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Scoping Exercise to Support Sustainable Urban Sanitation in Tamil Nadu

PRIMARY STUDY REPORT

March 2016

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Abbreviations

BMGF	Bill and Melinda Gates Foundation
BSUP	Basic Services to Urban Poor
CMA	Commissionerate of Municipal Administration
CMWSSB	Chennai Metro Water Supply and Sewerage Board
CPHEEO	Central Public Health Environmental Engineering Organization
CRPF	Central Reserve Police Force
CWSS	Combined Water Supply Scheme
DTP	Directorate of Town Panchayats
DTCP	District Town and Country Planning
EO	Executive Officer
GO	Government Order
GoTN	Government of Tamil Nadu
HH	Household
IIHS	Indian Institute for Human Settlements
ITI	Industrial Training Institute
LPA	Local Planning Authority
MLD	Million Liters per Day
MoC	Memorandum of Cooperation
MoUD	Ministry of Urban Development
MT	Metric Tonne
NH	National Highway
NUSP	National Urban Sanitation Policy
OD	Open Defecation
OHT	Over Head Tank
PSP	Public Stand Post
PVC	Poly Vinyl Chloride
RCC	Reinforced Cement Concrete
RO	Reverse Osmosis
STP	Sewage Treatment Plant
SWM	Solid Waste Management
TN	Tamil Nadu
TNCWW	Tamil Nadu Construction Workers Welfare (Board)
TP	Town Panchayat
TWAD	Tamil Nadu Water and Drainage (Board)
ULB	Urban Local Body
WPR	Workforce Participation Rati

1 Study Background

1 Study Background

1.1 Urban Sanitation in Tamil Nadu

Urban settlements in India are grappling with the challenge of severe deficits along the "full sanitation chain". While public systems in India have historically hailed sewerage as the sole solution for urban households, it is a fact that nearly two-thirds of urban households depend on on-site systems, i.e. septic tanks and pit latrines (Census of India, 2011a). Adequate attention needs to be paid to comprehensive management of human excreta, whether sewage or septage, if the deficits of urban sanitation in India are to be addressed. This has been highlighted in India's National Urban Sanitation Policy (MoUD, 2008), the draft advisory and policy on Septage Management issued by the MoUD, and in the Septage Management Operative Guidelines issued by the Govt. of Tamil Nadu (GoTN, 2014a).

Taking due cognisance of the predominance of on-site sanitation systems in the State, the Government of Tamil Nadu (GoTN) committed to improving urban sanitation in mission mode, and issued the Operative Guidelines for Septage Management across the State in September, 2014. These guidelines underlined the importance of standardizing the design and construction of septic tanks, instituting standard operating procedures for collection and transportation of septage, and implementing possible co-treatment options at the existing under-utilized sewage treatment plants, apart from creating new infrastructure and systems for comprehensive septage management.

The Bill & Melinda Gates Foundation (BMGF) came forward to assist the GoTN in developing and implementing sustainable sanitation solutions for urban Tamil Nadu. The objectives of the Tamil Nadu Sanitation Mission include elimination of open defecation; safe containment, treatment, and disposal of human excreta, so that public health, hygiene and dignity can be achieved for urban households and urban areas in the state. The BMGF signed a Memorandum of Cooperation (MoC) with GoTN for the same, in August, 2015.

With a view to scope the tasks that need to be carried out under the TN Sanitation Mission, including identification of the institutional arrangements and capacities required, the IIHS were commissioned to carry out a scoping exercise (study). This scoping study comprises a secondary review, supplemented with primary data collection in select urban areas, and the conduct of consultations with identified stakeholders; to understand better the situation of sanitation in the urban areas of the State. The State-level analyses are supplemented with primary studies and consultations in two urban locations in the State: a town panchayat cluster, and a municipality.

This is the report for primary study conducted in Pammal Municipality and two Town Panchayats of Periyanaicken-palayam and Narsimhanaicken-palayam in Coimbatore District in Tamil Nadu. It provides a brief profile of these urban locations, with a focus on urban sanitation and water. This study is based primarily on the primary data collection carried out by the IIHS team in 2015, supplemented by secondary sources like Census.

1.2 Project Objectives and Scope of Work

The objectives of the project are:

- Carrying out a situational analysis of urban sanitation in Tamil Nadu (TN).
- Conducting an institutional, financial and legal analysis for sustainable urban sanitation solutions in Tamil Nadu State (and two pilot urban areas).
- Landscaping of key stakeholders, supporters, potential partners for the government's efforts and ongoing initiatives on urban sanitation in TN.
- Facilitating engagement with relevant stakeholders, including, but not restricted to, government officials and community groups.
- Facilitating exposure visits to successful examples of FSM in similar contexts.

- Develop recommendations for high level interventions by the Technical Support Unit that is going to be established by the Govt. of Tamil Nadu.

Building upon secondary study, primary study was be carried out in selected two locations to gain an in-depth understanding of the current arrangements and practices for the full-chain of sanitation-ranging from design and construction practices of on-site sanitation systems to septage collection and waste disposal. This included in-depth interviews with select households, masons and contractors, private business operators, as well as government officials. In addition, an in-depth institutional and financial analysis will be conducted including detailed stakeholder mapping.

1.3 Scope and Structure of this Document

For the Primary Study, the dimensions investigated for the two urban locations, were:

- Different types of toilets, collection / containment structures, and disposal/treatment systems in the two locations, across different settlement types or housing typology
- Decision making process of constructing latrines with septic tanks or other on-site sanitation systems
- Perceptions on functioning of septic tanks and their cleaning 0r de-sludging
- Frequency of de-sludging and expenditure incurred on cleaning the septic tanks
- Concerns or issues of respondents in respect of sanitation and other environmental conditions

First, based on secondary data, and reconnaissance, the team mapped identified the different types of settlement and housing typologies. From each of the significant typologies, different types of household and neighbourhood sanitation arrangements were sought to be covered.

In doing so, a purposive sampling was adopted for choosing study respondents, spread across different on-site sanitation arrangements located in the relevant housing typologies.

The Primary Study used a mix of a map-based reconnaissance, discussions with selected household respondents, and other stakeholders in the Study locations. In addition, observations and documentation of built structures and systems was also undertaken. A semi-structured questionnaire and a direct observation schedule were used.

Household Sanitation Arrangements across Housing Typologies Covered

Table 1-1 presents the distribution of canvassed households across household typologies and with different household sanitation arrangements in Pammal.

Table 1-1: **Distribution of Study Households across building types and sanitation arrangements: Pammal**

Sl. No.	Housing Typology	No. of HHs	Area Name	Ward No.	Sanitation Arrangements
01	Independent houses/villas	2	Pasumpon Nagar	6	Individual Household Latrine, Septic tank connected to soak pit latrine and Septic tank
02	Multi-storey Apartments	1	Shankar Nagar	1	Individual Household Latrine, Septic tank connected to soak pit

Table 1-1: **Distribution of Study Households across building types and sanitation arrangements: Pammal**					
Sl. No.	**Housing Typology**	**No. of HHs**	**Area Name**	**Ward No.**	**Sanitation Arrangements**
03	Plotted development	2	Shankar Nagar	1	Individual Household Latrine, Septic tank connected to soak pit
04	Row housing with no side setbacks	2	Jagajeevan Ram Street	7	Individual Household Latrine, Septic tank
05	Low income houses	4	Shivshankaran Street	7	Individual Household Latrine, Septic tank
					Individual Household Latrine, without Septic tank (Only Soak Pits)
			Thiruvallur Street	5	Access to shared toilet (3 to 4 HHs)
					Access to public toilet
06	Government Housing (BSUP)	1	Thiruvallur Street	5	Individual household toilet, Septic tank
07	Slums	4	Rajiv Gandhi Nagar, Fathima Nagar	1	Open Defecation
Source: IIHS Primary Study, 2015					

The sample comprised respondents from diverse occupations including government service, entrepreneurs, wage labour, etc. With an average household size of five members, 12 respondent households owned the plot of land of which three houses were built 30 to 35 years ago and four houses were built in the range of 4 years to 12 years. Respondents included five men and 8 women.

Table 1-2 presents the distribution of canvassed households across household typologies and with different household sanitation arrangements in the Coimbatore Town Panchayats.

Table 1-2: **Distribution of Study households across various building typologies and sanitation arrangements: Coimbatore TPs.**						
Sl. No.	**Housing Typology**	**Name of the Town**	**No. of HHs studied**	**Area Name**	**Ward No**	**Sanitation Arrangements**
01	Independent houses/villas	Periyanaicken-palayam	2	Seerkali Amman koil street,	4	Twin Pit latrine
				JadalNaidu street	15	Twin Pit latrine

Table 1-2: **Distribution of Study households across various building typologies and sanitation arrangements: Coimbatore TPs.**

Sl. No.	Housing Typology	Name of the Town	No. of HHs studied	Area Name	Ward No	Sanitation Arrangements
		Narsimhanaicken-palayam	2	Ramaswamy Nagar,Surya Nagar	9 & 2	With latrine and cess pit
		Idigarai	1	RamanujaNagar, 2nd street	-	With latrine and septic tank
02	Multi-storey Apartments	Periyanaicken-palayam	1	-	1	With Latrine and Septic tank connected to soak pit
03	Plotted development	Periyanaicken-palayam	2	Ranganathapuram	13	With Latrine and Septic tank connected to soak pit
		Narsimhanaicken-palayam	1	Priya Garden	-	With latrine and septic tank
04	Row housing near the storm water drain	Periyanaicken-palayam	2	Annanagar	7	Public toilets
05	Low income houses	Periyanaicken-palayam	1	Seerkali amman koil street 2	4	Earlier Open Defecation, built toilet one year ago
06	Government Housing (BSUP)	Periyanaicken-palayam	1	Kasthuri palyam	13	With latrine and septic tank
		Idigarai	1	Amman colony	-	Open defecation
07	Slums	Periyanaicken-palayam	4	Vivekanandapuram	1	Open defecation
		Veerapandi (No. 4)	2	Nandawana Nagar, Devinagar	6,10	Public toilets

Source: IIHS Primary Study , 2015

The sample from households comprised of people from diverse occupation like software engineer, labourer, landlord, and driver, a maintenance manager of multi storey apartment and majorly employees of LMW and Pricol industries in Periyanaicken-palayam.

The average household size was 5; one low income household in Periyanaicken-palayam has 9 members in the family. In comparison with households with latrines, Open defecation households tend to be younger, have more children, include more female-headed households, and have less education. The team interacted with an equal number of male and female respondents.

Other Respondents Covered

In both the locations, the team interacted with the following other respondents to collect information on sanitation:

a) **Municipal Officers:** from Pammal Municipality and four Town Panchayats in Coimbatore, were consulted. In addition to the Executive Officers and Elected representatives from these ULBs, the team also interacted with ULB staff, including engineers, sanitary workers, and other staff involved to sanitation, health and related positions.
b) **Cesspool Vehicle Operator:** The team interacted with a private cesspool vehicle operator, operating in and around Pammal. In addition, the team met with representatives from Cesspool Operators' Federation based out of Coimbatore, and active in the Town Panchayats.
c) **Builders and developers**: In both the locations, the team interacted with builders who had executed housing projects ranging from small independent houses to multi-storeyed apartments and layouts, over the last two to three decades that they have been in business.
d) **Masons:** In both the locations, two of three masons each were interviewed . These included those for who this is a family tradition and they are from these areas, as well in a few cases, in-migrant masons from other States.

1.4 Scoping and Limitations

- The current field-study was a scoping exercise and hence, the interactions were structured to understand the different salient features of sanitation structures, practices and key stakeholders. While numbers of interactions are mentioned, these do not purport to be a quantitative survey, and the qualitative nature of findings needs to be kept in view.
- Primary study locations were limited to two areas: near Chennai and near Coimbatore. It is expected that a much larger number of variations in systems and practices across the full chain of sanitation, will be observable once the inquiry is expanded across the State. Even in these two locations though, a large number of interesting practices have been captured. Some generic lessons and challenges can be extracted from these.
- While there is information available from Census and NFHS on physical availability of toilets, there is little information even with ULBs, on de-sludging, conveyance and treatment. These aspects need a comprehensive baseline survey to be conducted.
- The current Study was able to commence the process of consulting masons, builders, de-sludging operators, and other private and non-government agencies involved in urban sanitation in the State, the findings may be treated with caution as detailed discussions are needed to generate options for resolution of some of the difficult issues in practice, e.g. in respect of regulation without adequate infrastructure for deposition of septage, and so on.

2

City Profile of Pammal

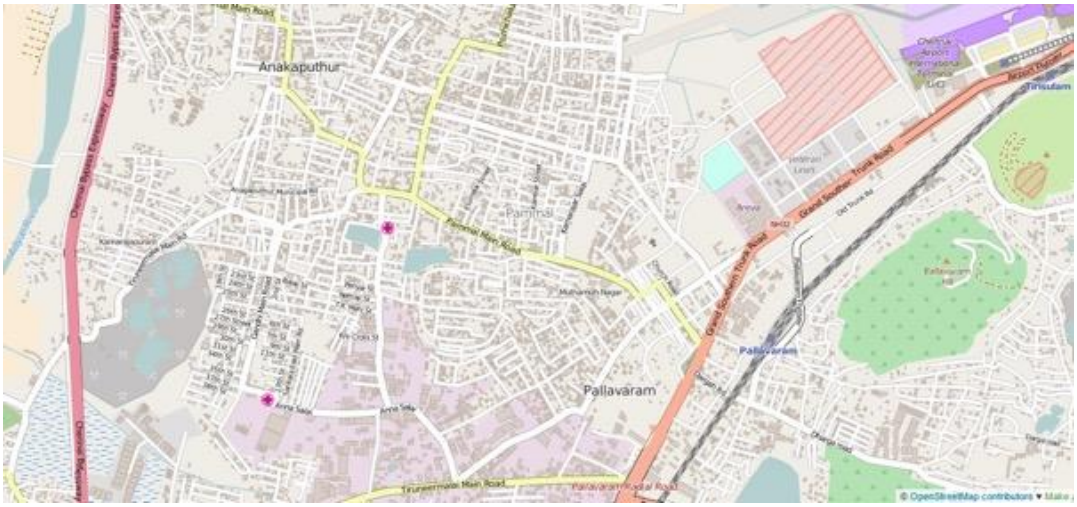
2 City Profile of Pammal

2.1 Location of Pammal

2.1.1 Location and Regional Context

Pammal is located in Kancheepuram district of Tamil Nadu. It is adjacent to the Chennai International Airport and is considered a suburb of Chennai. The town is located next to NH45, which connects Chennai to Tiruchirapalli in the south.

Figure 2-1 **Location of Pammal Town**



Source:(Wikipedia, 2016) and (Map, 2016)

2.1.2 Linkages and Connectivity

Being located next to Chennai, Pammal is well-connected by Road, Rail, and air transport. The town falls between Chennai Bypass Road on the west and Tiruchi Chennai Highway (Irumbiliyur-Muduchur-Oragadam Road) on the east. Pammal Main Road running across the town connects these two highways and the settlements further west, including Periyapanicheri and Kovur. The Tiruneermalai

Road on the southern part of the town, connects Pammal to the popular Ranganatha Temple situated on the Tiruneermalai hill.

Pammal is very well connected with busses to surrounding areas like Pallavaram, Anakaputhur, Tiruneermalai and Pozhichalur. The closest railway station to Pammal is the Pallavaram Railway Station, local trains connecting Chennai and its sub-urban areas and trains going towards Kancheepuram and further south, can be accessed here. Pammal is just 7 km away from the Chennai International Airport operating flights to various parts in India and around the world.

2.1.3 Physiography and Topology

Pammal town is mostly flat with a minimal slope. The areas close to the Chengaluneermalai hill are at a higher altitude.

Plate 2-1 **Chengaluneermalai hill on the western side of Pammal Town**

Source: Photo - IIHS Primary Study, 2015, Map - Pammal Municipality

2.2 Demographic and Socio-Economic Profile of Pammal

2.2.1 Population and Growth

The Census of India, 2011 reported the population of Pammal to be 75,870 (about 19,000 households), and its geographical area as 13.8 sq. km (Census, 2011). The town has witnessed rapid growth in population through the past four decades, as presented in Table 2-1

Table 2-1 **Decadal Population Growth Rates of Pammal and surrounding towns**

Sl. No.	Town/City	1961-71	1971-81	1981-91	1991-2001	2001-11	Population (2011)
01	Chennai	42.8 %	32.7 %	17.2 %	13.1 %	7.0 %	4,646,732
02	**Pammal**	**-**	**207.6 %**	**31.2 %**	**37.0 %**	**51.7 %**	**75,870**
03	Anakaputhur	45.9 %	40.6 %	59.1 %	31.1 %	50.5 %	48,050
04	St.Thomas Mount cum Pallavaram	74.2 %	21.3 %	19.1 %	6.1 %	3.9 %	43,795
05	Meenambakkam	57.0 %	23.4 %	23.0 %	-5.1 %	18.8 %	24,334

Source: Town Directory, Census 2001 & PCA 2011

The average household size in Pammal is a little more than four persons, slightly higher than the average for urban Tamil Nadu at 3.88 (Census, 2011). A tenth of the population is below 6 years of age, similar to the state urban population cohorts. The sex ratio was 998.1, comparable to urban Tamil Nadu's 999.98 (Census, 2011). The sex ratio for population below 6 was 956.9, higher than the overall state urban figure of 951.7 (Census, 2011).

2.2.2 Literacy and Education

Ninety-one per cent of the population of the town above the age of 6 is literate (Census, 2011). The corresponding figure for urban Tamil Nadu is 87 per cent. The male and female literacy rates are also higher than the urban Tamil Nadu average, at 94 and 88 per cent respectively (Census, 2011). The Census Town Directory of 2001 lists 35 schools and one polytechnic in the town.

2.2.3 Social Composition

More than 19 per cent of the population in Pammal belongs to the Scheduled Castes, while 0.16 per cent belongs to the Scheduled Tribes (Census, 2011). The figure for SC population is considerably higher than the overall state urban figure of 14.2 per cent while for STs, the figure is marginally lower than the state figure at 0.38 per cent (Census, 2011).

Adi Dravidas, Paraiyans, Arunthathiyars, Pallans and Adi Andhras were the most prominent scheduled castes in the town, while Kaniyans, Kattunayakans and Irulas were the main scheduled tribes in Pammal (Census Town Directory, 2001).

The Census, 2001 had reported 77 per cent of the town's population being Hindus, while Christians and Muslims made up 12 and 11 per cent respectively, of the population. Tamil is the dominant language in the town, with 93 per cent of the residents speaking the language. Telugu, Urdu and Malayalam are others languages spoken in the town.

2.2.4 Workforce Participation

The workforce participation rate in the town is 43 per cent, marginally lower than the state urban figure of 44.6 per cent (Census, 2011). Male and female work force participation rates are similar to the average urban figures for the state, at 65 per cent and 21 per cent respectively (Census, 2011). About

86 per cent of the workforce is engaged as main workers, comprising 37 per cent of the population (Census, 2011).

Historically, Pammal and its neighboring settlements of Chromepet, Nagalkeni etc., have had a number of leather tanneries. These are reported to have shut down in the last few years.

2.3 In-city Transportation

The Pammal Main Road running between the Chennai Bypass Road and Tiruchi-Chennai Highway; and the Tiruneermalai Road carry the maximum traffic load. Government and private buses run to Chennai (via Pallavaram), Pozhichalur and Tiruneermalai. Auto rickshaws (sharing and private) are also noted as a major means of transportation for people. More than 50 per cent of the households in the town own a motorized two-wheeler, while the percentage of households with a car, jeep or van is 8 per cent (Census, 2011).

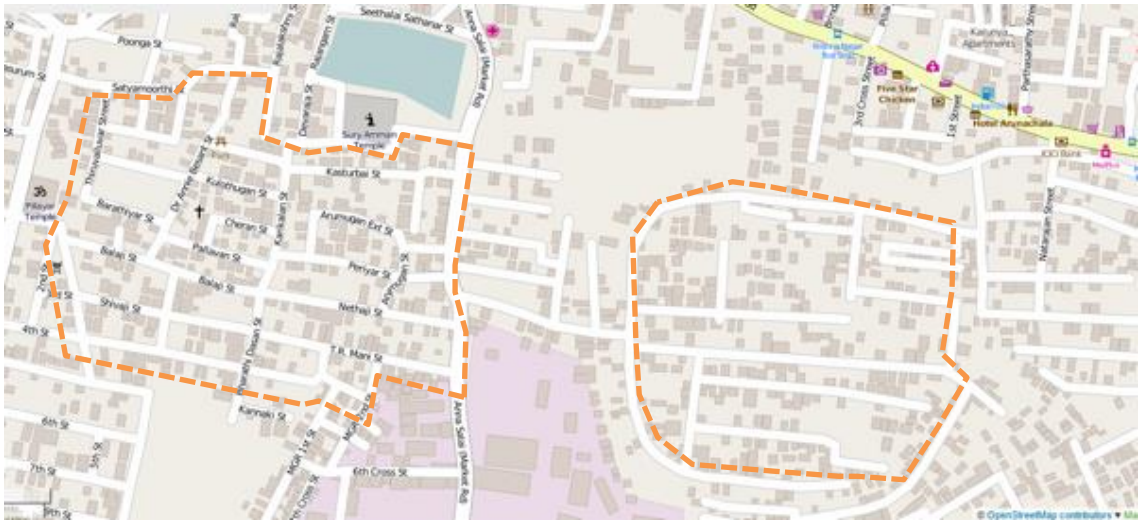
2.4 Settlement Patterns, Housing and Slums

2.4.1 Settlement pattern and Housing Typologies

The northern part of town has low-rise high density stand-alone residential buildings restricted to a height of G+2 floors. The pattern is similar to the southern side of the main Pammal road. Most of the urban poor pockets are as a part of these settlements. The south-western part of town is an organized layout-based development with individual bungalows/villas and apartment. The main commercial establishments are along the Pammal main Road. The southernmost part of the town along the Tiruneermalai Road, houses the industrial areas. The housing typologies across these settlement patterns are described below.

The majority of the housing type in Pammal is low and middle income housing. The areas of VOC Nagar, Bhavani Nagar & Nimnabad areas and most of the other localities house single and double storied permanent buildings in the town. The materials used for construction of these houses are brick and RCC, generally flat roof type. Sometimes small commercial settlements form a part of these houses. The settlement pattern and the housing types are depicted in Plate 2-2 below.

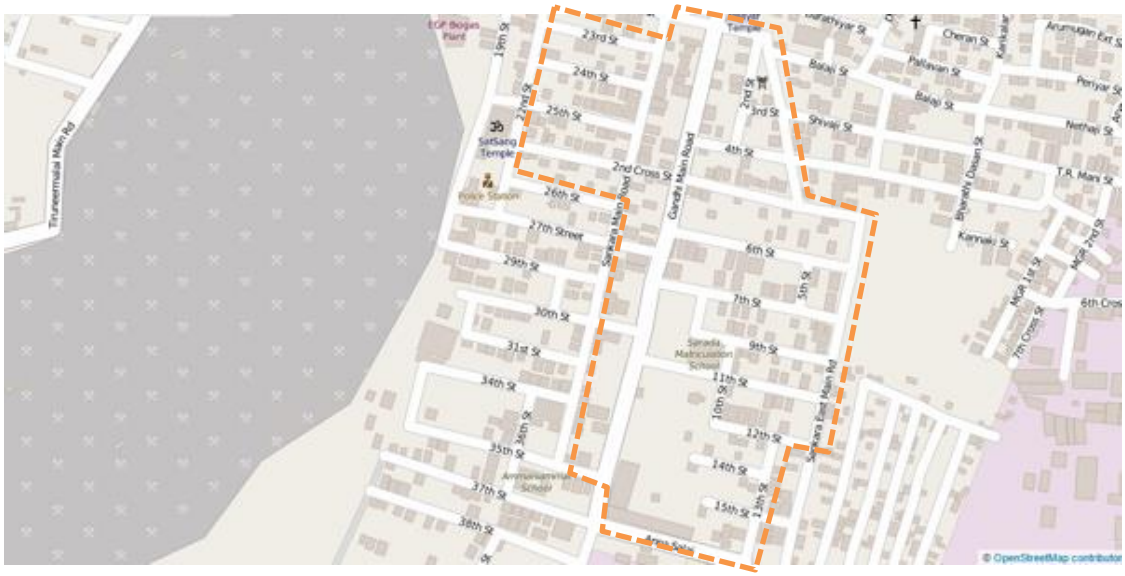
Plate 2-2 **Settlement pattern and Photographs of the low & middle income housing**



Source: Open Street Maps; IIHS Primary Study

The Shankar Nagar area inhabits higher income households in the town. The buildings are generally individual villas or bungalows. There are also large group houses and apartments. The materials used for construction of these houses are brick and RCC, generally flat roof type.

