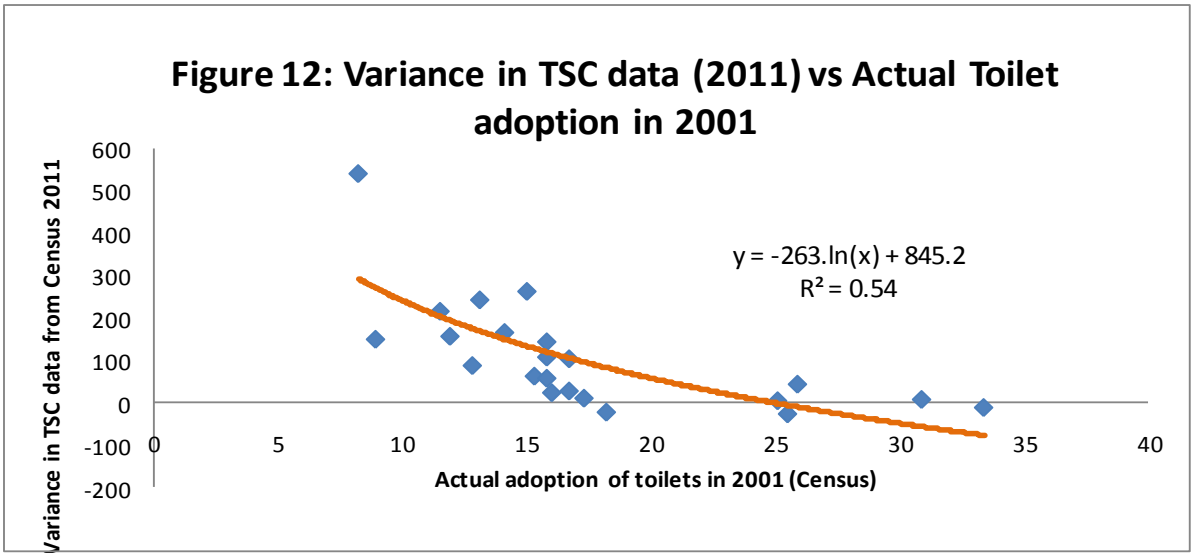
The quality of monitoring currently being done at the level of Panchayats for the TSC appears to be very poor. This is evident from the two emerging facts: 1] wide variations exist between the figures of toilet adoption reported by TSC and that arrived at by Census 2011; and 2] the variation is larger for districts (as high as 542% in the case of Vizianagaram, 264% for Warangal and 244 % for Mahbubnagar) which have comparatively lower level of adoption of improved toilets as per the Census of 2001. The variance is negligible for the districts which had relatively better level of adoption of toilets even as far back as 2001, i.e., before the TSC programme was launched. These are districts which are most likely to have gone for adoption of toilets, without the support of subsidies from TSC. This negative correlation between variance in TSC data from Census (2011) data and the Census (2001) data on improved toilet adoption, which is graphically shown in Figure 12

[13] The other role being that of disbursal of funds down to the level of Gram Panchayat

(R2=0.54), seems to suggest that the data manipulation involved is of higher order when the physical achievements under TSC are reported.

An elaborate administrative structure does exist in the state of Andhra Pradesh which extends from the state to the GP level for executing various activities under the Total Sanitation Campaign. Analysis of this administrative structure reveals two important gaps: the administrative structure is not equipped with adequate number of full-time trained personnel, who are expected to work only on rural sanitation; the objectives, criteria and indicators for monitoring are not clear, and the indicators used for monitoring only consider the physical progress in construction of the physical infrastructure, i.e., latrines. No attention is being paid to the quality of construction, the specifications which need to be followed for construction, particularly those in schools and Anganwadis, the extent of use of toilets and who uses, and hygiene related issues. If these issues are to be addressed, one time monitoring won't help. More importantly, the personnel who are engaged in monitoring should have good understanding of hygiene behaviour of rural households.

Unfortunately, the personnel who are engaged in monitoring of TSC are mainly civil engineers from rural water supply department, who only have engineering focus. Promoting



improved sanitation practices and good hygiene behaviour requires good understanding of sanitation/public health engineering, water-hygiene-health linkages and behaviour sciences. Such expertise is not readily available in the market and even when available is in short supply. Normally, people who have technical background in either water supply or public health engineering or community health and sanitation and who have worked in the social/ developmental sector are ideal for these jobs. But, they mostly work for international organizations such as the UNICEF, Water Aid, Action Aid, DFID and World Health Organization or Indian philanthropic organizations.