Plate 2-3 **Settlement pattern and Photographs of the high income housing**



Source: Open Street Maps; IIHS Primary Study

Pammal Colony is a congregation of two slum pockets in Ward numbers 5 & 7. The houses are made of single-storied, detached structures that are located without any order. The materials used for the construction of these houses are exposed brick walls and have thatched or pitched roofs. A few houses also have flat RCC roofs and brick walls with very little space between the dwelling units.

Plate 2-4 **Settlement pattern and Photographs of the urban poor**

Source: Open Street Maps; IIHS Primary Study

2.4.2 Slums

More than 17,000 people or approximately 23 per cent of the town's population, live in slums (Census, 2011). The average household size of the slum population is 4.16, higher than the town average. The sex ratio of slums was higher than the figure for the town, at 1013. The type of buildings in slums was presented in the previous section.

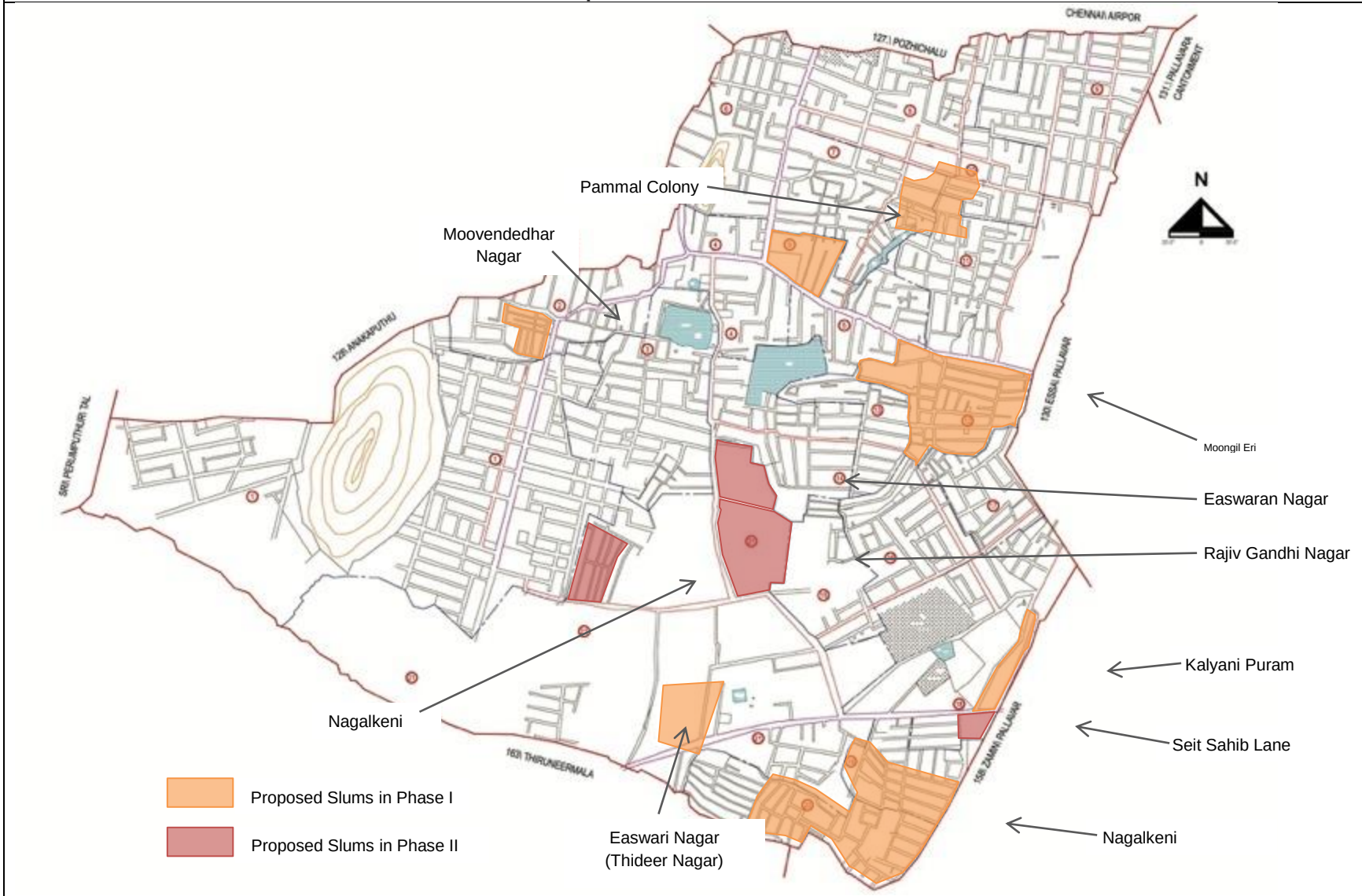
According to the Pammal Municipality, there are 7 notified and four non-notified slums in the town, as presented in Table (2-3) and Map 1.

Table 2-2 **List of Slums in Pammal**

Sl. No.	**Name of the Slum**	**Ward No.**
Notified:		
01	Moovendhara Nagar	2
02	Pammal Colony	5
03	Pammal Colony	7
04	Moongil Eri	12
05	Kalyanipuram	18

Table 2-2 **List of Slums in Pammal**		
Sl. No.	**Name of the Slum**	**Ward No.**
06	Nagalkeni	19
07	Easwari Nagar (Thideer Nagar)	21
Non-Notified:		
08	Easwaran Nagar	14
09	Rajiv Gandhi Nagar	15
10	Seit Sahib Lane	18
11	Adam Nagar	21
Source: Pammal Municipality		

Map 1 Location of Slums in Pammal



Source: Pammal Municipality and IIHS Primary Study, 2015

3 Urban Environmental Services in Pammal

3 Urban Environmental Services in Pammal

3.1 Water Supply

3.1.1 Household Arrangements

More than 80 per cent of households depend on tap water for their needs (Census, 2011). Of these, 51 per cent of households have access to treated tap water, usually public piped water supply. Almost a third of the households have taps but with water coming from untreated sources. This is more than double of the TN urban average for tap with untreated sources.
The other major source is groundwater, which provides water for more than 8 per cent of households.

A comparison between household water supply arrangements between Pammal and the average for urban Tamil Nadu is presented in Table 3-1. While Pammal has a lower physical coverage of taps with treated water, as compared to Urban TN and Urban, its dependency on hand pumps and bore wells is similar to the Urban TN average, but much lower compared to National Urban figures.

Table 3-1 **Comparison of Water Supply Arrangements in Pammal, Urban TN & Urban India**

Sl. No.	Source of Water	Pammal	Urban Tamil Nadu	Urban India
01	Tap water from treated source	50.7 %	66.3 %	62.0 %
02	Tap Water from untreated source	31.3 %	14.0 %	8.6 %
03	Well	4.1 %	4.3 %	6.2 %
04	Hand pump/Tube well/Borehole	10.5 %	12.6 %	20.8 %
05	Surface water sources	0.4 %	0.4 %	0.7 %
06	Other sources	3.1 %	2.3 %	1.7 %

Source: Census of India, 2011

Location of source of water:
About 68 per cent of households in Pammal are reported to access to water supply arrangements within their premises, while 29 per cent have access nearby their household premises. Table 3-2 shows that Pammal households have better physical access than TN urban average.

Table 3-2 **Location of source of drinking water – Pammal and urban Tamil Nadu**

Sl. No.	Location	Pammal	Urban TN
01	Within the premises	68.2 %	54.0 %
02	Near the premises	28.5 %	40.2 %
03	Away	3.3 %	5.7 %

Source: Census of India, 2011

3.1.2 Household Arrangements for potable water

a. Supply from Chennai Metro water

The main source of drinking water supplied by Pammal Municipality is from a Combined Water Supply Scheme (CWSS) from Alandur, by the Chennai Metro Water Supply and Sewerage Board (CMWSSB, or Metro water). Water is supplied once in 6 days for 2.5 hours only. Municipal officers estimate a supply of 50 lpcd from this source.

At present, there are 10,189 house service connections (HSCs), 15 commercial and 19 industrial water supply connection in the town. Ward No. 3 has the highest number of house service connections (806) in the town. (cf. Annexure 3 for ward-wise water connections).

b. Supplementary Public Provisioning

Since the supply of drinking water under CWSS is intermittent (once in 6 days), to facilitate regular drinking water supply, 619 public stand posts (PSPs) are provided at various locations in the town for to supply drinking water to the people who cannot afford to have a house service connection (Refer to Annexure 3 for a ward-wise list of PSPs).

Mini power pumps connected to Reverse Osmosis (RO) plants with storage tanks, have been installed in Pammal (cf. Annexure 3). In this arrangement, water drawn from the bore well through submersed pump is connected to the RO plant and the treated water is stored in a PVC tank (1000 lit capacity) and users draw water from it.

Plate 3-1 **Public Stand Posts delivering drinking water in Pammal**

Source: IIHS Primary Study, 2015

There are 25 such installation across the town (refer to Annexure 3 for ward-wise details), especially close to the urban poor settlements. The pumps are operated by the local residents themselves and use them on need basis.

3.1.3 Household Arrangements for non-potable water

a. Self-Supply

Due to limited and intermittent municipal water supply, many households have private open wells or bore wells within their premises.

b. Supplementary Public Provisioning (Mini power pumps, Hand pumps & Municipal Wells)

Pammal Municipality has also made arrangements of water for non-drinking purposes such as bathing, washing, cleaning etc. The main sources of such water are from the mini power pumps. In addition, there are hand pumps and few public wells too. There are 105 mini power pumps connected to storage tanks (2000 lit capacity) and public taps whence people collect water. These pumps are operated by the residents on need basis, in general, installations near urban poor settlements are operated about 10 times in a day and the other for about 2 to 3 times.

Plate 3-2: **Mini Power Pumps for Non-potable Water in Pammal**

Source: IIHS Primary Study, 2015

There are 142 hand pumps and at various locations in the town and two municipal well which are seasonally operated (during monsoon). While in use, water from these wells is pumped to about 80 PSPs across areas in and around Shankar Nagar and Nagalkeni.

Plate 3-3 **Hand Pumps in Pammal**

Source: IIHS Primary Study, 2015

City Level Water Infrastructure

The main source of water to this scheme is from the Chembarambakkam Lake. Though treated water is supplied, for additional safety, water is further disinfected using iodine and chlorine at the storage sump (1 MLD capacity) situated in HL colony in Pammal regularly. Water is pumped in to three overhead tanks in the town serving to three water zones. Since it is a combined water supply scheme, water is pumped to the adjacent town of Anakaputhur from the same sump. Table 3-3 and Map 2 presents details of storage infrastructure and distribution zones in Pammal town.

Table 3-3 **Water Storage Infrastructure and Distribution in Pammal**

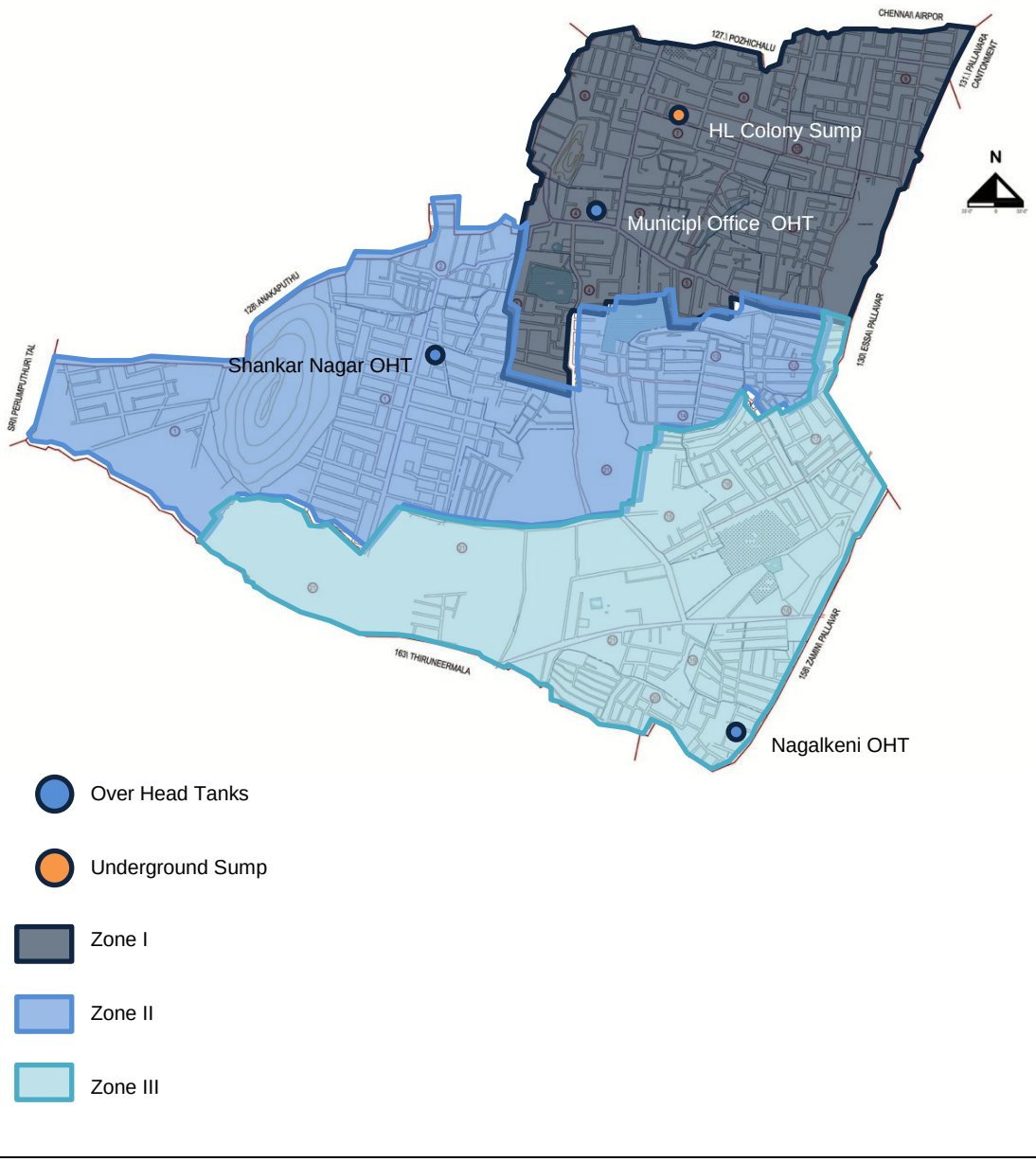
Sl. No.	Location of OHT	Capacity	Zone	Wards covered
01	Municipal Office	0.3 MLD	1	4, 5, 6, 7, 8 9, 10, 11 and parts of 3 & 12
02	Shankar Nagar	0.3 MLD	2	1, 2, 3, 13, 14 and parts of 3, 12, 17 & 21
03	Nagalkeni	0.15 MLD	3	15, 16, 18, 19, 20 and parts of 17 & 21

Source: Pammal Municipality

Plate 3-4: **Shankar Nagar OHT (0.3 MLD) in Pammal**

Source: IIHS Primary Study, 2015

Map 2: **Water Zones and Water Storage Infrastructure**



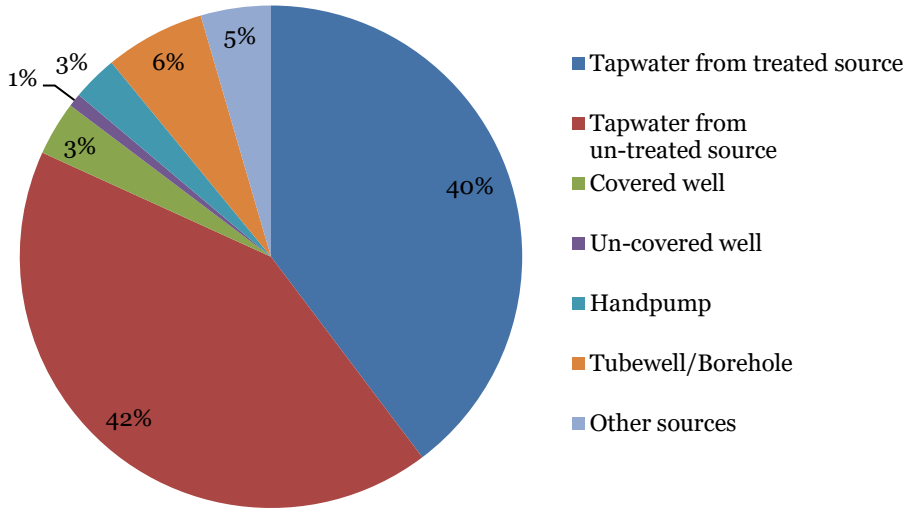
Source: Pammal Municipality and IIHS Primary Study, 2015

Discussions with municipal officers indicate that the overhead storage tanks are filled 3 to 4 times in a day indicating about 2.25 to 3 MLD of water being put in to distribution.

Water Supply in Slums:

The major source of water in the slum settlements in the town, is through the piped water supply provided by the Municipality. However, more than half of the water from piped supply is from an un-treated source. A few households depend on underground water sources like tube wells, hand pumps and wells.

Figure 3-1 **Source of water in Slums**



Source: Census of India, 2011

3.1.4 Water Tariffs

Pammal Municipality provides water service connections to households, establishments, institutions and industries from drinking water under the (CWSS) after paying a fixed one-time connection charges. Thereafter, a monthly user fee is levied for the usage of water. This is a flat rate since there is no metering. The details of connection charges and monthly water supply charge are presented in Table 3-4.

Table 3-4 **Water Supply Connection Costs in Pammal**

Sl. No.	Type of Connection	Connection Charge (Rs.)	Monthly User Fee (Rs.)
01	Household	7,500	50
02	Commercial	10,000	100
03	Institutional	10,000	100
04	Industrial	12,500	150

Source: Pammal Municipality

Public water supply i.e. public stand post (under CWSS), purified water from mini power pumps with ROs for drinking purposes, and non-potable water from mini power pumps and wells, are all provided free of cost by the municipality.

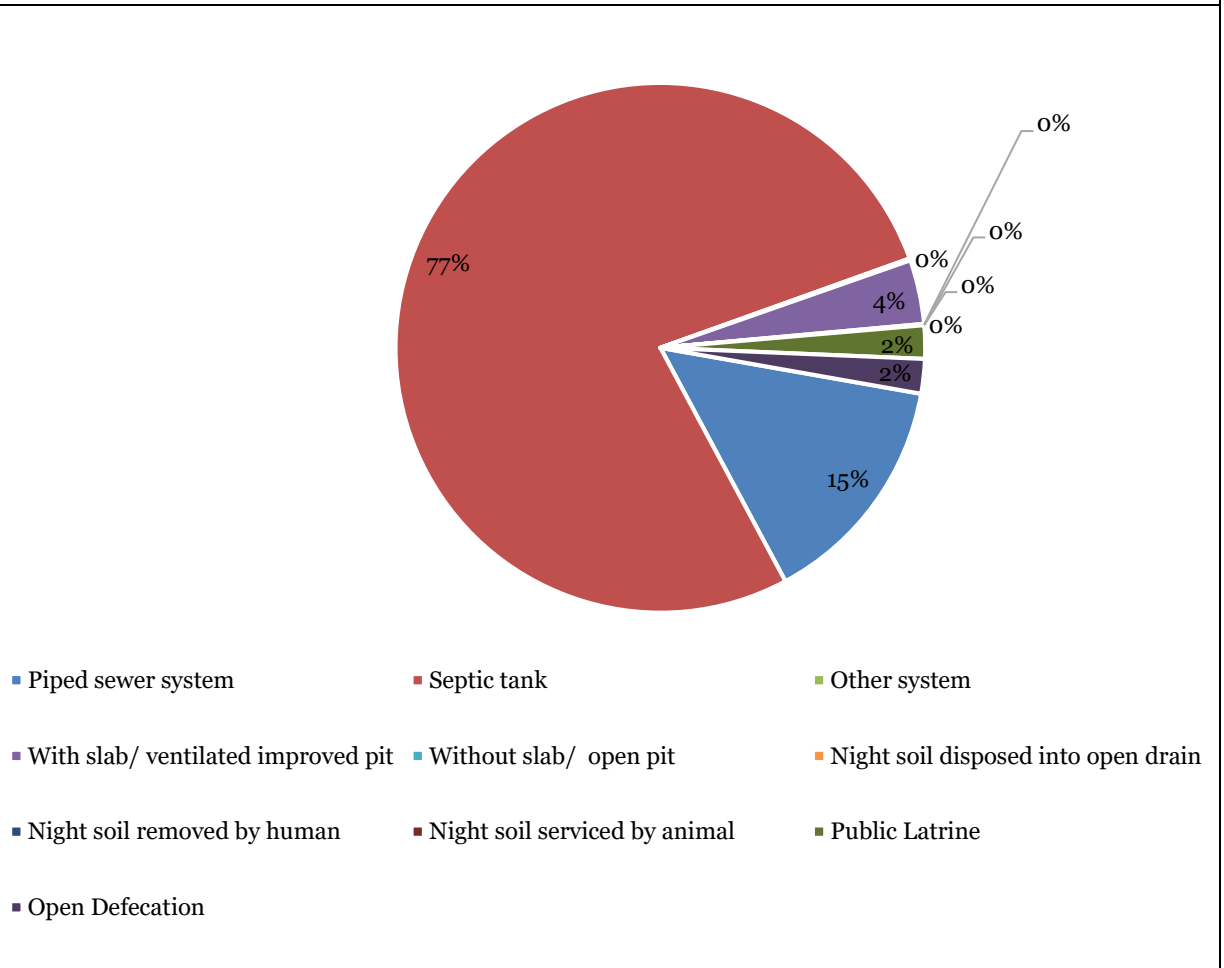
The water charges from the service connections are paid by the users at payment windows at municipal office operated by the revenue section. Typically, users pay once in 6 months or annually along with the Property Tax. Municipal officers reported the recovery rate of water supply charges is about 80% annually.

3.2 Sanitation

3.2.1 Household Arrangements

About 96 per cent of households in Pammal report having an individual household latrine within their premises. Almost 92 per cent of households have a flush or pour/flush toilet, with the majority 77 per cent depending on "septic" tanks (Census, 2011). Though Census reports that 14 per cent of households are connected to a piped sewer network, the primary study does not validate this claim. Figure 3-2 presents household sanitation arrangements in Pammal.

Figure 3-2: **Household Sanitation Arrangements in Pammal**



Source: Census of India, 2011

Slum Sanitation:

About 88 per cent of slum households in Pammal have access to a latrine within their premises (Census 2011). Of the remaining 12 per cent, 8 per cent of households rely on public latrines while four per cent resort to open defecation (Census 2011). Amongst households with latrines, the most predominant arrangement is the use of "septic" tanks – 61 per cent of slum households report having these structures.

A comparison of sanitation arrangements in Pammal, with urban TN and urban India averages, presented in Table 3-5, shows that Pammal households have higher proportion of physical access to individual households, "septic" tanks being predominant, a lower incidence of open defecation or use of public latrines. The Primary Study showed however near-absence of sewerage and perhaps a mis-classification of toilets of other categories into this – that could also explain a small proportion of pit latrines being reported. These are discussed later.

Table 3-5 : **Comparison of Sanitation Arrangements between Pammal, Urban TN & Urban India**

Sl. No.	Sanitation Arrangements	Pammal	Urban TN	Urban India
01	Latrine within premise	**95.9 %**	75.1 %	81 %
02	No latrine within premise	4.1 %	24.9 %	19 %
03	Piped sewer system	14.4 %	27.4 %	33 %
04	Septic tank	**77.4 %**	37.9 %	38 %
05	Other system	0.1 %	1.1 %	2 %
06	With slab/ ventilated improved pit	3.9 %	6.6 %	6 %
07	Without slab/ open pit	0.1 %	0.3 %	1 %
08	Night soil disposed into open drain	0.0 %	1.5 %	1 %
09	Night soil removed by human	0.0 %	0.2 %	0 %
10	Night soil serviced by animal	0.0 %	0.2 %	0 %
11	Public Latrine	2.0 %	8.6 %	6 %
12	Open Defecation	2.1 %	16.2 %	13 %

Source: Census of India, 2011

3.2.2 Household Arrangements in Study households

a. Households with individual toilets

Independent houses have built latrines either as attached to the bedroom inside the house, or as attached / separate structures. Out of 13 households studied, 8 have such attached toilet facilities. Some have built toilets outside the house but within the premises which according to them is to cater to even visitors or guests. Five houses have such latrines within the premises, whereas two houses (Pasumpon Nagar) have both attached toilet and a common toilet for guest within the premises. Only one of the low income houses (Thiruvallur street) had a latrine outside the premises. The latrines are mostly Indian Pan type with pour flush arrangements. Only two houses had western-type toilets with cistern flush.

All the eight houses with individual latrines have septic tanks to collect sewage, and seem to be working condition. More about their structure is discussed in the later section.

Since all the latrines were built during the construction of house some time ago, respondents were unable to recall the cost break-down separately for the toilet. One of the respondents who built the attached toilet recently, reported having spent Rs. 10,000- 15,000 on the western water closet/cistern, with an additional Rs.5000 to provide a pipeline connecting the western closet to Septic tank.

b. Households sharing toilets

The shared toilets are more prevalent in houses that are rented. The tenants are unhappy with this since the owners have individual toilets for their houses. Tenants also express concerns about cleaning arrangements for these shared toilets.

Plate 3-5: **Shared Toilet in Pammal**

Source: IIHS Primary Study, 2015

In Bhavani Nagar, near NSK Street, Ward No 13, a respondent has built four houses 15 years ago within a single plot and has two toilets within the premises which are shared by all the four households. The toilets are Indian type pour flush system connected to septic tank. Last year, the Government has built Namma Toilet in front of her house but this was not acceptable to them. In order to avoid viewing the users of Namma Toilet and the odour she raised a wall in front of her house.

c. Households dependent on public toilets

About 300 households depend on public toilets, according to ULB estimates. There are seven Public toilets in Pammal - six of these also have a bathing facility (except Bajana Koil Street Public toilet). These Public Toilets have four seats each for men and women and one for children. Water supply is adequate in all the toilets. User fee is collected in one of the public toilets in Bajanai Koil Street. Refer to Annexure 3 for details.

Box 1 Namma Toilets Users: a case from Pammal

Shivashankaran Street has two houses which depend on Public toilet at Bajanai Koil Street. The respondent from one of the house expressed her inability to afford constructing a toilet in her house. The house is 35 years old passed on by her grandparents to her. The household size is 7 with three children under the age group of 12 years and two each of male and female members. Her husband is a daily wage labourer who is the single earning member of the family. A sanitary worker taking care of a public toilet in Ward No. 7 says that about 150 people use the toilet. He cleans it twice a day. The major problem they face are that there are set of miscreants who get drunk at night and come and damage the property by breaking doors or stealing metal parts to sell them off.

Source: IIHS Primary Study, 2015

d. Open defecation

Rajiv Gandhi Nagar and Fathima Nagar are two notified slums where respondents reported that they defecate in the open. The residents of Fathima Nagar defecate in the vacant land under the Chennai bypass Flyover. The residents of Rajiv Gandhi Nagar use the vacant land near the old quarry of

Chengalneer Hills to defecate. The average time taken to go to the open defecation site one way is 15 minutes. The main reason reported for not possessing and using a toilet, was that these households cannot afford the cost of construction. The other reason is irregular water supply in Rajiv Gandhi Nagar where water is supplied once in 10 days. These household are willing to use public toilets provided there is regular supply of water.

One of the most common problems stated by respondents, included the waiting period to avoid the presence of passerby which is difficult near the crowded Chennai bypass; and the large presence of construction workers mostly men, as there are buildings under construction in the vicinity.

One respondent who in a rented house claimed that the there are many houses without toilets are built and rented out yet the owners would have toilets in their houses. All the respondents said that they did not carry water for cleaning purpose, but would return home and wash in the Bathrooms.

Probing further on the health issues indicated that they were not aware of any illness related to open defecation and only acknowledged that it was unhygienic. They are not willing to construct toilet citing affordability constraints, and are expecting the Government to come forward and build toilets.

3.2.3 Types of Septic Tanks

According to Census 2011, 77 per cent of households have “septic: tanks. From field observations the predominant on site sanitation system seen is septic tanks. The design of septic tanks submitted to the municipality along with building plans for approval; conform to the standards as prescribed in Central Public Health Environmental Engineering Organization (CPHEEO). However, during construction, several modifications are made.

Based on the team’s interaction with the Building Inspector, builders, residents and local Masons, during our site reconnaissance, septic tanks can be classified into different sub-types, as presented in Table 3-6.

Table 3-6 : **Types of septic tanks**

Sl. No.	Type	No. of Chambers	Water tightness	Outlet arrangements
01	Type I	Single chamber	Water tight	No outlet
02	Type II	Single chamber	Water tight	Soak pit
03	Type III	Single chamber	Porous	Percolating to ground
04	Type IV	Double	Water tight	Soak pit
05	Type V	Double	Porous	Percolating to ground
06	Type VI	Double	Water tight	No outlet
07	Type VII	Triple	Water tight	Soak pit
08	Type VIII	Triple	Porous	Soak pit

Source: IIHS primary study 2015

Figure 3-3: **Illustration and Description of Type of Septic Tanks**

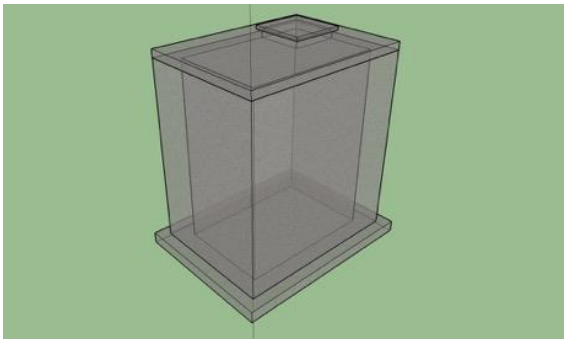
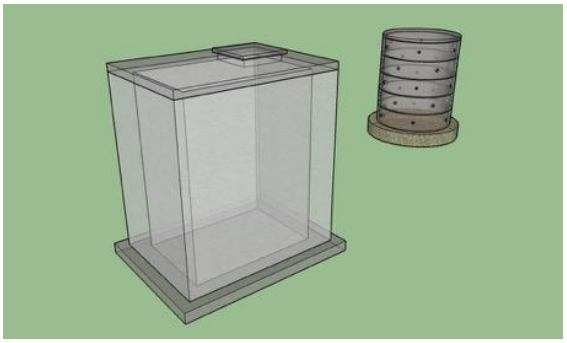
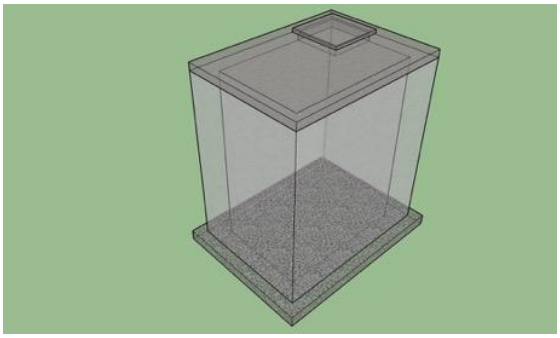
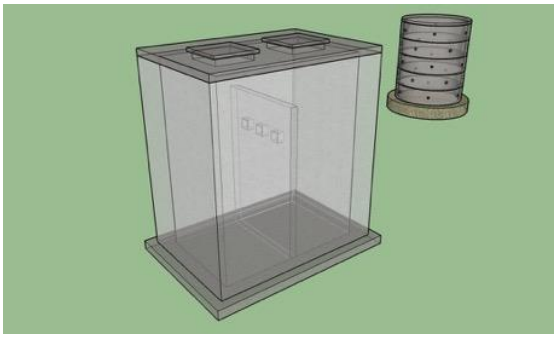
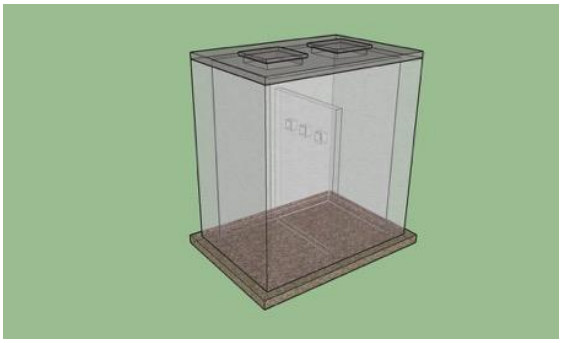
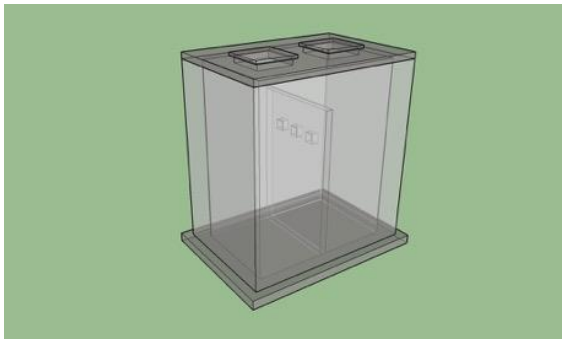
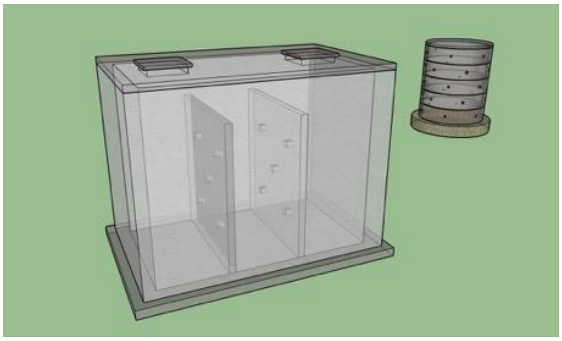
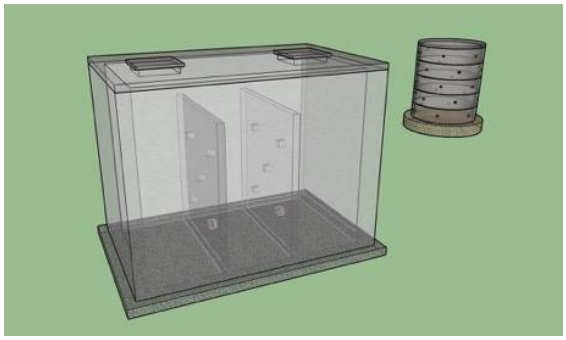
Type 1:	Type 2:
	
Dimension (LxBxD): 6'x 4'x 8' Chambers: 1 Base: Non-Porous Walls: Non-Porous Top Slab: RCC Access Cover (Y/N): Yes Soak Pit: No Other details: Generally noticed in single or double dwelling units (middle income group)	Dimension (LxBxD): 6'x 4'x 8' Chambers: 1 Base: Non-Porous Walls: Non-Porous Top Slab: RCC Access Cover (Y/N): Yes Soak Pit: Yes (4'dia & 5'deep) Other details: Generally noticed in single or double dwelling units (middle or high-income group)
Type 3:	**Type 4:**
	
Dimension (LxBxD): 6'x 4'x 8' Chambers: 1 Base: Porous Walls: Porous or Non-Porous Top Slab: RCC Access Cover (Y/N): Yes Soak Pit: No Other details: Generally noticed in single or double dwelling units (low and middle income group)	Dimension (LxBxD): 8'x 5'x 10' Chambers: 2 (partition wall at the center with holes) Base: Non-Porous Walls: Non-Porous Top Slab: RCC Access Cover (Y/N): Yes Soak Pit: Yes (4'dia & 5'deep) Other details: Generally noticed in single or double dwelling units (middle or high income group)

Figure 3-3: **Illustration and Description of Type of Septic Tanks**

Type 5:	Type 6:
	
Dimension (LxBxD): 8'x 5'x 10' Chambers: 2 (partition wall at the center with holes) Base: Porous Walls: Porous or Non-Porous Top Slab: RCC Access Cover (Y/N): Yes Soak Pit: No Other details: Generally noticed in single or double dwelling units (low and middle income group)	Dimension(LxBxD): 8'x 5'x 10' Chambers: 2 (partition wall at the center with holes) Base: Non-Porous Walls: Non-Porous Top Slab: RCC Access Cover (Y/N): Yes Soak Pit: No Other details: Generally noticed in single or double dwelling units (middle and high income group)
Type 7:	**Type 8:**
	
Dimension (LxBxD): 12'x 7'x 10' Chambers: 3 (two partition walls with holes) Base: Non-Porous Walls: Non-Porous Top Slab: RCC Access Cover (Y/N): Yes Soak Pit: Yes (4'dia & 5'deep) Other details: Generally noticed in multiple dwelling unit buildings (group houses) or Bungalows/Villas (middle or high income group)	Dimension (LxBxD): 12'x 7'x 10' Chambers: 3 (two partition walls with holes) Base: Porous Walls: Porous or Non-Porous Top Slab: RCC Access Cover (Y/N): Yes Soak Pit: Yes (4'dia & 5'deep) Other details: Generally noticed in multiple dwelling unit buildings (group houses) or Bungalows/Villas (middle or high income group)

Source: IIHS Primary Study 2015

Though there are standards prescribed for design and construction of septic tanks by CPHEEO and the BIS, considerable divergences are observed in practice. Table 3-7 presents the differences in terms of structural masonry, septic tank size and design, and disposal systems.

Table 3-7 : **Design Norms vs Construction in Practice of Septic tanks**

Sl. No.	Aspects of Septic Tank	Standard Design Norms	Observed construction practice
01	Structural Masonry	Septic tank functions as a solid – liquid separation tank which should hold sewage for about two days. The supernatant is to flow out and the solids to settle down and thicken at the bottom so that it can be removed after two to three years. As per CPHEEO standards, it is recommended that the septic tank should be constructed using cement concrete with water proofing. This is to avoid percolation by achieving water tightness.	Households prefer to just construct support walls and plain Cement Concrete plinth with a bed 40mm coarse aggregates (a mixture of sand, rubble and crushed stones) at the bottom. This practice, according to local mason's, facilitates prolongs de-sludging since the sewage percolates in to the ground due to the absence of water proofing.
02	Septic Tank Size and Design	As per CPHEEO standards, the size of septic tanks is to be determined based on the household size and desired de-sludging frequency,	In practice, masons and builders oversize the septic tanks. The Study revealed that the size of the septic tank is a function of financial capability, space availability and the imperative to avoiding frequent de-sludging. Hence, households prefer to have larger and deeper septic tanks built if they can afford it, and have sufficient space. According to masons, client households seek to minimize the recurring cost of de-sludging the septic tanks. Hence, masons build bigger sizes without bottom lining, to make way for percolation.

Table 3-7 : **Design Norms vs Construction in Practice of Septic tanks**

Sl. No.	Aspects of Septic Tank	Standard Design Norms	Observed construction practice
03	Disposal Systems	There are two types of wastes generated in septic tank 1. Liquid effluent which comes out of outlet every day; 2. Settled solids in the form of sludge that needs to be removed once in two or three years. For the liquid effluent, treatment is deemed appropriate by methods like soak pits or dispersion trenches with the caution that these sub-soil dispersion systems shall be at least 20 m away from any drinking water source. The distance between the soak pit and adjacent dwelling is recommended to be at least 7 m to avoid any corrosive effect due to tank gases vented into atmosphere. Sludge needs to be emptied by mechanical vacuum tankers and should be sent for further treatment at sludge treatment units at sewage treatment plants or appropriate septage treatment facility. For this regular de-sludging, access covers need to be provided.	For liquid effluent, two categories of arrangements are observed in practice: 1. With outlet: earlier, septic tank outlets were let into storm water drains. Now, the Municipality has attempted to ensuring that all the outlets are sealed, and the drains only receive sullage i.e. kitchen and bathroom wash water 2. Soak pits: outlets of septic tank are connected to soak pits in few buildings. Masons report providing soak pits at a distance of 10 feet from the septic tank and 20 feet away from the bore well in each house. De-sludging is not reported to be done at regular intervals, and access covers are not provided in all the buildings including in establishments. The tank is covered with an RCC slab and whenever there is a backflow of sewage in toilets, the concrete slab is broken open - enough to let the vacuum pipe inside the tank for cleaning, and the hole is closed again with concrete. The reason for such construction practice is explained as avoiding sewage overflow and breeding of mosquitoes.

Source: CPHEEO, IIHS Primary Study 2015

Plate 3-6: **Typical Household Septic Tank in Pammal**

Source: IIHS Primary Study, 2015

The Table 3-8 below shows the details on the type of septic tanks observed during the household survey.

Table 3-8 : **Summary of on-site systems observed through household survey**

Sl. No.	Household No.	Household Size	Age of the Building (years)	Shape of Septic Tank	Size of Septic Tank (cum)	No. of Chambers	Water tight Base (Y/N)	Openable Access Cover (Y/N)	Outlet	Frequency of Desludging (Yearly)	Last Cleaned
01	H1	15	10	Rectangular	10	2	N	Y	Soak Pit	Twice	6 months ago
02	H2	7	4	Rectangular	17.1	2	N	N	No Outlet	Not Required	-
03	H3	6	5	Rectangular	Could not determine as the septic tank was sealed underground and the respondent didn't know any details				-	-	-
04	H4	3	30	Rectangular	8.3	1	N	Y	-	-	2 years ago
05	H5	2	20	Rectangular	3	1	Y	Y	Soak Pit	-	1 year ago
06	H6	2	30	Rectangular	-	1	Y	Y	No Outlet	-	-
07	H7	6	12	Rectangular	5.7	2	-	-	No Outlet	-	1 year ago
08	H8	4	-	Rectangular	20	2	Y	N	No Outlet	-	-

Note: All households surveyed were single storied buildings (only ground floor)

Source: IIHS Primary Study 2015

Table 3-9 : **Summary of construction practice by builders and masons**

Sl. No.	Respondent	Number of buildings executed	Dimensions (LxBxD)	Avg. Capacity of Septic Tank (cu. mt.)	Water Tight		No. of chambers	Design of Partition Wall	Access covers	Outlet	Avg. Cost
					Side Walls	Bottom					
01	Builder 1	12	8'x 4'x 6'	6	Provided	Provided	3	5 Holes on the 2nd wall	One	To soak pit	` 50,000
02	Builder 2	300	Varies	10 to 12 HHs – 10 cu. mt. 4 HHs – 4 cu. mt.	Provided	provided	1	Not applicable	Some sealed some have openable cover	Depending on client's affordability, soak pit will be provided	` 65,000 to 75,000

Table 3-9 : **Summary of construction practice by builders and masons**

Sl. No.	Respondent	Number of buildings executed	Dimensions (LxBxD)	Avg. Capacity of Septic Tank (cu. mt.)	Water Tight		No. of chambers	Design of Partition Wall	Access covers	Outlet	Avg. Cost
					Side Walls	Bottom					
03	Mason 1	90	7' x 4'x 10'	8	Provided	Not provided	2	5 Holes on the 2nd wall	Some sealed some have openable cover	To soak pit	` 70,000 (incl. Soak Pit)
04	Mason 2	150			Provided	Not provided	2	5 Holes on the 2nd wall	Some sealed some have openable cover	Depending on space availability, soak pit will be provided	
05	Mason 3	15	9' x 10' x 9'	23	Provided	Not provided	1	Not applicable	Some sealed some have openable cover	Depending on space availability, soak pit will be provided	Was a part of the building cost (difficult to give separate cost)

Notes: All septic tanks are constructed in rectangular shape

Source: IIHS Primary Study 2015

The Tables (4-8, 4-9 & 4-10) above show that there are considerable differences between the standards and designs prescribed, and what obtains in practice on ground. A number of local factors, and perceptions and beliefs, appear to be playing a key role in driving practices that need to be analysed further. These are re-visited again in the section describing the Coimbatore Town Panchayats.

3.2.4 Transportation of Septage

Septage from households is collected and transported by a private operator. There are three de-sludging vehicles with capacities of 10,000 to 12,000 liters each, fitted with a 24 HP pump for vacuum suction. A driver and a worker each are deployed for each of the vehicle to carry out the de-sludging operations. Each vehicle is reported to have carried out three to four de-sludging operations in during rainy days and two to three in dry season. According to the operator, the usual de-sludging frequency varies from three to four years among households. The fee charged per trip varies between `1,200 and 1,800 depending on the size of the septic tank. The trip length was reported to be about 25 km.

The capital cost of the vehicle is about `20 lakh[1]. The vehicle is bought with open chassis and the holding tank and the suction machinery is built locally.

[1] Based on IIHS team's interaction with the local private cess-pool operator

Box 2: Desludging practice in a Community Hall

L C Mahal a community hall in Pammal can accommodate 350 people at a time and has 12 toilets. The manager of the hall reported that after every two marriage events, the septic tank needs to be emptied and this is usually once in a week during marriage season. The private cesspool operators (DMT Transport) are called for desludging the tank. They pay about ` 2,000 per trip and emptying the tank requires four to five trips.

While the closest STP assigned for de-sludging operators to use for emptying, is located about 25 km away, a number of difficulties are reported in successfully transporting and emptying the septage loads into these STPs. Therefore, there has been reportage of informal emptying in non-designated areas, drains and grounds, in and around Pammal. These reports need to be ascertained, and underlying factors studied in detail.

3.2.5 Treatment of Septage

At present, there are no facilities available for septage treatment in Pammal, and the nearest STP assigned for emptying septage is at Perungudi which is about 15km far.

Some innovations have been however tried out in some locations.

Box 3: Household Level Initiative for effective management of Septic Tank

A resident of Pammal, X, has built an excellent Green Home which has earned wide acclaim. This is a zero-waste home, where everything from solid kitchen waste to wastewater is put to good use.

A septic tank in the garden receives septage and is treated with bacteria called *Bacillus subtilis*, that neutralises the sewage to turn waste into manure for plants in the garden.
Species Canna Indica has been planted to phytoremediate the sullage water mainly the water from washing and bathing to remove soap and other solids. According to X, Canna and Colacasia digest soap and later provision should be made for percolation so that water does not stagnate in one place which forms the major source of mosquito breeding. Under the drainage pipe, he has buried some worms that not only digest the organic matter but also feed on the mosquito eggs. He practices rain water harvesting by installing percolation pits and has made provision for collection of rain water from roof top to his open well in the year 2002.