Therefore, the monitoring system needs to be improved. A monitoring and evaluation unit needs to be set up in the office of the State Water and Sanitation Mission and should be mandated to carry out periodic and independent monitoring and evaluation of the progress in rural sanitation through the help of independent agencies for the same. The current system in which the village Panchayat secretaries gather data on the adoption of improved toilets has to be abolished as this involves conflict of interest.

10.4.2 Improving the Governance of Water Supply and Sanitation

The governance functions should be clearly separated from management functions. For instance, the same committee (VWSSC), which proposes a scheme from the GP, is responsible for running, once the scheme is implemented in the village. The Panchayati Raj institutions are institutions of local self-governance, and should be allowed to perform those roles. Their inputs should be in framing policies and making rules, and not in executing them. The governance functions can be distributed across the hierarchy starting from the State Water Supply and Sanitation Mission to the Village Water Supply and Sanitation Committee.

Governance of rural water supply and sanitation mainly concerns water supply, water pricing, and investment in water and sanitation infrastructure, including subsidies to promote sanitation. Governance of water pricing is about making rules relating to fixing water prices (norms for fixing prices; who should fix the prices, who should administer the prices and who should have a say in fixing pricing norms). Since there are complex social, economic and institutional considerations involved in framing rules for water pricing, it would be ideal to leave this function to the apex level in the governance structure for water supply and sanitation.

Water supply governance is also about making rules and norms regarding water supply (covering norms & criteria for deciding per capita supplies, duration and frequency of water supply, and quality of water). Since good water supply management should ensure that the water supply norms are user oriented and also known to the users, water supply governance should be left to the local government, i.e., the Panchayat. However, the responsibility of fixing water quality criteria can be left with the highest level of the governance structure in the State, i.e., the State Water Supply and Sanitation Mission. However, the rule on the frequency of water quality monitoring etc. can be framed at the GP level, as water quality problems vary from location to location and the local authorities would be in a better position to gauge the water quality concerns of the locality.

Naturally, governance of water and sanitation infrastructure financing refers to setting rules & norms regarding: the type of infrastructure to be financed in water supply and sanitation sector; preparation of DPRs and cost estimates; who should approve finances; conditions for release of funds for building infrastructure; and infrastructure building performance review process. Since framing such rules call for good understanding of water supply systems, techno-legal issues, finance etc., it would be appropriate to vest the responsibility of rule-making in this regard with the Central Ministry. As is clearly evident from the analysis presented in earlier sections, the infrastructure for water supply should be such that it encourages better sanitation; the sanitation infrastructure being promoted should be ecologically sound, and therefore should be region-specific.

Governance of subsidy will be an extremely important element in sanitation sub-sector. This is in view of the fact that the government of India has already decided to extent the benefit in rural areas to the APL families also, and the amount of financial resources allocated for the same are huge. Governance of subsidies should concern the following: 1] what should be the extent of subsidy?; 2] Who should be given the subsidy?; and, 3] and what should be the terms for distribution of subsidy benefits? Since there are many location-specific factors which decide the eligibility criteria for subsidies, it would be appropriate to leave it to the District level to decide who what should be the extent of subsidy. Here again, the subsidies should be designed in such a way that it factors in the socio-economic conditions of the households, and the region-specific conditions.

Hence, water and sanitation sector would require delegated governance rather than centralized or decentralized governance.

11. Concluding Remarks

The State of Andhra Pradesh has to go a long way in promoting sustainable sanitation in rural areas. The actual extent of adoption of improved latrines by rural households in the 10 selected districts (48%) is less than the estimates provided by Total Sanitation Campaign for these districts (57.3%), with an overall accuracy of 83.7%. But, discrepancies in data are wide in many districts. While in some districts, the estimates of extent of adoption of toilets from primary survey are a little higher than that of TSC, in certain other districts the estimates are much lower than that of TSC estimates.