3.3 Solid Waste Management

Solid waste management is carried out by both municipality and a private agency in the town. Pammal Municipality manages only 5 out of the 21 wards in the town (Ward Nos. 7, 8, 9, 10 & 11) and the other 16 wards are managed by the private agency. At present, no user fee is separately charged by the Municipality for solid waste management.

a. Collection and Conveyance

In the municipal solid waste management system, the waste is collected through door to door collection system. Tricycles are used for collection of waste from households. Two sanitary workers are deployed for each tricycle to collect the waste from households and carry out street sweeping in parallel. Waste from the tricycles is loaded in to lorry or tractors and is transported to the treatment plant/ disposal site. (Cf. Annexure 3 for list of vehicles and tools available with the ULB for solid waste management).

Plate 3-7: **Vehicles used for solid waste collection in Pammal**

Tricycles for collecting door to door waste

Tractor for collecting waste from tricycles, street sweeping and drain cleaning waste

Source: IIHS Primary Study, 2015

In addition to door to door collection, the municipality has also placed 60 community bins across the town at various commercial spaces, markets, main roads etc. to collect solid wastes. These bins are 750 kg capacity made out of metal, that can be lifted and transported by the refuse collector vehicle operated by the municipality.

The ULB officials estimate solid waste generation of 45 tonnes per day. About 40 tonnes is collected every day, 10 by municipal staff and the rest by the private player.

b. Treatment and Disposal/Re-use

Treatment of solid waste is carried for a small portion of solid waste collected; only 5 MT of the total waste collected in a day is treated at the Tiruneermalai Resource Recovery Park situated at Vishweshwarapuram. The organic waste is treated by windrow and vermi-composting methods. The compost produced is sold out to farmers in the surrounding areas.

In addition to the resource recovery park, a Bio-methanation plant has been established to treat food waste from restaurants and vegetable and meat waste from markets. It is situated along the foot hill of Changelnermalai (adjacent to Rajiv Gandhi Nagar Slum). The plant was sponsored and implemented by SAM Foundation under the ExNoRa Green Pammal initiative and land was donated by Appaswamy Builders.

Plate 3-8: **Biomethanation plant for treatment of food waste in Pammal**

Source: IIHS Primary Study, 2015

c. Drain Cleaning

Surface drains in the town are the main conveyors of storm-water in the town, often mixed with black water i.e. with discharges from toilets in to these drains. Solid waste and silt finds its ways in to these drains and often result in blockage and overflowing. To avoid this, municipal sanitary workers are deployed for drain cleaning in the town. The sanitary workers remove solid waste and silt from the drains using forks/pickers, and dump these along the road. Larger vehicles like a lorry or a tractor running along collecting door to door waste from tricycles also lift this waste and transport it away to the disposal site.

Plate 3-9: **Drain cleaning by sanitary worker in Pammal**

Source: IIHS Primary Study, 2015

3.4 Storm Water Drainage

a. Natural storm water drainage

Pammal's natural storm water drainage pattern indicates that the storm drain converges from the surrounding areas of Anakaputhur and Pallavaram. Storm water from the southern part of the town flows in to the Surya Amman Temple Tank and the Thirupunanthal Lake on the eastern side and to previously existing Moongil Eri on the western side. The main outlet from the Thirupunanthal Lake is the Nadavaivodai storm drain (along Elumalai Street) collecting storm water from either sides in the northern part of the town and finally draining out in to Adayar River near the Airport on the North-Eastern part of the town. Please refer to the schematic Map 3 in the following pages for the broad natural drainage pattern in the town.

Plate 3-10: **Thirupunanthal Lake in Pammal**

Source: IIHS Primary Study, 2015

Plate 3-11: Main Storm Water Drains in Pammal

Main storm water drain from Thirupunanthal

Nadavaivodai storm drain

Source: IIHS Primary Study, 2015

b. Constructed drains

There is a good coverage of constructed surface storm drains in the town. Except for wards 1, 2, 3, 18 and 21 with partial coverage, all other wards are fully covered with storm water drains.

Plate 3-12: **Surface Storm Water Drains in Pammal**

Source: IIHS Primary Study, 2015

During monsoon, the areas of Moongil Eri (Ward 12), Mumthamizh Nagar (Ward 11) and Lakshminarayan Nagar (Ward 12) are prone to heavy water logging due to their proximity to the natural storm water drains. Two rescue-camps are designated viz. Annai Velankanni School and Sri Shankara Arts & Science College, for people to take shelter during heavy flood. Please refer to Map 3 for the drainage pattern and the coverage of constructed storm drains in the town.

While Storm-water and grey water from the households and establishments flows in to the surface drains in the town, it is common to observe a large number of toilets draining excreta into the drains directly or indirectly. With the recent drive conducted by the municipality, if is claimed that all such toilets and tanks, draining in to the open drains, have been plugged. However, visual evidence of toilets directly draining into drain is not uncommon. In addition, given the construction and management practices of toilets and the "septic" tanks, as described, it is highly likely that untreated fecal matter finds its way into drains through sub-surface leakage.

In deployment of staff for "sanitary" functions, solid waste management accounts for the major share, followed by drain-cleaning, as presented in Box 4.

Box 4: **Staff Deployment in Public Health (Sanitation) Section in Pammal Municipality**

One Sanitary Inspector is responsible for solid waste management in Pammal. He is assisted by two sanitary supervisors (one looking after wards 1 to 11 and the other 12 to 21). There are 93 sanitary workers operating under these supervisors. Out of the 93 workers, 25 are employed as office assistants and public toilet care-takers, three are on deputation and five to 10 remain absent each day leaving about 60 workers available each day. About 30 of them are deployed for solid waste collection in the 5 wards and the other 30 undertake drain cleaning in the entire town.

This means that monitoring the construction of toilets, as-built practices, and their regular de-sludging and maintenance, enjoys little priority and competent staff, leading to their neglect in the limited resources that the town has.

Map 3: **Storm Water Drainage Pattern & Coverage of Constructed Drains in Pammal**

Source: Pammal Municipality and IIHS Primary Study, 2015

4

Profile of the Town Panchayats

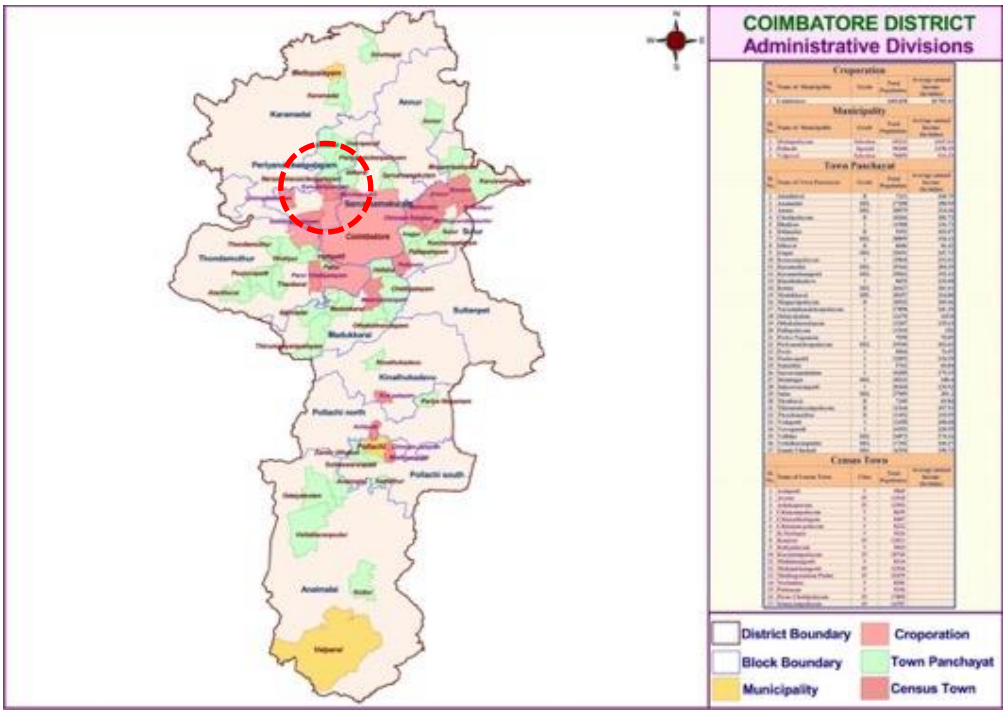
4 Profile of the Town Panchayats

4.1 Location of Town Panchayats Cluster

4.1.1 Location and Regional Context

The contiguous cluster of town panchayats consisting of Periyanaicken-palayam, Narsimhanaicken-palayam, Veerapandi (No. 4) and Idigarai are situated 17 km north of Coimbatore city. The Kousika River flowing east to west divides Periyanaicken-palayam and Narsimhanaicken-palayam. Idigarai is located in the east of the towns Periyanaicken-palayam and Narsimhanaicken-palayam and Veerapandi (No.4) is on the northern side of Periyanaicken-palayam.

Figure 4-1 **Location of Town Panchayats**



Source: (Wikipedia, 2016) and TWAD Board

4.1.2 Linkages and Connectivity

The major road is the Highway No. 67 running from Coimbatore to Gundlupete (near Hosur) via Ooty connects the towns of Periyanaicken-palayam and Narsimhanaicken-palayam to Coimbatore and Mettupalayam. Local roads radiating to the east from the highway connect Veerapandi (No. 4) and Idigarai. Veerapandi (No. 4) road running north to south connects Veerapandi (No. 4) to Periyanaicken-palayam and Idigarai.

Periyanaicken-palayam and Narsimhanaicken-palayam along the highway are very well connected by buses (both Govt. and Private buses) running between Coimbatore and Ooty and further north. Private busses connect the towns internally. A railway line between Coimbatore and Mettupalayam runs almost parallel to highway no. 67. A passenger train runs 5 times in a day. There is a railway station in Periyanaicken-palayam and Narsimhanaicken-palayam. The nearest Airport is the Coimbatore Airport which is well connected by domestic flights to various places in India and abroad.

4.1.3 Physiography and Topology

All the study towns are plain with a gradual slope from the west to the east. On the west is a Kurudi Hill range draining the rainwater falling on it creating a natural drainage system of a small river and streams passing through the study towns.

Figure 4-2: **Kurudi Hill Range on the western side of the TP cluster**

Source: IIHS Primary Study, 2015

4.2 Demographic and Socio-Economic Profile of Town Panchayats

4.2.1 Population and Growth

A cluster of four Town Panchayats were covered as a part of this Primary Study. Details about the four Town Panchayats are not always comparable, but are being presented to provide a flavor of contexts and issues. The population size of the town panchayats studied in Coimbatore ranges between 8,600 and 26,000 with an average household size of 4, similar to the State average.

Table 4-1 **Population of Studied Town Panchayats**			
Sl. No.	**Name of the Town Panchayat**	**Population (2011)**	**No. of Households**
01	Periyanaicken-palayam	25,930	7,377
02	Narsimhanaicken-palayam	17,858	5,023
03	Veerapandi (No. 4)	16,953	4,740
04	Idigarai	8,686	2,491
Source: Census 2011			

Periyanaicken-palayam showed steady population growth at the rate between 20 to 30 per cent each decade from 1971 to 2001 but slowed down to 14 per cent increase in the 2001-2011 decade. Narsimhanaicken-palayam town's population grew a maximum of 62 per cent between 1991 and 2001 and about 60 per cent in the following decade. It experienced steady growth of about 20 per cent between 1971 and 1991 (refer to Table 4-2 for details). The decadal population details of Veerapandi (No. 4) and Idigarai were not available.

Table 4-2 **Population Growth in Periyanaicken-palayam & Narsimhanaicken-palayam**					
Sl. No	**Year**	**Periyanaicken-palayam**		**Narsimhanaicken-palayam**	
		Population	**Decadal Growth Rate**	**Population**	**Decadal Growth Rate**
01	2011	25930	14 %	17858	58 %
02	2001	22844	27 %	11271	62 %
03	1991	18043	21 %	6972	21 %
04	1981	14914	22 %	5779	19 %
05	1971	12200	-	4843	-
Source: Town Directory, 2001; PCA 2011					

There is a even distribution of men and women in each of the towns, sex ratio is in the range of 993 to 1000 which is equivalent to the state average of 1000. The population below the age of 6 is about 8 to 9 per cent of the total population, almost equal to the state average of 10 per cent. However, the sex ration among children below 6 years varies in each town, Narsimhanaicken-palayam has the highest ratio of 1017 and Periyanaicken-palayam is the lowest with 894.

4.2.2 Literacy and Education

Periyanaicken-palayam and Narsimhanaicken-palayam have literacy levels marginally higher than the State average of 87 per cent, at 89 and 88 per cent respectively. Veerapandi (No. 4) has 85 per cent literate population and Idigarai reported 80 per cent. Male literacy rates are near to the state average of 92 per cent in Periyanaicken-palayam and Narsimhanaicken-palayam but a little lower in Veerapandi (No. 4) and Idigarai. Female literacy is more than 80 per cent in 3 of the towns except Idigarai, having only 74 per cent.

4.2.3 Social Composition

About 14.2 per cent of Urban Tamil Nadu belongs to Scheduled Castes; in urban Coimbatore the figure drops slightly to 13.3 per cent. These figures are however, below the overall state average of 20 per cent. In urban Tamil Nadu, Arunthatiyars constitute the largest single caste group, accounting for 50 per cent of the scheduled caste population. In urban Coimbatore, this group forms 38.7 per cent of the total population of Scheduled Castes, with Adi Dravidas adding to 18 per cent of the total. The portion of Scheduled Caste population in the study towns (Periyanaicken-palayam, Narsimhanaicken-palayam,

Veerapandi & Idigarai) is in the range of 6 to 16 per cent. In the study towns, these two castes – Arunthathiyars and Adi Dravidas - again form the largest section according to Census 200 (Census 2011 data for Scheduled Castes and Tribes at the sub-district level, is awaited).

In the case of Scheduled Tribes, the figures for urban Tamil Nadu and urban Coimbatore stand at 0.4 per cent and 0.3 per cent. In contrast, the share of Scheduled Tribes in the overall state and district population is 1.1 per cent and 0.8 per cent respectively. The study towns have an even lower share of Scheduled Tribes in their populations- ranging from 0.03 per cent to 0.2 per cent. Kattunayakans and Irulas are the largest Scheduled Tribes in the share of urban population in the state, forming 23 and 21 per cent of all Scheduled Tribes. In urban Coimbatore, Irulas and Malasars are the numerically dominant amongst Scheduled Tribes, forming 26 and 25 per cent of all Scheduled Tribes. The Town Directory of 2001 lists Kurumans and Irulas as the largest tribal groups in the study areas.

Hindus are the dominant religious group, forming more than 90 per cent of the population in all the study towns. Christians account for a small portion and very less portion of Muslims in the towns. More than half of the people speak Tamil in 3 of the towns except Veerapandi (No. 4) where 90 per cent speak Tamil. Telugu, Kannada, Malayalam and Urdu are also spoken in the study towns.

4.2.4 Workforce Participation

The workforce participation rate in the towns is in the range of 47 to 53 per cent, near to the State Urban average of 44 per cent. Male workforce participation rate stands between 65 to 70 per cent, while female workforce participation rate is in the range of 27 to 35 per cent. Idigarai leads in workforce participation rate among the study towns.

Portion of main workers is in the range of 42 to 48 per cent of the total working population, about 60 per cent are male and the rest female. Marginal workforce ranges between 3 to 5 per cent of the total working population in the towns.

4.3 Connectivity and Transportation

4.3.1 Public Transport System

Periyanaicken-palayam and Narsimhanaicken-palayam have access to a good public transport system as the highway connecting Coimbatore and Mettupalayam goes through the towns. The frequency of buses to either ends is as high as one in every 10 minutes during the day time. The towns of Idigarai and Veerapandi (No. 4) are moderately connected by private buses.

Railway Stations in Periyanaicken-palayam and Narsimhanaicken-palayam provide access to the passenger train running five times a day between Coimbatore and Mettupalayam.

4.3.2 Individual Transport System

According to Census 2011, about half (44 to 51 per cent) of the households in the towns own a motorized two wheeler. The ownership of a four-wheeler ranges between 5 to 9 per cent of the total households in the study towns.

4.4 Housing and Slums

4.4.1 Housing

Majority of the houses in town panchayats are to a level of ground or ground plus one floor above. There are few group houses and small apartments seen in Periyanaicken-palayam and Narsimhanaicken-palayam. Census 2011 data reports the predominant material, more than 50 per cent

(except in Idigarai), for roof construction as concrete suggesting. Burnt bricks are mainly used for construction of walls in the towns (50 to 77 per cent), but a good proportion of households also use un-burnt or mud bricks for wall construction. Flooring is mainly made in cement or covered with mosaic or floor tiles in the house in the studied towns. Please refer to Annexure 4 for details on materials used for the construction of houses in the towns.

The housing and settlement typologies in the Study Town Panchayats include slum-type settlements with structures (using thatch, tiles, cloth, etc. for roofing); stand-alone houses (with roofing materials of tiles and brick walls); stand-alone houses (with Cement Concrete roofing and Burnt Brick walls); and the emerging G+1/2 housing structures. This range of housing typologies probably corresponds to the historical evolution of these town panchayat areas, but not necessarily amenable to planned/unplanned classifications except in some cases.

Plate 4-1 **Housing typologies in Town Panchayats**

Stand Alone Houses – Semi-Permanent and Permanent Houses in TPs

G+1 Households in the towns

Plate 4-1 **Housing typologies in Town Panchayats**

Source: IIHS Primary Study, 2015

4.4.2 Slums

According to Census 2011, in the study towns, about 7 to 12 per cent of the population lives in slums. The number of people living in any one slum ranges from 600 to 2000 across the towns. Veerapandi (No. 4) has the maximum portion of its population living in slums (12 per cent). The average household size of slums in all the towns is about 4 (not too disimilar to the towns' average). Scheduled Caste families are predominant (almost 100 per cent) in the towns of Narsimhanaicken-palayam and Idigarai. In the other two towns, the portion of Scheduled Caste families ranges between 20 to 40 per cent. Please refer Annexure 4 for details on Slums gathered from the respective town panchayat offices.

Plate 4-2 Urban poor house typology in Town Panchayats

Source: IIHS Primary Study, 2015

5 Urban Environmental Services Selected Town Panchayat Cluster in Coimbatore

5 Urban Environmental Services in Selected Town Panchayat Cluster in Coimbatore

5.1 Water Supply

5.1.1 Household Arrangements for Water Supply

The physical coverage of piped water supply through treated source is very good in the study towns. The proportion ranges between 85 and 99 per cent. A combined water supply scheme (CWSS) supplies water to all the study towns. A small portion of supply comes from untreated sources too. A few households depend on open ells and bore wells too. Table 5-1 presents the water supply arrangements in the study towns according to Census 2011.

Table 5-1 **Comparison of Water Supply arrangements in TPs, Urban TN & Urban India**

Sl. No.	Source of Water	Units	Periyanaicken-palayam	Narsimhanaicken-palayam	Veerapandi (No. 4)	Idigarai	Urban TN	Urban India
01	Tap water from treated source	%	97.9	99.0	85.9	95.1	66.3	62.0
02	Tap Water from untreated source	%	1.1	0.5	8.0	1.8	14.0	8.6
03	Wells	%	0.3	0.1	1.4	1.2	4.3	6.2
04	Hand pump/ Tube well/Bore hole	%	0.4	0.0	1.0	1.6	12.6	20.8
05	Surface water sources	%	0.1	0.0	0.0	0.0	0.4	0.7
06	Other sources	%	0.3	0.4	3.7	0.3	2.3	1.7

Source: Census 2011

The coverage of piped supply to households with in their premises is high in Periyanaicken-palayam and Narsimhanaicken-palayam, at 81 and 84 per cent respectively, and only some portion of households depend on the nearby public stand posts. In Veerapandi (No. 4) and Idigarai, more than half of the households have piped supply within their premises, but a sizeable proportion of households depend on public stand posts, as presented in Table 5-2.

Table 5-2 **Location of water supply in TPs in comparison with Urban TN**

Sl. No.	Source of Water	Units	Periyanaicken-palayam	Narsimhanaicken-palayam	Veerapandi (No. 4)	Idigarai	Urban TN
01	Within the premises	%	81.4	84.2	65.4	50.6	54.0
02	Near the premises (within 100 m)	%	17.9	15.3	32.3	41.7	40.2
03	Away (> 100 m)	%	0.7	0.5	2.3	7.7	5.7

Source: Census 2011

5.1.2 Arrangements for potable water

a. Household Arrangements

The drinking water supply to the town is from a Combined Water Supply Scheme (CWSS) implemented by TWAD Board. The main source of water is from Pilur Dam which is about 50 km away from the TP cluster in The Nilgiris. Using the difference in altitude, water flows into the towns by gravity in to the storage infrastructure, and further to the households and public taps.

In Periyanaicken-palayam, water reaching the town from the CWSS is stored in four overhead tanks (OHTs) with a total installed capacity of 1.74 MLD situated at various locations in the town, as presented in Table 5-3.

Table 5-3 **Water Storage Infrastructure and Distribution in Periyanaicken-palayam**

Sl. No.	Location of OHT	Capacity	Zone	Wards covered
01	Tiruvike Nagar	0.54 MLD	1	1, 2, 4, 18 and Part of 3
02	Raju Nagar	0.3 MLD	2	16, 17 and Part of 3
03	Housing Board	0.5 MLD	3	5, 11, 12, 13 and Parts of 10, 14 & 15
04	SRKV	0.4 MLD	4	6, 7, 8, 9 and Parts of 10, 14 & 15

Source: Periyanaicken-palayam Town Panchayat

The OHTs are filled up for about three times in a day, depending on the supply of water from the source, and supplied to the households through house service connections and few public taps accessed by urban poor. It is estimated by the TP officials that about 43 to 46 lakh liters of water is supplied through this CWSS.

The frequency of supply to localities under each OHT is once in three days for a duration of about 2.5 hours. For example, if there are 10 to 15 streets or localities under each OHT, though the supply of water to the OHT is continuous, the distribution to each locality is manually controlled and ensured that each of the street or locality gets water at the frequency and duration mentioned above.

b. Public Provisioning

To provide access to drinking water to households who cannot afford to have a house service connection, about 35 public stand posts are provided are convenient locations in the Periyanaicken-palayam for the benefit of these households. The frequency and duration of supply is same as that mentioned above.

Plate 5-1 **Public Stand Posts delivering drinking water in Anna Nagar**

Source: IIHS Primary Study, 2015

5.1.3 Arrangements for non-potable water

a. Household

A small proportion of households in the Study towns, have private bore wells or wells whence water is pumped and used for non-potable purposes. Data is not available on the extent of these private arrangements.

b. Public Provisioning

Since the water from CWSS is intermittent, in Periyanaicken-palayam, the Town Panchayat has installed about 46 bore wells in the town to draw groundwater for non-potable use of public. Few of these bore wells cater to public toilets, government buildings and institutions in the town, but the majority deliver water to public stand posts across the town. There are about 2,500 such PSPs connected to these bore wells and it is estimated that about 5,000 people depend on them in Periyanaicken-palayam.

In addition to the above mentioned bore wells, three public open wells with submersed pumps supply water through PSP to three to four streets in the town. There are three hand pumps also in the town used by the public.

Arrangement for water, both potable and non-potable purposes as described in sections 0 and 5.1.3 above are similar in the other study towns of Narsimhanaicken-palayam, Veerapandi (No. 4) and Idigarai with variations in capacities and numbers.

5.1.4 Water Tariffs

The Town Panchayats provide water service connections to households, establishments and industries from drinking water under the CWSS on paying a fixed one time connection charges. Thereafter, a monthly user fee is levied for the usage of water. The rate fixed is a flat rate as volumetric metering is not available. The tariffs for three Town Panchayats under study are presented in Table 5-4.

Table 5-4 **Water Supply Connection Costs in TPs**

Sl. No.	Type of Connection	Connection Charge (`)	Monthly User Fee (`)
Periyanaicken-palayam:			
01	Household	3,000	60
02	Commercial	5,000	140
03	Industrial	5,000	200
Narsimhanaicken-palayam:			
01	Household	7,000	60
02	Commercial	11,000	135
03	Industrial	11,000	205
Idigarai:			
01	Household	6,000	65
02	Commercial	12,000	125
03	Industrial	25,000	185

Source: Respective town panchayat offices, 2015

Public water supply i.e. through public stand post (under CWSS); and non-potable water from bore wells, open wells and hand pumps; are all provided free of cost by the TPs.

5.2 Sanitation

5.2.1 Household Arrangements for Sanitation

According to Census 2011, close to 83 per cent of households have individual household latrines in Periyanaicken-palayam. Of the remaining households, 13 per cent are dependent on public latrines while more than three per cent engage in open defecation. Open defecation is reported to be common in slums. For instance, the proximity of Vivekanandapuram and Kuppuchipalayam to railway tracks and agricultural fields respectively, and difficulties in accessing individual and public toilets, are factors explaining the continuance of open defecation in these locations.

In Narsimhanaicken-palayam, while 75 per cent of households in the town have individual household latrines within their premises, close to 25 per cent do not own toilets. Public latrines are reported to be serving more than 19 per cent of the town, leaving 5 per cent of households that practise open defecation. Most of the households on Balavinayagar Nagar in this TP for instance, are reported to be resorting to open defecation.

In Idigarai, only about 52 per cent of all households in the town have individual household latrines. Open defecation is prevalent, with 26 per cent of households having no other sanitation option. The usage of public latrines is also high, with 21 per cent of all households reported to be using these. Most households in slum settlements do not have access to any sanitation facilities and defecate in the open.

About 72 per cent of households in Veerapandi (No. 4) have an individual household latrine. The remaining 28 per cent of households are equally split between using public latrines and having to resort to open defecation.

Slum Sanitation

Census 2011 reports that the slums of Idigarai have the highest open defecation rate of 96 per cent, followed by Periyanaicken-palayam with 17 per cent of slum population defecating in the open. Veerapandi (No. 4) and Narsimhanaicken-palayam have 14 per cent and 12 per cent of open defecation being reported from the slums.

Only slums of the two towns of Periyanaicken-palayam and Veerapandi (No. 4) have individual household latrines. The slums of Periyanaicken-palayam have the highest coverage of individual household latrine i.e., 71 per cent of households have individual household latrines. In Idigarai, most households in slum settlements do not have access to any sanitation facilities and defecate in the open. The slums of Narsimhanaicken-palayam are heavily depending on public latrines, reported to be up to 88 per cent.

5.2.2 Household Arrangements in Study Households

a. Households with individual toilets

Among the ten households studied by the team, 8 households have Indian pour flush toilets and two households have both western and Indian pan type. A rich landlord household (in Periyanaicken-palayam) reported five toilets in their house of which four were cistern flush western type, and one an Indian type within the premises for the visitors.

Three houses have recently constructed toilets in Periyanaicken-palayam and Narsimhanaicken-palayam. In Periyanaicken-palayam, two of the households built have toilets five years ago. Earlier they used to defecate in the open, and report that they needed time to plan financially and afford the construction of toilet. They reported having spent about Rs. 50,000 on the construction of their toilets.

All the study houses have latrines in working condition. Since all the latrines were built during the construction of the houses, with the exception of two households, respondents were unable to provide cost break-down exclusively for their toilets.

b. Households dependent on public toilets

In Periyanaicken-palayam, the team interacted with four households who use public toilets at Vivekanandapuram and Annanagar. The Vivekanandapuram public toilet has 6 seats for men, 6 women. One of the user families, with a house located about 200 m away, uses this toilet facility, but they have a bathroom in their house which they use for bathing and washing.

In Ward no 7, Annanagar, about 450 houses are located along the stretch of the storm water drain built on Poramboke Land[2] according to the residents. Only four of these houses have built toilets, and other households were constrained by lack of space, and are dependent on the public toilet provided at the end of the street. Concerns raised by these users included:

i. The number of users is high and hence the loading rate is high per seat.
ii. Due to over-loading, there is continuous odor problem.

[2] A class of land meaning Wasteland for grazing etc.

iii. The sanitary worker deployed to clean, comes only on alternate days. He is an old man and suffers from illnesses and hence not able to look after the toilet adequately.
iv. Users also complained about irregular cleaning, and disinfectants not being used.

c. Households practicing Open defecation

In Veerapandi (No. 4), the team observed contrasting situations of people defecating in the open. Two wards representing two different circumstances namely i. People who refuse to use public toilets; and ii. People who continue to defecate in the open in spite of having individual toilets. Box 5 presents some of the anecdotes of how open defecation is viewed by different stakeholder groups.

Box 5: **Open Defecation – constraints and practices**

Open defecation is a common sight along the railway station street in ward number 10 of Veerapandi (No. 4). The ward councilor for that ward (elected four years ago) has been struggling to convince and change the attitude of residents of Indranagar who refuse to use the public toilet built in Devinagar which is about 500 m away. Every day early morning she comes out for inspection but her efforts are in vain: “controlling 250 people from defecating in the open is a huge number for a single lady”.

Ward X of Veerapandi (No. 4) has 250 households (with a population of 750) of which 50 houses have toilets. Of the remaining 200 households, about 150 households are from S-nagar who use the public toilet. The remaining houses are in Annanagar who refuse to use the public toilet and defecate in the open. They prefer usually early mornings from 5 am to 7 am, or late evenings when it is dark from 7 pm to 11 pm. The Town Panchayat Chairman also requested assistance from factory owners nearby but this is yet to bear fruit.

The ward councilor of Ward No X admits that he and his family members do not use the toilet within their house. His family has shifted to this locality five years ago when government allocated land for people under the Basic Services for Urban Poor (BSUP) scheme. The toilet was built about a year ago and is connected to a soak pit. The family is not aware of how the toilet is constructed and the function of the soak pit hence, he feels by using the toilet, the wastewater from the toilet will overflow in front of his house as there is no drainage or provision made for sewage to flow. Now the toilet is used as a store room of fodder for cattle and sheep.

A detailed survey was conducted in Periyanaicken-palayam by the TP staff to identify households without toilets to plan for benefits under SBM, and also as a baseline assessment for a septage management project concept proposed by TWAD Board in 2014. It was identified that 1,118 households in Periyanaicken-palayam do not have toilets, but 542 out of these do not have space for construction of individual toilets. Therefore, a demand for construction of 576 individual toilets was proposed for this town. Under SBM, for the year 2015-16, a target of 86 toilets has been set by the TP officials for households. The applications were issued to the households, received and uploaded and are awaiting sanction from the State Govt. Ward wise details of households without toilets are included in the Annexure 4.

5.2.3 On-site systems

a. Type of on-site systems

From field observations, the predominant on site sanitation system appears to be the “septic tanks”. Based on interactions with local masons and builders, these can be further classified into Septic Tanks, Cess pits and twin pit latrines, as presented in Table 5-5.

Table 5-5 : **Types of On-site systems**						
Sl. No.	**Type**	**Name of the system**	**Shape**	**No. of Chambers**	**Water tightness**	**Outlet Arrangement**
01	Type I	Septic tank	Rectangular	Single chamber	Porous	No outlet
02	Type II	Septic tank	Rectangular	Double chamber	Water tight	Soak pit
03	Type III	Septic tank	Rectangular	Double chamber	porous	Soak pit
04	Type IV	Twin Pit	Circular	Single chamber	Porous	No outlet
05	Type V	Cess pit	Circular	Single chamber	Porous	Percolating to ground
Source: IIHS primary study 2015						

Please refer to Table 5-6 for illustration of the above mentioned on-site containment systems prevalent in the study town panchayats of Coimbatore.

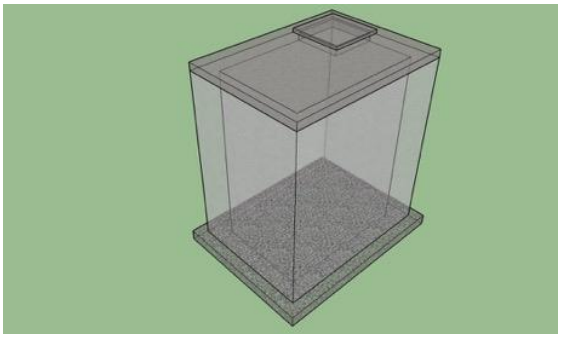
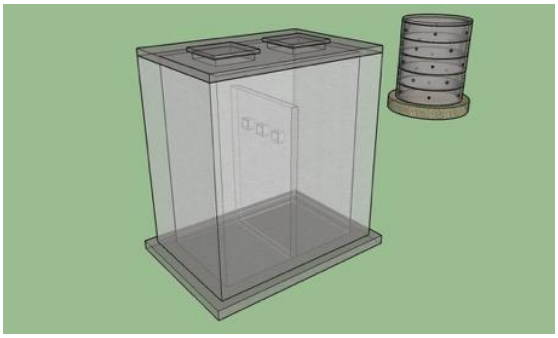
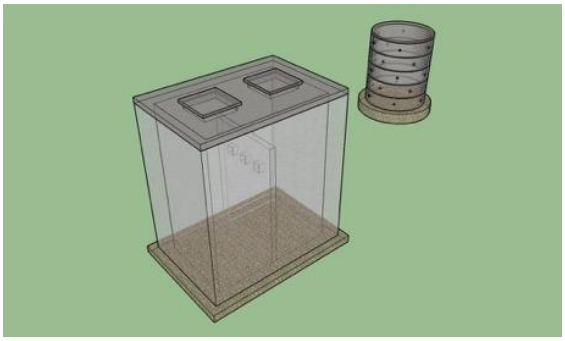
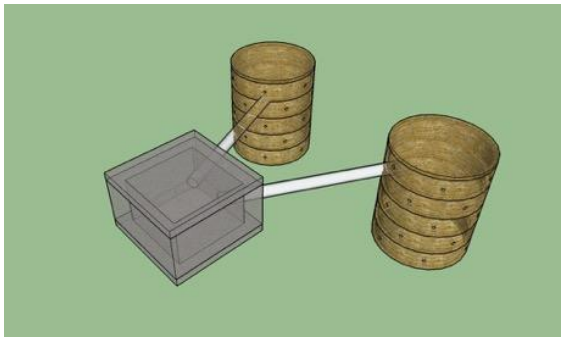
Table 5-6 : **Illustration and Description of Type of Septic Tanks**	
Type 1:	Type 2:
	
Dimension (LxBxD): 6'x 4'x 8' Chambers: 1 Base: Porous Walls: Porous or Non-Porous Top Slab: RCC Access Cover (Y/N): Yes Soak Pit: No Other details: Generally noticed in single or double dwelling units (low and middle income group)	Dimension (LxBxD): 8'x 5'x 10' Chambers: 2 (partition wall at the center with holes) Base: Non-Porous Walls: Non-Porous Top Slab: RCC Access Cover (Y/N): Yes Soak Pit: Yes (4'dia & 5'deep) Other details: Generally noticed in single or double dwelling units (middle or high income group)

Table 5-6 : **Illustration and Description of Type of Septic Tanks**

Type 3:	Type 4:
	
Dimension (LxBxD): 8'x 5'x 10' Chambers: 2 (partition wall at the center with holes) Base: Porous Walls: Porous or Non-Porous Top Slab: RCC Access Cover (Y/N): Yes Soak Pit: No Other details: Generally noticed in single or double dwelling units (low and middle income group)	Dimension (Diameter & Depth): 4'x 8' Chambers: 2 (Twin Pits - used alternatively) Base: Porous Walls: Porous Top Slab: RCC, Thatch, Wood etc. Other details: Generally noticed in single or double dwelling units (low income group)

Type 5: Cess-Pit

Dimension (Diameter & Depth): 4'x 8'

Chambers: 1

Base: Porous

Walls: Porous (made of stone)

Top Slab: RCC, Thatch, Wood etc.

Other details: Generally noticed in single or double dwelling units (low income group)

Source: IIHS Primary Study 2015

Twin Pit Latrines

An example of a twin-pit latrine is to be seen in the house in Periyanaicken-palayam, who is a tenant in the house built by a temple trustee since 7 years. This house has a twin pit latrine where twin pits are laid adjacent to the toilet. Each pit is of 1.5 m Diameter and 6 feet deep. The first pit was cleaned 6 years back and the second pit was cleaned last year.

Plate 5-2 Twin Pit System in Periyanaicken-palayam

Source: IIHS Primary Study 2015

Septic Tanks

The standards prescribed for design and construction of septic tanks by CPHEEO and the BIS, and the actual practice on ground in the Study Town Panchayats, in terms of structural masonry, septic tank size and design, and disposal systems, are presented in Table 5-7.

Table 5-7 : **Design Norms vs Construction in Practice of Septic tanks**

Sl. No.	Aspects of Septic Tank	Standard Design Norms	Observed construction practice
01	Structural Masonry	Septic tank functions as a solid – liquid separation tank which should hold sewage for about two days. The supernatant is to flow out and the solids to settle down and thicken at the bottom so that it can be removed after two to three years. As per CPHEEO standards, it is recommended that the septic tank should be constructed using cement concrete with water proofing. This is to avoid percolation by achieving water tightness.	Households prefer to just construct two walls and at the bottom use the Plain Cement Concrete plinth with a bed of 40mm coarse aggregates (a mixture of sand, rubble and crushed stones). This practice, according to local masons, facilitates increased holding time and delays period to de-sludging since sewage percolates due to the absence of water proofing.

Table 5-7 : **Design Norms vs Construction in Practice of Septic tanks**

Sl. No.	Aspects of Septic Tank	Standard Design Norms	Observed construction practice
02	Septic Tank Size and Design	As per CPHEEO standards, the size of septic tanks is to be determined based on the household size and desired de-sludging frequency,	In practice, masons and builders are observed to oversize the septic tanks. The Study revealed that the size of the septic tank is a function of financial capability, space availability and the imperative to avoid frequent de-sludging. Hence, households prefer to build larger and deeper septic tanks if they can afford it and if they have sufficient space. According to masons, client households seek to avoid the recurring operational cost of de-sludging the septic tanks. Hence, masons build bigger tanks without bottom lining to make way for percolation. The de-sludging interval for ICC metal aggregates lined septic tank is expected to be once in four years.
03	Disposal Systems	There are two types of wastes generated in septic tank 1. Liquid effluent which comes out of outlet every day; 2. Settled solids in the form of sludge that needs to be removed once in two or three years. For the liquid effluent, treatment is deemed appropriate by methods like soak pits or dispersion trenches with the caution that these sub-soil dispersion systems shall be at least 20 m away from any drinking water source. The distance between the soak pit and adjacent dwelling is recommended to be at least 7 m to avoid any corrosive effect due to tank gases vented into atmosphere. Sludge needs to be emptied by mechanical vacuum tankers and should be sent for further treatment at sludge treatment units at sewage treatment plants or appropriate septage treatment facility. For this regular de-sludging, access covers need to be provided.	For liquid effluent, there are two categories of arrangements with outlet: earlier the septic tank outlets were let into storm water drains to receive the liquid waste. Now, TPs are attempting to get all such outlets sealed, and the drains only receive the sullage i.e. kitchen and bathroom wash water. Soak pits: In order to avoid frequent de-sludging, the outlet of septic tank is connected to soak pits. Masons report providing soak pits at a distance of about 10 feet from the septic tank and about 20 feet away from the bore well in each house. One of the households, with G+1 floor has five toilets, for which a septic tank of L= 10ft X B = 8 ft X D = 10 ft is provided (at a construction cost of Rs. 70,000 approximately). The mason has acquired this knowledge from his father. The septic tank has no baffle walls. It is under the house structure, and the dimensions are based on an intended de-sludging frequency of about five years. A soak pit is not provided as it is perceived to be not good for soil and de-sludging using cess pool vehicle is considered safer practice.

Source: CPHEEO, IIHS Primary Study 2015

Community Septic tanks

Idigarai Town Panchayat has an interesting case of a settlement at ward no 15 for a slum under BSUP scheme, where a community septic tank has been constructed a year ago with a biogas plant, but people refuse to get house service connections The reasons for this are :

i. Many BSUP houses are partially constructed, and people are unable to bear the full cost of construction, and hence, they continue to defecating in the open.
ii. The road in this settlement is made up of cement concrete which makes it very difficult to dig and lay house service connections. One of the government contractors however pointed out that residents were given six months time to get their toilets constructed
iii. Some people feel that connecting to community septic tank will eventually create problems as it gets filled up, and they will have backflow inside their house.

Hence, out of the 200 houses in this settlement, very few have toilets with soak pits, and the rest continue defecating in the open.

Plate 5-3 **Various Septic Tanks observed in the Town Panchayats**

Source: IIHS Primary Study, 2015

Cess Pool/ Cess Pits

A cesspool is a large structure consisting of concrete cylinder rings with an open bottom or perforated sides. It is usually a meter in diameter and four to five meters deep. It is covered with a hatch, and the sewage is kept in it till it is automatically biodegraded. The solids are settled deep inside the base of the cesspool while the liquid percolates into the soil through the concrete. The difference between septic tank and cess-pool appear to be:

* Cesspools do not treat wastewater while septic tanks have sewage treatment options.

* Cesspools are underground well-like containers used for the storage of biodegradable substances while septic tanks are mainly used to store human waste and have a drainage facility. Plate 5-4 shows the design of a typical cess pit

Plate 5-4 **Cess pits in TPs**

Source: IIHS Primary Study, 2015

Box 6 - Concrete rings for constructing cess-pits: at Idigarai

- Manufacturers of cess pit rings have started their business in Idigarai in recent months, after obtaining training in Singanallur. Concrete rings of different diameters ranging from 2 ft to 6 ft are made, for which pre-cast molds of these diameters are available. The materials used are cement, jelly, sand and reinforced steel. The mixture is poured and allowed to settle for one week, by cured.
- About 20 pieces are sold in one month at a price of Rs. 350 per ring, including delivery and installation.
- These rings are not only used in constructing cess pits but also in water-holding sumps.
- Rings used for cess pit, are provided with holes. Holes are provided for the convenience of lifting and installing, and to allow sewage percolation.
- Rings are preferred over stone structures since the earth filling between the walls tends to get damp resulting in collapse of the structure collapses. Concrete rings do not collapse, and become stronger by absorbing moisture.

Box 6 - Concrete rings for constructing cess-pits: at Idigarai

Source: IIHS Primary Study, 2015

The previous sub-sections shows that there are considerable differences between the standards and designs prescribed, and what obtains in practice on ground. There are many similarities between the practices in Pammal and Coimbatore TPs, while local variations are there as expected.

Many of these divergences are critical to appreciate in improving the standards and performance of toilet containment structures. It is clear that while known as “Septic Tanks”, many of the structures and systems are indeed in the nature of pits, soak-pits, cess-pits or merely holding tanks with liquids being discharged regularly sub-surface or through drain-out systems into drains and open areas.

Apparently, popular perceptions and the construction practices ascribe the round or circular structures to being pits or soak pits, whereas rectangular structures, howsoever constructed, are deemed to be akin to “septic tanks”.

Box 7 lays out the prescribed procedure for building proper toilets and containment structures.

Box 7: Regulations Pertaining to Toilets in TPs

Building bye-laws and permissions at TP level play a key role in understanding the regulation pertaining to existence of household toilet and wastewater containment systems. The building permissions are approved by the Executive Officer of the Town Panchayat under the Tamil Nadu Panchayat Building Rules, 1997 (there is no separate planning or building section in the office). The approval is limited to construction of up to 4,000 sq. ft. of residential and 2,000 sq. ft. of commercial buildings, and to a height of G+2 Floors. All building exceeding this built area need to seek permission from the District Town and Country Planning (DTCP) Office or the Local Planning Authority (LPA) in Coimbatore.

The key steps involved obtaining building permission from the Town Panchayat Office are:

1. Submission of Application (Appendix-B) by the owner along with building plans, sale deed or documents indicating land ownership etc.
2. The application should be endorsed by the Licensed Building Surveyor (LBS) empaneled under the TP office
3. The EO needs to conduct a site inspection (vacant land) and approve the building permission application, and issue an executive order

Box 7: Regulations Pertaining to Toilets in TPs

4. The land owner needs to pay 1% of the building cost to the Manual Workers General Welfare Fund of the TNCWW Board Chennai before final approval
5. The owner of the land starts the construction of the building

The presence of toilets and septic tank details in building application and drawings is a mandatory in both commercial and residential buildings proposed. However, the approval process needs much to be desired, and actual as-built construction of toilets or septic tanks is currently not monitored by the TP office before the building is put into use.

Hence, the above underlines the fact that households, masons and builders, as well as enforcement agencies suffer from deficits that has resulted in the current situation. This also highlights the need for considerable re-orientation and re-education of customers, masons and builders, as well as better resourcing, staffing, and procedures of approving, enforcement and regulation agencies.

5.2.4 Transportation of Septage in Study TPs

About a decade ago, in Periyanaicken-palayam, septic tanks outflow was typically let out into open drains. This practice was sought to be stopped by sealing such structures. However, many households do not have properly constructed tanks. The town has a de-sludging truck but this is typically used for removing the water from public toilet tanks. Much of this is reported to be disposed of in agricultural fields with consent of the farmers. Apart from farm-lands, some of the de-sludging trucks are also periodically reported to be disposing septage in open areas. In Narsimhanaicken-palayam, the TP is in process of identifying land for disposal of septage.

Plate 5-5 **Cess-Pool Vehicle operating in Idigarai**

Source: IIHS Primary Study, 2015

5.2.5 Treatment of Septage

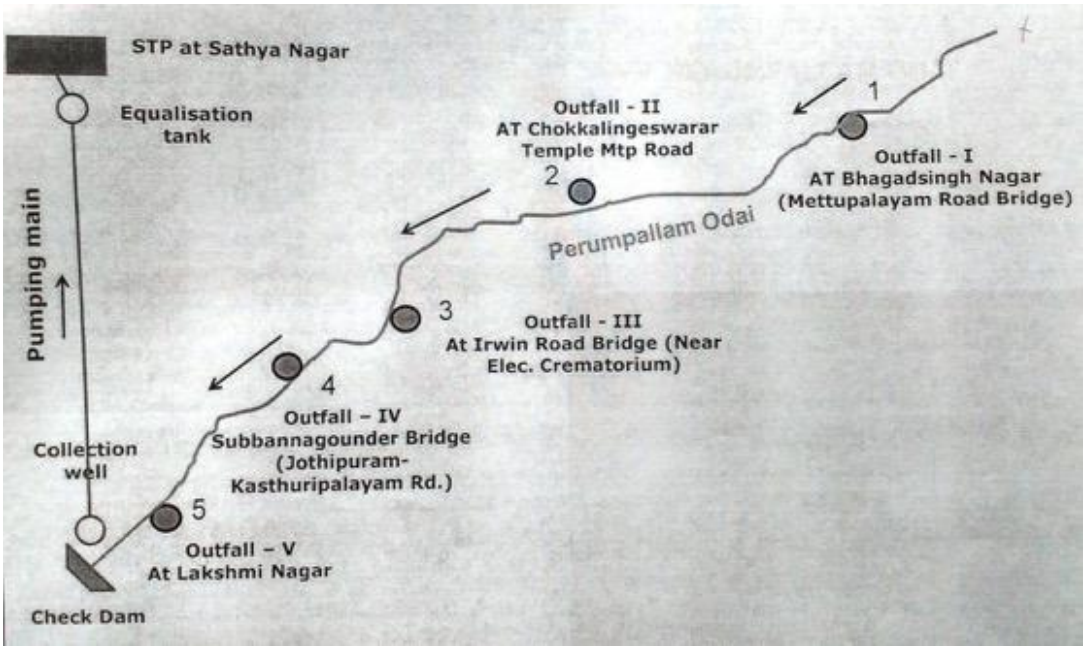
During the field visits it was observed that the septage from collected by the cess-pool vehicle (both ULB's and Private) discharge the waste in to agricultural lands. Farmers request for the septage as it is rich in nutrients. The discharged septage is allowed to completely dry up and the land is ploughed and cropped.