The condition of the physical infrastructure being used as toilets in rural areas is a major concern, with the superstructure being absent in large number of cases. Less than half of the toilets have proper water supply connection and power connection. The extent of use of toilet however is reasonably high (75%), though variation in the extent of use is found across age groups, caste, gender and class. The prevalence of hand-washing after toilet use was found only in 40% of the members of adopter households, whereas the prevalence of hand-washing (with water alone) before food was found in around 77% of the cases.

The health benefits and privacy & self-esteem appear to be the factors maximum people consider as motivating for adopting an improved toilet. There are some socio-economic factors which drive adoption of improved toilets at the HH level are the economic condition of the family, overall adult literacy, presence of literate females in the family, caste and no. of small children below the age of five. These factors create conditions for households to get motivated for adopting improved sanitation methods. The estimated demand for improved latrines among non-adopters is quite low. However, since nearly 32.6% of the non-adopters do not have any permanent constraints in building toilets, they will become adopters in near future, once the temporary constraints are removed. The key constraints to adoption are poverty, space un-availability and tenancy.

A blanket policy of offering subsidy to every household for constructing toilets will not work for promoting improved sanitation. Household decision to go for a toilet is largely an economic decision of the head of the households along with the female counterparts, which is driven by the perceived benefits of time-saving, improved health, good living standards, protection from vector-borne and water borne diseases and prevention of loss of employment, and the ability to bear the cost of building a toilet. But, these benefits are high under certain conditions, and fully realized under certain other conditions. Therefore, there is a strong need to use economic principles in allocating resources for promoting improved sanitation at the household level. Subsidy for toilet construction would be justified when the earning of the adult members of the family is not good, or the economic condition of the family does not allow investing in a toilet with own money, or the family belongs to a backward caste, but the other 'conditions' such as presence of educated adults and school going children in the family are met.

The negative consequences of lack of proper sanitation would be higher in area with cold and humid climate, heavy soils, shallow ground water table and high flood proneness. The regions, where such negative impacts of poor sanitation are higher and where adoption of improved latrines is poor, need to be targeted for sanitation programmes. By doing such targeting, the benefits and welfare impacts of improved sanitation can be maximized.

As regards institutional capacity building for promoting sanitation, monitoring also needs to be strengthened to efficiently manage rural sanitation campaign. Over and above the need to obtain reliable data on the actual extent of adoption of improved latrines by individual households, it is important to make sure that the households, which seek subsidy benefits, have space close to their

dwelling to construct the toilet. At the next level, monitoring is essential to ensure that the toilets are constructed as per the standard specification to ensure quality of the infrastructure. There is a need for greater coordination between water supply and sanitation sub-sectors in Andhra Pradesh, in view of the strong linkage between water access and sanitation and hygiene practices. The very success in achieving the desirable outcomes from construction of improved latrines, which can come only through proper use of the facility and hygiene practices depend very much on whether the households have good access to water supply.

The IEC interventions cannot alter the socio-economic conditions of the households, which actually determine the opportunity cost of not practicing improved sanitation. It can only change the way some of these costs are appreciated by the members of the households. It is important that the IEC programmes lay stress on outcomes, which are easily perceived and which people can relate to. The economic gains, which the individual households can accrue in the short run, need to be highlighted in such programmes, rather than the welfare gains, which the society at large can accrue in the long run. The IEC materials should be tailor made, keeping in mind the socio-economic profile of the target communities.

As regards the policy, indirect economic incentives and disincentives should be used for promotion of toilets to increase the benefits of adoption and opportunity cost of non-adoption. Besides this, there is a need to strengthen the institutional capacity in the sanitation sector for better monitoring of the implementation of sanitation programmes at the village level.

Finally, water and sanitation sector would require delegated governance rather than centralized or decentralized governance. Sanitation infrastructure financing and 'subsidy provision' are two important elements in governance of sanitation sub-sector. Since framing rules for sanitation infrastructure financing calls for good understanding of water supply systems, techno-legal issues, finance etc., it would be appropriate to vest the responsibility of rule-making in this regard with the Central Ministry, the infrastructure for water supply should be such that it encourages better sanitation; the sanitation infrastructure being promoted should be ecologically sound, and therefore should be region-specific. Since there are many location-specific factors which decide the eligibility criteria for subsidies- what should be the extent of subsidy, and who should be given the subsidy and what should be the terms for distribution of subsidy benefits? --, it would be appropriate to leave it to the District level to decide who what should be the extent of subsidy.

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