Plate 5-6 **Land Application of Septage in Farm Lands as Soil Conditioner in Periyanaicken-palayam**

Source: IIHS Primary Study, 2015

At present, there are no sewage or septage treatment facilities in or around these Town Panchayats (Coimbatore STP being the closest facility). IIHS team's interactions with the Assistant Engineer from the ADTP office reveiled that the TWAD Board has proposed a concept plan for sewage management in Periyanaicken-palayam in 2014. The main outfalls into Perumpallam Odai (main storm drain) are identified, and it is proposed to intercept the flow at the check dam, collect the wastewater in an existing well, and pumps it to the STP site. Refer to Plate 5-7 for the project concept diagram. The STP is proposed to be situated at the old solid waste resource recovery park at Sathya Nagar (Cost details shown in Table 5-8)

Plate 5-7 **Flow Diagram proposed in Septage Management DPR**



Source: Septage Management DPR, 2014

Table 5-8 : **Cost Abstract of DPR for Septage Management Proposed by TWAD Board**		
Sl. No.	**Description**	**Amount (`in Lakhs)**
01	Cleaning, removal of debris, de-silting etc. at Perumpallam Odai	10.00
02	Pumping station at Lakshminagar	157.14
03	Pumping station at common collection well	51.87
04	Construction of STP	274.10
	Sub-Total (1)	**493.11**
05	Contingency Charges @ 1%	4.93
06	Unforeseen Charges @about 2.5%	12.33
07	Provision for Road Restoration Charges to be paid to SH, NH, Railway Crossing etc.	107.00
	Sub-Total (2)	**617.37**
08	Centage Charges @ 5%	30.87
	Sub-Total (3)	648.24
09	Preparation of DPR @ 1%	6.48
	Grand Total	**654.72**
Source: Asst. Engineer, ADTP – In-charge for Periyanaicken-palayam		

The proposal is currently under consideration of the Govt. Small scale treatment systems are being tried out in different locations in and around Coimbatore, one being a site inside a residential complex in Idigarai.

Another example of innovation is observed in an integrated campus level management of wastewater and re-use, Periyanaicken-palayam, as presented in Box 8.

Box 8- Sri Ramakrishna Mission – Industrial Training Institute in Periyanaicken-palayam

The Ramakrishna Mission has started a group of educational institutions from schools to diploma level in 150 acres of land on the main road of Periyanaicken-palayam. The interaction with one of the training officer there in ITI revealed that they have a full cycle of septage management in place. In ITI, the strength is 400 students with accommodation facility. The campus has 100 urinals and 10 toilets connected to a septic tank and two soak pits of 2 m dia. The septic tank was built ten years ago, and is 20 ft long and 20 ft deep. A separate collection tank is provided for wash water from urinals which is used for gardening.

The Institution has its own cess-pool vehicle which desludges septic tanks and disposes the septage in their own agricultural land spanning 365 acres.

5.3 Solid Waste Management

Solid waste management is carried out by Town Panchayats with support from NGOs in the study towns. Currently, no user fee is charged by the TPs for solid waste management.

a. Collection and Conveyance

The waste is collected through a door-to-door collection system. Tricycles and Mini Trucks are used for collection of waste from households and establishments, in these towns. Waste from the tricycles and mini trucks, is loaded in to tractors or tipper lorries, and then transported to the compost yards, called Resource Recovery Parks.

Plate 5-8 **Vehicles used for solid waste collection in TPs**

Push Carts collecting waste from door to door and transferring in to Tipper Lorry for transportation to the resource recovery park in Periyanaicken-palayam

Source: IIHS Primary Study, 2015

In addition to door to door collection, Town Panchayats have also placed community bins across the towns at various commercial spaces, markets, main roads etc. Wastes from these bins are collected by the tractors or tipper lorries, and is transported to the Resource Recovery Parks.

b. Treatment and Disposal/Re-use

Organic wastes are segregated at the compost yards is treated by windrow composting methods. The compost produced is sold out to farmers in the surrounding areas.

The old resource recovery park situated at Sathya Nagar which spreads across 1.5 acres is not being used currently since the inception of the new SWM site near the housing board layout in the town. It is reserved for the construction of STP under the scheme proposed by TWAD board discussed earlier under 5.2.5.

Plate 5-9 **Solid Waste Management sites in TPs**

Compost Yard of Narsimhanaicken-palayam

Compost Yard of Veerapandi (No. 4)

Source: IIHS Primary Study, 2015

Table 5-9 summarises the solid waste management practices across the study Town Panchayats.

Table 5-9 **Snapshot of Solid Waste Management in TPs**

Sl. No.	Component of SWM	Periyanaicken-palayam	Narsimhanaicken-palayam	Veerapandi (No. 4)	Idigarai
01	Existence of door to door collection	Yes	Yes	Information not available	Yes
02	Coverage	All 18 Wards (8410 HHs)	12 out of 15 Wards (5415 HHs)	Information not available	13 out of 15 Wards (2385 HHs)
03	Quantity Collected	8.5 MT	4 MT	Information not available	1 MT
04	Source Segregation	Only in Ward No. 7	No	Information not available	No
05	Vehicles used for Primary Collection	Push Carts	Mini Truck (Ape)	Information not available	Push Carts
06	Vehicles used for Secondary Collection	Tractors, Mini Truck and Tipper	Tractors	Information not available	Tractors
07	No. of Community Bins	NA	15	Information not available	15
08	Where is the collected waste transported to	Resource Recovery Parks	Compost Yard	Resource Recovery Park	Compost Yard
09	Is the waste treated	Yes	Partially	Yes	Yes
10	What is the method of treatment	Windrow and Vermi-Composting	Windrow Composting	Windrow Composting	Windrow Composting
11	Disposal of waste without treatment	No	Partial	No	No

Table 5-9 **Snapshot of Solid Waste Management in TPs**					
Sl. No.	**Component of SWM**	**Periyanaicken-palayam**	**Narsimhanaicken-palayam**	**Veerapandi (No. 4)**	**Idigarai**
12	User fee for SWM services	No	No	No	No
Source: Respective town panchayat offices, 2015					

5.4 Storm Water Drainage

c. Natural storm water drainage

The surface run-off from the Kurudi Hill Range on the western side of the study Town Panchayats' cluster, creates the dominant natural drainage pattern existing in the area. One of the main carrier is the Kousika River that runs from the foot hill (north of the CRPF Training College in Narsimhanaicken-palayam), dividing Periyanaicken-palayam and Narsimhanaicken-palayam, and flows eastwards through Idigarai and further to as far as Tirrupur. Another stream originating from the foot hills, runs north east to Periyanaicken-palayam and through Veerapandi (No. 4), and further to Karamadai and beyond. A third stream flows from the hills through southern side of Narsimhanaicken-palayam and drains in to the Kousika River.

Plate 5-10 **Main Constructed Storm Water Drains in Periyanaicken-palayam and Narsimhanaicken-palayam**

Main Storm Drain of Periyanaicken-palayam	**Main Storm Drain of Narsimhanaicken-palayam**
	

Check Dam on the Kousika River in Narsimhanaicken-palayam

Source: IIHS Primary Study, 2015

d. Constructed drains

There is a good coverage of constructed surface storm drains in all the study Town Panchayats, as presented in photographs from these towns.

Plate 5-11 **Surface Storm Water Drains in TPs**

Source: IIHS Primary Study, 2015

6 Conclusions

6 Conclusions

The Secondary Review had highlighted the following issues for validation and further study as a part of the Primary Study:

- Issues of Access
- Full Cycle sanitation
- Water Stress
- Public Health Outcomes
- Behaviour change
- Knowledge generation
- Institutional Priority to urban Sanitation and Financing

The fore-going Sections have highlighted a number of salient features in respect of access and the full cycle of sanitation:

1) Open Defecation: It is quite clear that issues of access to sanitation, and the practice of open defecation are important issues in urban Tamil Nadu. Study locations show that there are larger deficits in the small Town Panchayats compared to the municipalities, but these also point to two important issues. One, the nature of settlements, especially slums prevent individual household toilets because of space and affordability constraints. These render communities to be dependent on community and public toilets where these are available. Availability too may not translate into regular use if these toilets are no maintained and managed properly, as reported from many locations. Two, there is also reportage of members resorting to open defecation even in households that have toilets. While cultural factors are used to explain such behaviours, many are also related to perceived imperatives to reduce load on own toilets, and hence prolong the period to de-sludging.
2) Toilet Design, Construction and Containment: In both the study locations, there is considerable divergence noted between prescribed standards and actual practices. One, the Study shows the considerable sub-types and variations of containment structures, a recurring theme being porosity of base and side walls and typical over-design for size to avoid de-sludging for long periods of time. Two, unlike popular perception, many of these structures are not “septic” or safe containment mechanisms, but may be actually in the nature of pits, soak-pits, cess-pits or merely holding tanks with liquids being discharged regularly sub-surface or through drain-out systems into drains and open areas. Apparently, popular perceptions and the construction practices ascribe the round or circular structures to being pits or soak pits, whereas rectangular structures, howsoever constructed, are deemed to be akin to “septic tanks”.
3) De-sludging and Conveyance: at present, de-sludging services are provided by private operators, and some ULBs have their own vehicles too. The equipment used include basic trucks fitted with suction pumps, and safety gear does not seem to be used. Sludge operators report a number of difficulties including unwillingness of households to clean regularly, non-existence or very distant availability of locations to empty sewage, and other barriers to their operations. Regulation has also reported to have been lax leading to disposal of sewage in non-designated areas. De-sludging seems to be enjoying a negative perception amongst households to be avoided as much as possible. This part of the chain requires considerable strengthening both from the supply and demand side, supported by regulatory frameworks that promote desirable safe conveyance practices.
4) Treatment and Safe Disposal: At present, there are only a few Sewage Treatment Plants in or near the Study locations. Hence, the bulk of septage cleared from septic tanks is reported to be emptied in farm fields with consent of farmers who utilize this as manure. The lack of STPs or emptying points nearby seems to be the biggest constraint to safe treatment and disposal.

5) Linkage with other environmental services: the linkages of sanitation with other environmental services viz. water supply, solid waste management, and drainage, are located in the urban settlement pattern in these Study locations. The links of containment structures with drainage is quite obvious when drains become repositories of not just sullage but also fecal matter. Recent attempts to seal open discharge of toilets into drains appear to be bearing results, it is not clear whether and to what extent sub-surface leakages find their way into drains, and pollute groundwater. These issues will need further investigation.
6) Institutional and related issues: As highlighted in the Secondary analysis, the institutional capacities of ULBs, especially the Town Panchayats, are limited. Further, the available resources for sanitation are claimed a large measure by solid waste management, that is much more visible to all stakeholders. It will take considerable effort, human and financial resources, to accord institutional priority to the full chain of human excreta management, from improved construction and maintenance of containment structure, to improved de-sludging and conveyance, to finally, safe disposal and treatment.

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Annexures

Annexure 1: Instruments for Primary Study

Questionnaire Form for Households

Vanakkam, I am _____, from the Indian Institute for Human Settlements in Bangalore. We are conducting a study on sanitation in Tamil Nadu. We have chosen two localities for the study and are interviewing households and establishments in these areas. Participation in this survey as respondent will not result in terms of any benefit of being part of any government programmes or schemes. The survey is only for academic purposes. Your response and views to the survey is of utmost importance and would help in our study.

Participating in this survey and is purely dependent on your willingness, we would request and do respect and value time and decision of participating. In case you choose not to participate in the survey, you will not be asked to give an explanation.

The information collected through this survey will remain confidential, and only be made public after obtaining your approval. The survey is generic and would be collected across from various households in your town/city and does not include information of your household in particular. Your cooperation and support in answering the questions would be valuable to our institution.

Would you like to participate in this survey? Or would like to know any more information either regarding the institution or the survey in particular?

Respondent does not agree to be interviewed_____2 (end the conversation)

Section I: Basic Information		
1.1	Name of the respondent?	
1.2	Household Size	M > 12 yrs ☐ F ☐ Children < 12 yrs ☐
1.3	Who are the earning members and what are their occupations?	
1.4`		Occupation

Section II – Housing				
2.1.	Do you own this house or is it rented?	Own		
		Rented/leased		
		Other _____		
2.2.	How old is the building (in years)?			
		DKCS		
2.3.	Remarks			

Section III – Water Supply						
3.1.	What are your major sources of water? (Mark all that are applicable)					
		Drinking and cooking		Washing, Bathing, etc.		
		Summer	Other seasons	Summer	Other seasons	
	Piped water supply					
	Piped into dwelling					
	Piped into yard/plot					
	Public taps/ stand pipes					
	Tubewell or Borewell					
	Dug well					
	Protected					
	Unprotected					
	Water from Spring					
	Protected					
	Unprotected					
	Rainwater					
	Tanker/truck					
	Cart with small tank					
3.2.	Surface water (river/dam/lake/pond/canal/ irrigation channel)					
3.3.	What is the distance to your primary source of water?	Within the house				
		Inside the compound				
		Outside the compound but within 200 m				
		Between 200 and500 m				
		Between 500 m and 1 km				
		Others (with remarks)				
3.4.	What is the broad estimate of monthly expenditure on water and related expenses?	Piped water supply		Remarks		
		Private water tankers				
		Informal water suppliers				
		Treated waste-water				
		Bottled water/cans				
		Others (Specify)				
		Total				

Section IV: Individual Household Latrine

4.1	Where is your latrine/s located?	Inside the house		
		Inside the premises		
		Outside the premises		
4.2	What is the type of the latrine/s?	Improved Pit latrine		
		Unimproved pit latrine		
		Flush/Pour flush latrine connected to sewer system		
		Pour flush latrine connected to septic tank		
		Other flush/pour flush latrine		
		DKCS		
		Others (specify)_____		
4.3	When was the latrine constructed?			
4.4	Who was given the job of constructing the latrine?	Contractor		
		Mason		
		Self-made		
		Others specify) _____		
4.5	Who decided on the design, size and shape of the latrine?	Contractor		
		Mason		
		Self-made		
		Husband/ Wife		
		Decided together		
		Influenced by neighbour		
		Influenced by relative		
		Others specify) _____		
4.7	What was the time taken for constructing Septic tank?			
4.8	What was the total expenditure in constructing the latrine?			
4.9	Where does the waste water from the latrine go?	Stays inside the system		
		On to the street outside		

		On to the drain outside		
		On to open areas outside		
		Others_____		
		Others (specify) _____		

If the HH has a Pit Latrine, go to the following question. ***If the HH has a Septic Tank, go to question 4.22***				
4.17	What is the dimensions of the			
4.18	Is it single pit or a double pit?	Single		
		Double		
4.19	Have you ever cleaned the pit?	Yes		
		No		
		Not required as of now		
4.20	When was the pit last cleaned?			
4.21	How was the pit cleaned?	Manually		
		Mechanical (Vacuum truck etc.		
		Others_____		
4.22	Who owned the vacuum truck?	Corporation		
		Private Operator		
		Others_____		
4.23	What was the expenditure for getting the tank cleaned?			
4.24	Where is the sludge disposed of?	Treatment plant		
		Open field for drying		
		Open areas		
		Drains		
		DKCS		
4.25	How long does the pit take to fill up? [In months/years]			
		DKCS		
4.27	Remarks: if any other problems?			

HH with Septic Tank				
4.29	What are the dimensions of the septic tank?	L B D		
4.30	Have you ever cleaned the septic tank?	Yes		
		No		
		Not required as of now		
4.31	When was the septic tank last cleaned?			
4.32	How was the septic tank cleaned?	Manually		
		Mechanical (Vacuum truck etc.)		
		DKCS		
		Others_____		
4.33	Who owned the vacuum truck?	Corporation		
		Private Operator		
		Others_____		
4.34	What was the expenditure incurred for cleaning the tank?			
4.35	How long does the septic tank take to fill up/overflow?			
		DKCS		
4.36	Where is the septage disposed of?	Treatment plant		
		Open field for drying		
		Open land		
		Drains		
		DKCS		
4.38	Why did you opt for a septic tank?			

Section V: Disposal of Grey Water				
5.1	Where does waste water from Kitchen etc. that is not from the toilet go off to?	Flows and dries inside the premises		
		Flows off into fields or open areas outside premises		
		Flows off into the street outside		
		Flows off into the drain outside		
		Others		

Section VI: Observation schedule for Household latrine		
Location of toilet	Within the house	
	Outside the house	
Functional status	Working	
	Not in use	
	Used for storage	
	Working but leaks and breakages visible	
Type of toilet	Flush/pour flush latrine connected to sewer	
	Flush /pour flush latrine connected to septic tank	
	Flush/pour flush latrine connected to other systems	
	Pit latrine with slab/ventilated improved pit	
	Pit latrine without slab/open pit	
Type of toilet seat	Indian Pan	
	Western Commode	
	Platform with hole (Raised)	
	Platform with hole (on the floor)	
Type of flush	Cistern flush	
	Pour flush	
Pan Material		

Section VII: Observation Schedule for Pits		
Location of the Pit	Within the compound	
	Adjacent to the toilet	
	Below the toilet	
	Within the house	
Design	Single pit (unlined)	
	Single pit (lined)	
	Twin pit (unlined)	
	Twin pit (lined)	
Size	Length	
	Width	
	Depth	
Material	Bricks	
	Cement Concrete	
	Concrete rings	
	Others (specify)	
Accessibility (by cesspool vehicle)	Yes	
	No	

Section VIII: Observation Schedule for Septic Tanks		
Location of the Septic Tank	Within the compound	
	Adjacent to the toilet	
	Below the toilet	
	Within the house	
Design	Single chamber (sealed)	
	Single chamber (with open able cover)	
	Double chamber (sealed)	
	Double chamber (with open able cover)	
Size	Length	
	Width	
	Depth	
	Can't identify	
Outlet connected to:	Soak pit	
	Surface drain	
	Sewer line	
	Let out into open area	
	Can't identify	

Section IX: Observation Schedule for Housing Observe and make note (ask questions wherever necessary)			
Land use type	Mixed use		
	Residential		
	Others		
Building Typology	Slum settlement		
	Government quarters/housing		
	Independent bungalows		
	Multi-storeyed individual apartments (< 5 storeys)		
	Multi-storeyed individual apartments (> 5 storeys)		
	Gated community complexes		
	Others		
No. of storeys	Ground (G)		
	G+1		
	G+2		
	b/w G+3 to G+6		
	G+6 and above		
Total number of units/households in the building	1		
	1 to 3		
	3 to 6		
	6 to 12		
	12 to 30		
	30 and above		
Materials used for construction of roof	Thatch		
	Asbestos/Aluminum sheet		

	Tiles		
	Cement concrete		
	Plastic/Polythene		
	Others		
Materials used for the construction of walls	Stone		
	Brick – Load-bearing		
	Brick - Framework		
	Clay hollow blocks		
	Cement concrete		
	Plastic/Polythene		
	Aluminum sheets		
	Others		

Questionnaire Form for shared toilet Households

Vanakkam, I am _____, from the Indian Institute for Human Settlements in Bangalore. We are conducting a study on sanitation in Tamil Nadu. We have chosen two localities for the study and are interviewing households and establishments in these areas. Participation in this survey as respondent will not result in terms of any benefit of being part of any government programmes or schemes. The survey is only for academic purposes. Your response and views to the survey is of utmost importance and would help in our study.

Participating in this survey and is purely dependent on your willingness, we would request and do respect and value time and decision of participating. In case you choose not to participate in the survey, you will not be asked to give an explanation.

The information collected through this survey will remain confidential, and only be made public after obtaining your approval. The survey is generic and would be collected across from various households in your town/city and does not include information of your household in particular. Your cooperation and support in answering the questions would be valuable to our institution.

Would you like to participate in this survey? Or would like to know any more information either regarding the institution or the survey in particular?

Section I: Basic Information		
1.1	Name of the respondent?	
1.2	Household Size	M > 12 yrs ☐ F ☐ Children < 12 yr ☐
1.3	Who are the earning members and what are their occupations?	
1.4		Occupation

Section II – Housing				
2.4.	Do you own this house or is it rented?	Own		
		Rented/leased		
		Other _____		
2.5.	If rented, what is the monthly rent?			
2.6.	Who is the owner of the land?	Self		
		Husband/ Wife		
		Parents/ Parents-in-law		
		Other family members		
		Government		
		Landlord		
		DKCS		
		Others		
		Don't know		
		Other (with remarks)		
2.7.	How old is the building (in years)?			
		Don't know/Can't say		

Section III – Water Supply					
3.5.	What are your major sources of water? (Mark all that are applicable)				
		Drinking and cooking		Washing, Bathing, etc.	
		Summer	Other seasons	Summer	Other seasons
	Piped water supply				
	Piped into dwelling				
	Piped into yard/plot				
	Public taps/ stand pipes				
	Tubewell or Borewell				
	Dug well				
	Protected				
	Unprotected				
	Water from Spring				
	Protected				
	Unprotected				
	Rainwater				
	Tanker/truck				
	Cart with small tank				
3.6.	Surface water (river/dam/lake/pond/canal/irrigation channel)				
3.7.	What is the distance to your primary source of water?	Within the house			
		Inside the compound			
		Outside the compound but within 200 m			
		Between 200 and 500 m			
		Between 500 m and 1 km			
		Others (with remarks)			
3.8.	What is the broad estimate of monthly expenditure on water and related expenses?	Piped water supply		Remarks	
		Private water tankers			
		Informal water suppliers			
		Treated waste-water			
		Bottled water/cans			
		Others (Specify)			
		Total			

Section IV: Shared latrine				
4.1	How many other households use this latrine? Probe around loading of the Toilets			
4.2	Where is the latrine located?	Inside the plot		
		Outside the plot		
4.3	How many seats are there?	Male Female Children		
4.3	What is the distance to the latrine?	Less than 100m		
		Between 100m-200m		
		Between 200m-500m		
		Between 500m – 1 km		
		More than 1 km		
		DKCS		
4.4	What is the type of latrine?	Hole in the ground		
		Single pit		
		Double pit		
		Septic tank		
		Flush toilet connected to sewer system		
		Others_____		
4.5	When was the latrine constructed? [Month, year]			
4.10	Time taken for construction? (In days/months)			
4.11	Total expenditure in constructing latrine?			
4.12	Where does the waste water from the latrine go?	Stays inside the system		
		On to the street outside		
		On to the drain outside		
		DKCS		
		Others_____		

If the shared toilet has a soakpit, go to the following question.
If the toilet has a Septic Tank, go to question 4.25

4.15	What is the depth of the pit?			
4.16	Have you ever cleaned the pit?	Yes		
		No		
		Not required as of now		

4.17	When was the pit last cleaned?			
4.18	How was the pit cleaned?	Manually		
		Mechanical (Vacuum truck etc.)		
		Others_____		
4.19	Who owned the vacuum truck?	Municipality		
		Private Operator		
		Others_____		
4.20	What was the expenditure?			
4.21	How long does the pit take to fill up? [In months/years]			
		DKCS		
4.22	Where is the septage disposed of?	Treatment plant		
		Open field for drying		
		Open areas		
		Drains		
		DKCS		
4.23	Do you have any issues with your soakpit?	Yes		
		No		
4.24	What are the issues?			

Shared Toilet with Septic Tank				
4.25	Have you ever cleaned the septic tank?	Yes		
		No		
		Not required as of now		
4.26	When was the septic tank last cleaned?			
4.27	How was the septic tank cleaned?	Manually		
		Mechanical (Vacuum truck etc.)		
		Others_____		
4.28	Who owned the vacuum truck?	Municipality		
		Private Operator		
		Others_____		
4.29	What was the expenditure?			

		DKCS		
4.30	How long does the septic tank take to fill up/overflow?			
		DKCS		
4.31	Where is the septage disposed of?	Treatment plant		
		Open field for drying		
		Open areas		
		Drains		
		DKCS		
4.32	Do you have any issues with your septic tank?	Yes		
		No		
4.33	What are the issues?			

Section V: Disposal of Grey Water				
5.1	Where does waste water from Kitchen etc. that is not from the toilet go off to?	Flows and dries inside the premises		
		Flows off into fields or open areas outside premises		
		Flows off into the street outside		
		Flows off into the drain outside		
		Others		

Section VI: Observation schedule for shared latrine			
Location of toilet	Within the house		
	Outside the house		
Functional status	Working		
	Not in use		
	Used for storage		
Type of toilet	Water seal (sanitary)		
	Pit		
	VIP (Ventilated Improved Pit)		
Type of toilet seat	Indian Pan		
	Western Commode		
	Platform with hole (Raised)		
	Platform with hole (on the floor)		
Water Supply	Water Tap (continuous)		
	Water Tap (intermittent)		
	Storage Tank		

Type of flush	Cistern flush		
	Pour flush		
Collection System	Pit		
	Ventilated Improved Pit		
	Twin pit		
	Septic tank		
	Sewer system		
Structure	Permanent		
	Temporary		

Section VII: Observation Schedule for Septic Tanks			
Location of the Septic Tank	Within the compound		
	Adjacent to the toilet		
	Below the toilet		
	Within the house		
Design	Single chamber (sealed)		
	Single chamber (with open able cover)		
	Double chamber (sealed)		
	Double chamber (with open able cover)		
Size	Length		
	Width		
	Depth		
	Can't identify		
Water tightness (plastered inside & out)	Yes		
	No		
	Can't identify		
Distance from the nearest ground water source	Within 10 mts		
	Beyond 10 mts		
	Not Applicable		
Accessibility (by cesspool vehicle)	Yes		
	No		
Level	Raised above the ground		
	Flushed to the ground		
	Below the ground		
Ventilation (vent pipe)	Yes		
	No		
	Can't identify		
Outlet connected to:	Soak pit		
	Surface drain		
	Sewer line		
	Let out into open area		
	Can't identify		

Section VIII: Observation Schedule for Pits			
Location of the Pit	Within the compound		
	Adjacent to the toilet		
	Below the toilet		
	Within the house		
Design	Single pit (unlined)		
	Single pit (lined)		
	Twin pit (unlined)		
	Twin pit (lined)		
Size	Length		
	Width		
	Depth		
	Can't identify		
Material	Bricks		
	Cement Concrete		
	Concrete rings		
	Others (specify)		
Accessibility (by cesspool vehicle)	Yes		
	No		
Distance from the nearest ground water source	Within 10 mts		
	Beyond 10 mts		
	Not Applicable		
Ventilation (vent pipe)	Yes		
	No		
	Can't identify		

Questionnaire Form for OD Households

Vanakkam, I am _____, from the Indian Institute for Human Settlements in Bangalore. We are conducting a study on sanitation in Tamil Nadu. We have chosen two localities for the study and are interviewing households and establishments in these areas. Participation in this survey as respondent will not result in terms of any benefit of being part of any government programmes or schemes. The survey is only for academic purposes. Your response and views to the survey is of utmost importance and would help in our study.

Participating in this survey and is purely dependent on your willingness, we would request and do respect and value time and decision of participating. In case you choose not to participate in the survey, you will not be asked to give an explanation.

The information collected through this survey will remain confidential, and only be made public after obtaining your approval. The survey is generic and would be collected across from various households in your town/city and does not include information of your household in particular. Your cooperation and support in answering the questions would be valuable to our institution.

Would you like to participate in this survey? Or would like to know any more information either regarding the institution or the survey in particular?

Section I: Basic Information		
1.1	Name of the respondent?	
1.2	Household Size	M > 12 yrs ☐ F ☐ Children < 12 yrs ☐
1.3	Who are the earning members and what are their occupations?	
1.4		Occupation

Section II – Housing				
2.8.	Do you own this house or is it rented?	Own		
		Rented/leased		
		Other _____		
2.9.	If rented, what is the monthly rent?			
2.10.	Who is the owner of the land?	Self		
		Husband/ Wife		
		Parents/ Parents-in-law		
		Other family members		
		Government		
		Landlord		
		DKCS		
		Others		
		Don't know		
		Other (with remarks)		
2.11.	How old is the building (in years)?			
		DKCS		

Section III – Water Supply						
3.9.	What are your major sources of water? (Mark all that are applicable)					
		Drinking and cooking		Washing, Bathing, etc.		
		Summer	Other seasons	Summer	Other seasons	
	Piped water supply					
	Piped into dwelling					
	Piped into yard/plot					
	Public taps/ stand pipes					
	Tubewell or Borewell					
	Dug well					
	Protected					
	Unprotected					
	Water from Spring					
	Protected					
	Unprotected					
	Rainwater					
	Tanker/truck					
	Cart with small tank					
3.10.	Surface water (river/dam/lake/pond/canal/ irrigation channel)					
3.11.	What is the distance to your primary source of water?	Within the house				
		Inside the compound				
		Outside the compound but within 200 m				
		Between 200 and500 m				
		Between 500 m and 1 km				
		Others (with remarks)				
3.12.	What is the broad estimate of monthly expenditure on water and related expenses?	Piped water supply		Remarks		
		Private water tankers				
		Informal water suppliers				
		Treated waste-water				
		Bottled water/cans				
		Others (Specify)				
		Total				

Section IV: Open Defecation				
4.1	Why your family does not have access to Toilet?			
4.2	Where do household members go for defecation? (tick all applicable)	Next to drain		
		On rail lines		
		Open fields		
		Field/ Bushes		
		Forested areas		
		Others _____		
4.3	Do all members defecate un open?			
4.4	How much time does it take to reach there? (In minutes)			
4.5	Have you and your family always defecated in the open?	Yes		
		No		
4.6	Where did you go earlier? (Describe when, where)			
4.7	What was the reason for the change?			
4.8	Do you face any problem in defecating outside?	Yes		
		No		
4.9	What kind of problems do you face in defecating outside?			

Section V: Disposal of Grey Water				
5.1	Where does waste water from washing, cleaning and bathing go off to?	Flows and dries inside the house		
		Flows off into fields or open areas		
		Flows off into the street outside		
		Flows off into the drain outside		
		Others		

Section VI: Observation Schedule for building *Observe and make note (ask questions wherever necessary)*			
Land use type	Mixed use		
	Residential		
	Others		
Building Typology	Slum settlement		
	Government quarters/housing		
	Independent bungalows		
	Multi-storeyed individual apartments (< 5 storeys)		
	Multi-storeyed individual apartments (> 5 storeys)		
	Gated community complexes		
	Others		
No. of storeys	Ground (G)		
	G+1		
	G+2		
	b/w G+3 to G+6		
	G+6 and above		
Total number of units/households in the building	1		
	1 to 3		
	3 to 6		
	6 to 12		
	12 to 30		
	30 and above		
Materials used for construction of roof	Thatch		
	Asbestos/Aluminum sheet		
	Tiles		
	Cement concrete		
	Plastic/Polythene		
	Others		

Materials used for the construction of walls	Stone		
	Brick – Load-bearing		
	Brick - Framework		
	Clay hollow blocks		
	Cement concrete		
	Plastic/Polythene		
	Aluminum sheets		
	Others		

Checklist for Masons

(In first few questions, determine whether the respondent is a toilet mason or not, and continue with the discussion only if they have experience in constructing toilets.)

Vanakkam, I am _____, from the Indian Institute for Human Settlements in Bangalore. We are conducting a study on sanitation in Tamil Nadu in order to improve the full cycle of access to toilets, safe collection and disposal/proper treatment of human excreta. We have chosen your neighbourhood to understand the problems and issues in urban areas pertinent to sanitation, so that appropriate improvements can be proposed. Your identity and responses shall not be disclosed to anyone. Your cooperation and support in answering the questions would be valuable to our study.

1. What kind of buildings do you construct? (*Single houses, Group houses, Apartments, Shops etc.*) *and does toilet construction form a part of this work?*
2. How many building have you constructed in the last year?
3. What are the localities /area you operate in?
4. How long have you been in the masonry business?
5. How did you come into this business?
6. How did you learn the trade?
7. Do you work alone or with some-one else? (*Probe for mode of operation)*
8. What kind of toilets do you construct (pits, septic tanks, others)?
9. On an average, how many toilets do you construct in a month? (*Probe for seasonal variations) In a year?*
10. How do clients get in touch with you?
11. What are the standard type designs for Septic tanks that are constructed? *(Probe for details, before introducing sketch, and systems costing sheet)*
12. How have the construction and design practices changed in the last ten years?
13. For the septic tanks, what is the most common arrangement for effluent outflow?
14. Generally, is there a soak away? If not, what is the most common arrangement? (*Probe for how these arrangements vary by different building typologies or across socio-economic classes?)*
15. Typically, how long does it take to make a septic tank? (*If there are variations, probe why there are variations?)*
16. Who decides the location of the septic tank vis-a-vis the building?
17. Who decides upon the design, size etc.? (*Probe whether it is household, which members of the household, builders etc.)*
18. Who supervises the construction process?
19. Do you undertake repair work also? If yes, ask for details about what kind of repair work is undertaken.
20. What are common problems faced by you as a mason? How can the above problems be addressed?
21. Anything you would like to ask us?

Your Contact no:

End by thanking the respondent, and also asking for another appointment if needed.

Checklist for Contractors

Vanakkam, I am _____, from the Indian Institute for Human Settlements in Bangalore. We are conducting a study on sanitation in Tamil Nadu in order to improve the full cycle of access to toilets, safe collection and disposal/proper treatment of human excreta. We have chosen your neighbourhood to understand the problems and issues in urban areas pertinent to sanitation, so that appropriate improvements can be proposed. Your identity and responses shall not be disclosed to anyone. Your cooperation and support in answering the questions would be valuable to our study.

1. What are the different type of construction activities do you undertake? (Probe about w*hat kind of buildings, scale of buildings)*
2. Do you undertake construction job on a turn-key basis? (*Probe for mode of operation)*
3. What are the localities /area you operate in?
4. What kind of buildings do you construct? (Single houses, Group houses, Apartments, Shops etc.)
5. How did you come into this business?
6. How many of them did you construct in the last year?
7. In the building you construct, do you undertake toilet construction with your own people or is this sub-contracted? (*Probe for details)*
8. Typically, what are different kind of sanitation systems are adopted in the town? (*Probe for differences according to housing type, Identify all types of systems).*

For each type, ask set of following questions:

9. What are the different types of designs? (Additionally*, for septic tank- get sketches)*
10. How much does each of the building systems cost? (*for septic tank, get detailed costing)*
11. What are the disposal arrangements? *(for effluent and sludge)*
12. How much time is required for construction?
13. Who decides on type (design, size, location) of the sanitation system?
14. Who supervises the construction of the septic tanks and toilets?
15. What are the common arrangements for operations and maintenance of these sanitation systems?

22. Tell us little bit about the problems facing your business? How can the above problems be addressed?

Please share your Contact no:

End by thanking the respondent, and also asking for another appointment if needed.

Checklist for Sanitary Workers

Vanakkam, I am _____, from the Indian Institute for Human Settlements in Bangalore. We are conducting a study on sanitation in Tamil Nadu in order to improve the full cycle of access to toilets, safe collection and disposal/proper treatment of human excreta. We have chosen your neighbourhood to understand the problems and issues in urban areas pertinent to sanitation, so that appropriate improvements can be proposed. Your identity and responses shall not be disclosed to anyone. Your cooperation and support in answering the questions would be valuable to our study.

1. What kind of toilets do you clean*? (pit latrines, septic tanks, etc.)*
2. How many cleaning requests do you get in a month? (*probe for seasonal variations if any at all)*
3. How much do you get paid? Does this vary by type of client or type/size of installation?
4. Does the household provide any other benefits?
5. Approximately, how much do you earn in a month?
6. What are the different types of toilets prevalent in this area? (*probe which are the predominant ones)*
7. How have the construction and design practices changed over the last ten years or so? (*Probe for details)*
8. How long does it take to clean one pit larine or septic tank?
9. Where do you dispose of the sludge? (*Gently probe for different methods of disposal)*
10. Do you wear any gloves, masks, dresses etc. protective gear while cleaning? Do you take any other precaution before cleaning?
11. Do you have any health concerns due to this?
12. What can make your job of cleaning more efficient?

End by thanking the respondent, and also asking for another appointment if needed.

Checklist for Government Cesspool operators

Vanakkam, I am _____, from the Indian Institute for Human Settlements in Bangalore. We are conducting a study on sanitation in Tamil Nadu in order to improve the full cycle of access to toilets, safe collection and disposal/proper treatment of human excreta. We have chosen your neighbourhood to understand the problems and issues in urban areas pertinent to sanitation, so that appropriate improvements can be proposed. Your identity and responses shall not be disclosed to anyone. Your cooperation and support in answering the questions would be valuable to our study.

1. How many honey suckers does the ULB own or hire?
2. What is the type and capacity of these vehicles? List number of vehicles by capacity, also note whether these are modified trucks or specially made or equipped vehicles).
3. For how long have these vehicles been operational? (add age to the above list)
4. What kind of buildings/ clients do you service? *(Households, institutions, commercial etc.) Is the rate different for each of the above customer categories? (ask for rate card)*
5. How do people get in touch with you?
6. On an average, how many cleaning requests do you get in a month? In a year?
7. How many trips do the vehicles make per month?
8. How are the routes decided?
9. In a normal trip, do you ensure the truck cleans the septic tank to its full capacity or do these have to carry partial loads?
10. How is the rate decided? When did the rates last change?
11. What costs do you incur – including labour costs, transportation costs and others?
12. Does the ULB have any condition for collecting septage from a particular household or building (such as property tax receipts)?
13. How is collected septage normally disposed?
14. If dumped, where is it disposed of?
15. Are there buyers of sewage? Ex: agriculturists etc.?
16. Do you provide any gloves, caps, suits, etc. protective gear to your workers?
17. How many private operators are there in the town? How many vehicles do they operate?
18. How many of them are registered with the ULB?
19. Are there any rules and regulations that are enforced upon them?
20. What are your suggestions to improving septage collection, transportation and treatment?

End by thanking the respondent, and also asking for another appointment if needed.

Checklist for Private Cesspool vehicles

Vanakkam, I am _____, from the Indian Institute for Human Settlements in Bangalore. We are conducting a study on sanitation in Tamil Nadu in order to improve the full cycle of access to toilets, safe collection and disposal/proper treatment of human excreta. We have chosen your neighbourhood to understand the problems and issues in urban areas pertinent to sanitation, so that appropriate improvements can be proposed. Your identity and responses shall not be disclosed to anyone. Your cooperation and support in answering the questions would be valuable to our study.

1. How many honey suckers do you own?
2. What is the total capacity of these vehicles?
3. How long have you been in this business?
4. How did you enter this business?
5. What is the area (localities) of operation?
6. What kind of buildings/ clients do you service? *(households, institutions, commercial etc.)*
7. How do people get in touch with you? (*Probe for differences households, institutions, etc.)*
8. On an average, how many cleaning requests do you get in a month?
9. What are the rates that you charge for cleaning? (*probe for differences)*
10. When did the rates last change? How is collected septage disposed of? Where? (Probe gently whether there are designated locations and whether the actual practice differs from the prescribed).
11. Do you provide any gloves, caps, suits, etc. protective gear to your workers?
12. How many other operators are there in the town or in the area? How many vehicles do they have?
13. Is there a process of registration or licensing that you have do? What are the steps involved?
14. What are the other rules and regulations that you are expected to follow?
15. Are there buyers of sewage? Ex: agriculturists etc.?
16. How many other private operators are there in the town? How many vehicles do they operate?
17. What are your suggestions to improving septage collection, transportation and treatment?
18. What has been your experience of interacting with officers of the ULB?
19. What are your major kinds of expenditure in a month? (personnel, labour, vehicle etc.)
20. What are the monthly costs that you incur – including labour costs, transportation costs and others?
21. How much capital investment was needed? (Probe for details)

May we contact you again??

Checklist for farmers

1. Do you regularly buy septage as manure/fertilizer in your farm?
2. What is the frequency at which you buy and put septage in your land? At what volume per acre?
3. What crops do you grow that specifically require input of septage?
4. How much do you pay for septage?
5. Are these private or public tankers? Is there a difference in their rates?
6. Do neighbouring farmers also use septage? (*Probe for differences in arrangements, prices etc.)*
7. How is the septage applied on the field?
8. Do you feel that the septage provides any benefit to the crop?
9. Are there any problems in using septage?

Checklist for EO/ Municipal Commissioner and Chairperson

1. What are the key problems that you are faced with in keeping the town running? (Conversation, quickly move on)

2. What is the economic base of the city? What are the main sources of employment? Location of work and where do people live?

3. What are the roles and responsibilities of the ULB in providing water, sanitation, solid waste and drainage arrangements?

4. What are chief concerns regarding water supply in the city?

5. What are chief concerns regarding sanitation in the city?

6. What are chief concerns regarding solid waste management in the city?

7. What are the ongoing projects in the above sectors? How are they funded?

8. What is the role of private sector in provisioning these services?

9. What are the main sources of revenue for the ULB? What are the main areas of expenditure?

10. What is the planning framework? How is the process? Who are the key players? (If at state level, get names)

11. Slum overview? How many slums are there? How are they decided? Is there an area of concentration? What are the chief concerns?

12. What is the relationship of the city/ district with nearby cities/ district?

Checklist for Chief Engineer/ Other Technical Staff

1. Please can you tell us a little bit about the town? What is its importance? A brief on its geography, administrative boundaries, connectivity, landmarks etc.

2. What are the broad settlement patterns in the town? (High, medium and low income groups or high rise, low rise high density and slum pockets) (a broad distribution on the map)

3. What is the current water supply system in the town/city (source, collection, treatment, storage and distribution)? Is there a map showing these zones, current treatment, storage and distribution infrastructure? If no map is available, can we have a schematic of the current system (simple flow diagram).

4. How many municipal water connections are present in the town/city (household, commercial & bulk)? What is the cost of connection and monthly tariff? How is the user fee collected and at what frequency?

5. What is the estimated distribution losses and non-revenue water?

6. What is coverage of individual toilets in the city (per cent) and how many of them exist (numbers). What are most common type of individual toilets (pits, pour flush or flush toilets)

7. What is the general disposal patter of toilets (individual & public) in the city (Pits, septic tanks or open drains)?

8. What is the general disposal pattern of sullage (greywater) in the town (left into open drains or open areas)?
9. Do you have an underground sewerage system? If yes, to what extent (per cent of physical areas covered)? Do you have sewer zones? Is there a map showing these zones, current network coverage, treatment and disposal infrastructure? If no map is available, can be have a schematic of the current system (simple flow diagram)
10. How many sewer connections are there in the town/city (household, commercial, industrial etc.)? What is the cost of connection and monthly tariff? How is the user fee collected and at what frequency?

11. If there is No underground sewerage, is there a system of regularly cleaning septic tanks and treating septage in a designated facility?
(Probe for Details)

12. What are the roles and responsibilities of different departments?

13. What is the current staffing pattern (on pay roll & on contract) of the department against sanctioned structure?

14. How many public and community toilets are present in the town/city? What disposal system are they connected to? What is the current functional status? Who maintains them? What are the costs and receipts and how are these managed?

15. What is the current solid waste management system in the town/city (collection, transportation, treatment and disposal/reuse)? Do you have zones demarcated for SWM? Is there a map showing these zones, current treatment, storage locations and vehicle routing? If no map is available, can be have a schematic of the current system (simple flow diagram)

16. How many households and establishments are covered under SWM? What is the monthly tariff? How is the user fee collected and at what frequency? What is the general recovery rate?

17. Please give details on the natural storm water drainage system in the town/city (rivers, streams, etc.). What is the coverage of man-made storm drains? Is there a map showing both natural and man-made drains? If no map is available, can be have a schematic (simple flow diagram)

18. What are key concerns regarding environmental services in the town?
(Ask for each service)

Secondary Data Checklist (To collect from ULB)

I. General Information:	
1. Population	
2. Area (in sq. km.) (Document recent changes in boundaries, if any)	
3. Class (as per Census)	
4. Grade (as per DTP)	
5. Year of Establishment	
6. No. of Wards (Document recent changes in boundaries, if any)	
7. Groundwater levels (mts)	
8. Soil type	
II. Demography:	
1. Population (2011)	
2. Decadal Population (2001, 1991, 1981, 1971 & 1961)	
3. Ward-wise population (Printout or soft copy)	
4. Floating population (regular and seasonal)	
5. Urban poor (Population & No. of HHs) (Attach list of Slums with Ward no. and Population)	

III. Water Supply:	
1. Main sources for municipal supply	
2. Distance from the town (in km)	
3. How is the water conveyed? (gravity or pumping)	
4. Details of Treatment Infrastructure	a. Location: b. Capacity (MLD): c. Treatment Technology: d. Current utilization level (%):
5. Coverage of water supply network	a. Physical coverage (%): b: No. of Households covered: c: Details of un-served areas (If any):
6. Quantity supplied (in MLD)	
7. Frequency of supply (number of times in a day)	
8. Duration of supply (hours per day)	
9. Per capita supplied (lpcd)	
10. Non-revenue water	a. Total NRW (quantity and per cent)

	b. Physical losses: i) Leakage from transmission and distribution mains ii) Leakage and overflow from utility reservoirs and storage tanks iii) Leakage in service connections c. Commercial/Apparent losses: i) Unmetered or free connections ii) Meter inaccuracy iii) Unauthorized consumption iv) Meter reading errors v) Data handling and accounting errors

11. Water Supply – Connection Details:

Sl. No.	Type of Connection	No. of Connections	Connection Charge	Monthly Tariff
a	Regular Household			
b	Slum Household			
c	Commercial			
d	Institutional			
e	Industrial			
f	Others (If any)			
Note: Collect data at ward level for each type				

Notes:

12. Projects implemented in the last 5 years:

Sl. No.	Name of the Project	Capital Cost	Funding Source	Scheme details
a				
b				
c				
d				

13. Projects proposed in the next 5 years:

Sl. No.	Name of the Project	Capital Cost	Funding Source	Scheme details
a				
b				
c				
d				
e				

14. Service Level Benchmarks – Water Supply:

Sl. No.	Indicator	Benchmark	Proposed. 2016	2015	2014	2013	2012	2011	2010
1	Coverage of Water Supply Connections	100%							
2	Per Capita Supply of Water	135 lpcd							
3	Extent of Metering of Water Connections	100%							
4	Extent of Non-Revenue Water	20%							
5	Continuity of Water Supply	24 hrs							
6	Quality of Water Supplied	100%							
7	Efficiency in Redressal of Customer Complaints	80%							
8	Cost Recovery in Water Supply Services	100%							
9	Efficiency in Collection of Water Supply-related Charges	90%							

IV. Details of Public Toilets:

Sl. No.	Ward no.	Location of the Public Toilet	Water Supply	Toilet Seats			Urinal			O&M responsibility	User Fee (Y/N) If Y,?	Functional Status / Remarks
				Male	Female	Child	Male	Female	Child			
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												

I. Details of Community Toilets:

Sl. No	Ward No.	Location of the Community Toilet	Water Supply	Water Closets			Urinal			Bath		O&M respon.	User Fee (Y/N) If Y?	Functional Status/ Remarks
				Male	Female	Child	Male	Female	Child	Male	Female			
1														
2														
3														
4														
5														
6														
7														
8														

V.	Wastewater Management:	
1.	Do you have a sewerage system (if yes, ask points 2 to 15 or skip to section VI)	
2.	How is sewage conveyed (gravity or pumping)	
	Coverage of sewer network (Physical extent and no. of households)	a. Physical coverage (%): b: No. of Households covered: c: Details of un-served areas (If any):
3.	Details of Treatment Infrastructure (location, capacity & current utilization levels)	a. Location: b. Capacity (MLD): c. Treatment Technology: d. Current utilization level (%):
4.	Quantity of sewage collected (in MLD)	

5. Connection charges – Sewerage:

Sl. No.	Type of Connection	No. of Connections	Connection Charge	Monthly Tariff
a	Regular Household			
b	Slum Household			
c	Commercial			
d	Institutional			
e	Industrial			

Sl. No.	Type of Connection	No. of Connections	Connection Charge	Monthly Tariff
f	Others (If any)			
Note: Collect a ward wise list for each type				
Notes:				

15. Projects implement in the last 5 years:

Sl. No.	Name of the Project	Capital Cost	Funding Source	Scheme details
a				
b				
c				
d				
e				

16. Projects proposed in the next 5 years:

Sl. No.	Name of the Project	Capital Cost	Funding Source	Scheme details
a				
b				
c				
d				
e				

17. Service Level Benchmarks – Sewage Management:

Sl. No.	Indicator	Benchmark	Proposed 2016	2015	2014	2013	2012	2011	2010
1	Coverage of Toilets	100%							
2	Coverage of Sewage Network Services	100%							
3	Collection Efficiency of the Sewage Network	100%							
4	Adequacy of Sewage Treatment Capacity	100%							
5	Quality of Sewage Treatment	100%							
6	Extent of Reuse and Recycling of Sewage	20%							
7	Efficiency in Redressal of Customer Complaints	80%							
8	Extent of Cost Recovery in Sewage Management	100%							
9	Efficiency in Collection of Sewage Charges	90%							

VI. Septage Management:

1. Do you have a septage management system operated by ULB (if yes, ask points 2 to 6 or skip to section VII?)

2. How many cesspool vehicles you have? (please fill details below)

Sl. No.	Type of Vehicle	Capacity	Age	Trips per day
a				
b				
c				
d				
e				

3. Where is the septage disposed currently (location)	
4. User charge (Charged on trip basis or volume?) (for different categories)	
5. Other Details	

VII. Solid Waste Management:	
1. Do you have a door to door collection system? (if yes, ask points 2 to 4 or skip to 5)	
2. Coverage of SWM services	a. No. of Wards

	b. No. of Households
3. Quantity of solid waste collected (in TPD)	

4. How the solid waste collected (type of vehicles and instruments)?

Sl. No.	Type of Vehicles/Tools	Capacity	Age	Trips per day
a				
b				
c				
d				
e				
f				
g				
h				
i				
j				

5. How many community bins are there for collecting solid waste	
6. Where is the waste transported and disposed to	
7. Do you have a treatment plant (If yes fill 8 & 9, If no, record the current practice)	
8. Details of Treatment Infrastructure (location, capacity & current utilization levels)	a. Location: b. Capacity (MLD):

	c. Treatment Technology: d. Current utilization level (%):
9. Quantity of solid waste treated (in TPD)	

10. User charges – Solid Waste Collection:

Sl. No.	Type of Connection	Monthly User Charge
a	Regular Household	
b	Slum Household	
c	Commercial	
d	Institutional	
e	Industrial	
f	Others (If any)	

11. Service Level Benchmarks – Solid Waste Management:

Sl. No.	Indicator	Benchmark	Proposed. 2016	2015	2014	2013	2012	2011	2010
1	Household Level Coverage of SWM Services	100%							
2	Efficiency of Collection of Municipal Solid Waste	100%							
3	Extent of Segregation of Municipal Solid Waste	100%							
4	Extent of Municipal Solid Waste Recovered	80%							
5	Extent of Scientific Disposal of Municipal Solid Waste	100%							
6	Efficiency in Redressal of Customer Complaints	80%							
7	Extent of Cost Recovery in SWM services	100%							
8	Efficiency in Collection of SWM Charges	90%							

VIII. Storm water drainage:	
1. Coverage of storm water drains in the city	
2. Length of the drains constructed	
3. Major water logging areas (if any)	

List of documents to be collected from ULB and other agencies:

1. Demographic data:
    a. Ward wise population
    b. List of Slums
    c. Slum population ward wise
2. Water Supply:
    a. Ward wise list of HH connections
    b. Council resolution on user charge
3. Sewerage system:
    a. Ward wise list of HH connections
    b. Council resolution on sewerage cess
4. Septage management
    a. Movement record of cesspool vehicle
    b. Council resolution on cost of emptying
5. SLB data for the last 3 years
6. Municipal Finance:
    a. Annual Budgets for last 3 years
    b. Property tax assessment for last 3 years
    c. Collection efficiency for last 3 years
7. Institutional framework
    a. Organogram
    b. List of sanctioned positions verses filled positions (dept. wise)

List of Maps to be collected:

1. Administrative map,
2. Land use map
3. Topographic map,
4. Road and rail network map
5. Water Supply Map(s)
    a. Location of source,
    b. storage infrastructure and
    c. distribution network
6. Sewerage System Map(s)
    a. Catchment zones,
    b. Distribution network
    c. Location of treatment plant
7. Solid Waste Management Maps
    a. Zones
    b. collection route maps
    c. location of treatment plant
8. Location of septage disposal (Designated by ULB and Illegal dumping places)
9. Major water logging areas (if any)
10. Storm water drainage maps (network map of constructed drains and natural drains)

Annexure 2: Note on Selection Criteria for Studies Towns

The purpose of selection is to assist in the systematic identification of the two urban areas that will be selected for assistance in planning and implementation of the full cycle of sanitation and septage management. It has been proposed that one of the towns will be a Municipality (less than 1 million population), and another will be cluster of Town Panchayats (less than 100,000 population). Municipal Corporations, Cantonment Boards, and Census Towns are not being considered in the choice set.

A two-step selection criterion has been suggested:

i. A preliminary analysis based on secondary data will carried out to generate a short-list of cities. In discussions with GoTN, it was proposed that the selected cities would have high proportion of households covered by some sanitation facilities (or smaller proportion of households without individual toilets), and a high proportion of septic tanks so that early successes can be demonstrated.
ii. After generating the lists from analysis of secondary data, it is proposed that the final selection will be done based on criteria including availability of land for new treatment facilities, demand from institutional and community stakeholders, assurance about financial allocations etc.

This note is based on the initial secondary analysis (above).

Selection of Municipality:

Two options are presented for selection of municipalities.

Option 1:

1. Proportion of households without toilets within premises (going out in the open) – less than 20 per cent
2. Proportion of households with toilets with septic tanks – more than 60 per cent, and 12,000 or more (in number)

Option 2:

1. Proportion of Proportion of households without toilets within premises (going out in the open) – less than 20 per cent
2. Proportion of households with toilets with septic tanks – more than 60 per cent and 15,000 or more (in number)

Town Panchayats Cluster:

Selection criteria for the Town Panchayat clusters are as follows:

1. Proportion of Proportion of households without toilets within premises (going out in the open) – less than 20 per cent
2. Proportion of households with toilets with septic tanks – more than 50 per cent and 1,500 ore more (in number)
3. Clustering of TPs in the same Tehsil (as a proxy for distance)

Annexure 3: Data Tables for Pammal

Ward-wise Water Supply Connections in Pammal				
Ward. No.	**Residential**	**Commercial**	**Industrial**	**Total**
1	651	4	0	655
2	508	0	0	508
3	806	0	0	806
4	411	4	0	415
5	478	0	0	478
6	492	0	0	492
7	523	0	1	524
8	730	0	0	730
9	594	0	0	594
10	367	0	0	367
11	540	1	1	542
12	435	0	0	435
13	377	0	0	377
14	605	0	0	605
15	140	0	1	141
16	499	1	1	501
17	435	1	0	436
18	261	2	4	267
19	193	0	1	194
20	534	0	0	534
21	610	2	10	622
Totals	**10189**	**15**	**19**	**10223**
Source: Pammal Municipality, June 2015				

Ward-wise Public Stand Posts (PSP) in Pammal			
Ward No.	**No. of Streets**	**PSPs**	**PSPs with RO**
1	79	42	2
2	44	35	1
3	50	48	1
4	27	15	1
5	28	35	1
6	59	26	1
7	54	35	2
8	42	26	1

Ward-wise Public Stand Posts (PSP) in Pammal			
Ward No.	**No. of Streets**	**PSPs**	**PSPs with RO**
9	42	32	1
10	19	23	1
11	48	28	1
12	34	26	1
13	23	27	1
14	35	26	1
15	27	26	1
16	24	20	1
17	31	25	1
18	35	26	2
19	29	35	1
20	45	28	1
21	102	35	2
Total	**877**	**619**	**25**
Source: Pammal Municipality (June 2015)			

SLB Indicators for Water Supply in Pammal Municipality						
Sl. No.	**Indicator**	**Benchmark**	**2015**	**2014**	**2013**	**2012**
1	Coverage of Water Supply Connections	100%	55	51	48	43.17
2	Per Capita Supply of Water	135 lpcd	54	52	35	30.71
3	Extent of Metering of Water Connections	100%	0	0	0	0
4	Extent of Non-Revenue Water	20%	20	21	23	25.50
5	Continuity of Water Supply	24 hrs	2	2	2	2
6	Quality of Water Supplied	100%	100	100	100	100
7	Efficiency in Redressal of Customer Complaints	80%	85	80	80	66.66
8	Cost Recovery in Water Supply Services	100%	97	95	90	86.09

SLB Indicators for Water Supply in Pammal Municipality						
Sl. No.	**Indicator**	**Benchmark**	**2015**	**2014**	**2013**	**2012**
9	Efficiency in Collection of Water Supply-related Charges	90%	82	80	75	71.67
Source: Pammal Municipality (June 2015)						

SLB Indicators for SWM in Pammal Municipality						
Sl. No.	**Indicator**	**Benchmark**	**2015**	**2014**	**2013**	**2012**
1	Household Level Coverage of SWM Services	100%	85	84	82	80
2	Efficiency of Collection of Municipal Solid Waste	100%	85	84	83	80
3	Extent of Segregation of Municipal Solid Waste	100%	40	35	30	25
4	Extent of Municipal Solid Waste Recovered	80%	70	65	60	53.57
5	Extent of Scientific Disposal of Municipal Solid Waste	100%	0	0	0	0
6	Efficiency in Redressal of Customer Complaints	80%	75	73	70	66.67
7	Extent of Cost Recovery in SWM services	100%	2.5	2	2	1.8
8	Efficiency in Collection of SWM Charges	90%	0	0	0	42.94
Source: Pammal Municipality (June 2015)						

List of Public Toilets in Pammal													
Sl. No	**Location of the Community Toilet**	**Water Supply**	**Water Closets**			**Urinal**			**Bath**		**O&M respon.**	**User Fee (Y/N) If Y?**	**Functional Status/ Remarks**
			Male	Female	Child	Male	Female	Child	Male	Female			
1	Bajanai Koil Street	Yes	4	4	-	-	-	-	-	-	ULB	Y	Functioning
1	Pasumpon Nagar	Yes	4	4	1	-	-	-	1	1	ULB	N	Functioning
2	Veeraswamy Nagar	Yes	4	4	1	-	-	-	1	1	ULB	N	Functioning
3	Kalyanipuram	Yes	4	4	1	-	-	-	1	1	ULB	N	Functioning
4	Thideer Nagar	Yes	4	4	1	-	-	-	1	1	ULB	N	Functioning
5	Adam Nagar – 1	Yes	4	4	1	-	-	-	1	1	ULB	N	Functioning
6	Adam Nagar – 2	Yes	4	4	1	-	-	-	1	1	ULB	N	Functioning
Source: Pammal Municipality, June 2015													

Vehicle & Tools for SWM by Pammal Municipality				
Sl. No.	**Type of Vehicles/Tools**	**Capacity**	**Age**	**Trips per day**
a	Tricycle (70 nos.)	250 kg	3 years	2 trips within the ward
b	Mini Lorry (1)	2 MT	8 Years	2 trips
c	Tipper Lorry (1)	4 MT	10 years	2 trips
d	Tractor (2)	1.5 MT	8 Years	2 trips
e	Refuse Collector (1) Picks community bins	5 MT	5 Years	2 trips
f	Long Brooms (20)	-	As per ware and tare	-
g	Forks/Pickers (30 - 35)	-	As per ware and tare	-
h	Small Brooms (25 - 30)	-	As per ware and tare	-
Source: Pammal Municipality (June 2015)				

Sanctioned and Vacant Posts Matrix of Pammal Municipality					
Sl. No.	**Name of the Post**	**No. of Posts**			**Date from which vacant**
		Sanctioned	**Staff in Position**	**Vacant**	
I	**General Service**				
1	Commissioner	1	0	1	01.08.2011
2	Manager (Class IV)	1	0	1	17.04.2015
3	Assistant	1	1	0	
4	Junior Assistant	3	3	0	
5	Revenue Assistant	3	3	0	
6	Record Clerk	1	1	0	
7	Office Assistant	1	1	0	
8	Data Entry Operator	1	1	0	
9	Night Watchman	1	1	0	
10	Driver	1	1	0	
	Sub-Total	**14**	**12**	**2**	
II	**Engineering Service**				
1	**General**				

a	Municipal Engineer	1	1	0	
b	Public Work Overseer	2	2	0	
c	Work Inspector	1	1	0	
d	**Sub-Total**	**4**	**4**	**0**	
2	**Water supply**				
a	Electrician Grade II	1	1	0	
b	Driver	3	3	0	
c	Helper (water supply)	1	1	0	
d	Fitter Gr.II	1	1	0	
e	Hand pump maintainer	1	1	0	
f	Turn cock	3	3	0	
g	Overhead tank watch man	1	1	0	
h	Wireman & Helper	2	2	0	02.10.2010 and 08.05.2015
i	**Sub-Total**	**13**	**13**	**0**	
III	**Health Service**				
a	Sanitary Inspector	1	1	0	
b	Sanitary Supervisor	2	2	0	
c	Public Health Driver	5	5	0	
d	Sanitary workers	97	93	4	1 (05.05.2004), 1 (01.06.2007), 11 (1.04.2009), 1 (25.04.2009), 1 (12.01.2010), 1 (28.04.2010), 1 (01.02.2011)
e	Community Organizer	1	1	0	
	Sub-Total	**106**	**102**	**4**	
	Grand Total	**137**	**131**	**6**	
Source: Pammal Municipality (June 2015)					

Property Tax Assessments in Pammal					
Ward No.	**Population**	**Residential**	**Industrial**	**Commercial**	**Total**
1	5537	1744	6	47	1797
2	3361	1112	0	81	1193
3	2271	1159	19	124	1302
4	2284	581	1	155	737
5	3100	970	8	74	1052
6	3866	980	6	144	1130
7	4067	902	4	5	911
8	4392	1102	9	30	1141
9	3716	950	5	96	1051
10	1851	715	9	144	868
11	2947	805	5	151	961
12	5699	804	1	1	806
13	3068	595	3	1	599
14	3363	847	6	9	862
15	1670	362	32	7	401
16	3826	848	8	23	879
17	3688	765	6	34	805
18	2569	617	67	45	729
19	3246	545	25	8	578
20	4779	964	19	10	993
21	4074	1460	380	69	1909
Total	**73374**	**18827**	**619**	**1258**	**20704**
Source: Pammal Municipality (June 2015)					

Deviations in design of septic tanks during construction in Pammal														
Sl. No.	**Shape**	**Size (cu. mt.) (people)**				**No. of Chambers**	**Water Tightness**			**Free Board**	**Access Covers**	**Vent Pipe**	**Disposal**	
	Rectangular	**1.2 (5)**	**2.5 (10)**	**3.6 (15)**	**4.5 (20)**	**2**	**Walls**	**Base**	**Top Slab**				**Soak Pit**	**Trench**
From Household Interviews:														
1	Y	N	N	N	N	Y	Y	N	Y	NA	Y	Y	Y	NA
2	Y	N	N	N	N	Y	Y	N	Y	NA	N	Y	N	NA
3	Y	NA	NA	NA	NA	NA	Y	NA	Y	NA	y	N	N	NA
4	Y	N	N	N	N	N	Y	N	Y	NA	Y	Y	N	NA
5	Y	N	N	N	N	N	Y	Y	Y	NA	Y	Y	Y	NA
6	Y	NA	NA	NA	NA	N	Y	Y	Y	NA	Y	N	N	NA
7	Y	N	N	N	N	Y	Y	Y	Y	NA	N	Y	N	NA
8	Y	N	N	N	N	Y	Y	Y	Y	NA	N	Y	N	NA
From Masons:														
1	Y	N	N	N	N	Y	Y	N	Y	Y	Y	Y	Y	NA
2	Y	N	N	N	N	Y	Y	N	Y	Y	Y	Y	Y	NA
3	Y	N	N	N	N	N	Y	N	Y	Y	Y	Y	N	NA
From Builders:														
1	Y	N	N	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y
2	Y	N	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	NA

Annexure 4 Data Tables for Town Panchayats

Ward-wise population of TPs

Ward-wise population of Periyanaicken-palayam				
Ward No	No. of Houses	Total Population		
		Total	Male	Female
1	305	1326	670	656
2	340	866	435	431
3	480	2540	1279	1261
4	830	1529	766	763
5	342	1172	587	585
6	390	1301	674	627
7	482	1324	681	643
8	422	1006	491	515
9	420	1027	520	507
10	345	1807	877	930
11	365	989	483	506
12	420	1478	692	786
13	680	2052	1030	1022
14	345	1486	761	725
15	730	2346	1199	1147
16	530	2437	1241	1196
17	325	1201	596	605
18	386	1219	595	624

Ward-wise population of Periyanaicken-palayam				
Ward No	**No. of Houses**	**Total Population**		
		Total	**Male**	**Female**
	8137	**27106**	**13577**	**13529**
Source: Periyanaicken-palayam Town Panchayat, 2015				

Details of Slum Settlements in TPs

Details of Slum Settlements in Periyanaicken-palayam		
Sl. No.	**Name of the Slum**	**Ward No.**
1	Kuppuchipalayam	5
2	Anna Nagar	7
3	Vivekanandapuram	13
Total Population is 1695 (973 males and 822 Females)		
Source: Periyanaicken-palayam Town Panchayat, 2015		

Details of Slum Settlements in Narsimhanaicken-palayam					
Sl. No.	**Name of the Slum**	**No. of HHs**	**Population**	**Male**	**Female**
1	MGR Nagar	32	150	78	72
2	Om Shakthi Nagar	52	163	69	94
3	Ambethkar Nagar	23	86	32	56
4	Arijana Colony	71	162	79	82
5	Chennamanaickenur	75	145	81	63
6	Balavinayagar Nagar	60 - 80	No Data	No Data	No Data
	Totals	**290**	**857**	**408**	**449**
Source: Periyanaicken-palayam Town Panchayat, 2015					

Ward-wise Water Supply Connections in TPs

Ward-wise Water Supply Connections in Periyanaicken-palayam				
Ward No.	**Domestic**	**Commercial**	**Industries**	**Total**
1	457	9	2	468
2	188	1	0	189
3	453	12	7	472
4	304	0	0	304
5	360	3	7	370

Ward-wise Water Supply Connections in Periyanaicken-palayam				
Ward No.	**Domestic**	**Commercial**	**Industries**	**Total**
6	426	25	5	456
7	226	6	2	234
8	206	6	1	213
9	154	11	5	170
10	314	0	0	314
11	89	0	0	89
12	203	2	1	206
13	292	6	3	301
14	218	1	0	219
15	542	10	3	555
16	818	80	21	919
17	215	0	0	215
18	280	3	1	284
Total	**5745**	**175**	**58**	**5978**
Source: Periyanaicken-palayam Town Panchayat, 2015				

Year-wise SLB Data of TPs:

SLB Data of Periyanaicken-palayam:

SLB indicators for Water Supply in Periyanaicken-palayam						
Sl. No.	**Indicator**	**Benchmark**	**2015**	**2014**	**2013**	**2012**
1	Coverage of Water Supply Connections	100 %	NA	NA	NA	100
2	Per Capita Supply of Water	135 lpcd	NA	NA	NA	71
3	Extent of Metering of Water Connections	100 %	NA	NA	NA	100
4	Extent of Non-Revenue Water	20 %	NA	NA	NA	14.79
5	Continuity of Water Supply	24 hrs	NA	NA	NA	1
6	Quality of Water Supplied	100 %	NA	NA	NA	100
7	Efficiency in Redressal of Customer Complaints	80 %	NA	NA	NA	87

SLB indicators for Water Supply in Periyanaicken-palayam						
Sl. No.	**Indicator**	**Benchmark**	**2015**	**2014**	**2013**	**2012**
8	Cost Recovery in Water Supply Services	100 %	NA	NA	NA	-
9	Efficiency in Collection of Water Supply-related Charges	90 %	NA	NA	NA	100
Source: Periyanaicken-palayam Town Panchayat						

SLB indicators for SWM in Periyanaicken-palayam						
Sl. No.	**Indicator**	**Benchmark**	**2015**	**2014**	**2013**	**2012**
1	Household Level Coverage of SWM Services	100 %	NA	NA	NA	100
2	Efficiency of Collection of Municipal Solid Waste	100 %	NA	NA	NA	100
3	Extent of Segregation of Municipal Solid Waste	100 %	NA	NA	NA	50
4	Extent of Municipal Solid Waste Recovered	80 %	NA	NA	NA	-
5	Extent of Scientific Disposal of Municipal Solid Waste	100 %	NA	NA	NA	75
6	Efficiency in Redressal of Customer Complaints	80 %	NA	NA	NA	80
7	Extent of Cost Recovery in SWM services	100 %	NA	NA	NA	-
8	Efficiency in Collection of SWM Charges	90 %	NA	NA	NA	-
Source: Periyanaicken-palayam Town Panchayat						

SLB indicators for Storm Water Drainage in Periyanaicken-palayam						
Sl. No.	**Indicator**	**Benchmark**	**2015**	**2014**	**2013**	**2012**
1	Coverage of Storm water drainage network	100 %	NA	NA	NA	65.80
2	Incidence of water logging / flooding	0 %	NA	NA	NA	0
Source: Periyanaicken-palayam Town Panchayat						

List of Public Toilets in TPs

Public Toilets in Periyanaicken-palayam												
Sl. No.	**Ward no.**	**Location of the Public Toilet**	**Water Supply**	**Toilet Seats**			**Urinal**			**O&M responsibility**	**User Fee (Y/N) If Y?**	**Functional Status / Remarks**
				Male	Female	Child	Male	Female	Child			
1	3	Irvin Road	Yes	3	3	-	-	-	-	TP		
2	7	Anna Nagar	Yes	4	6	-	-	-	-	TP		
3	7	Ooty Road	Yes	3	3	-	-	-	--	TP		
4	10	Union Bank Road	Yes	-	6	-	-	--	-	TP		
5	11	Kanduvar Street	Yes	6	5	-	-	--	-	TP		
6	12	K K Nagar	Yes	6	-	-	-	-	-	TP		
7	13	Vivekanandapuram	Yes	6	6	-	-	-	-	TP		
8	18	Jyothipuram Bus Stand	Yes	8	9	-	-	-	-	TP		
9	8	Indra Nagar Shopping Complex	Yes	4	4	-	4	-	-	TP		
Source: Town Panchayat Office of Periyanaicken-palayam, 2015												

Community Toilets in Periyanaicken-palayam															
Sl. No	**Ward No.**	**Location of the Community Toilet**	**Water Supply**	**Water Closets**			**Urinal**			**Bath**		**O&M respon.**	**User Fee (Y/N)If Y?**	**Functional Status/ Remarks**
				Male	Female	Child	Male	Female	Child	Male	Female			
1	4	Kasturipalayam	Yes	3	3	-	-	-	-	-	3	TP		
2	4	Sathya Nagar	Yes	6	6	-	-	-	-	-	4	TP		
3	5	Kappichipalayam	Yes	-	13	-	-	-	-	-	4	TP		
4	15	Sakthi Nagar	Yes	8	9	-	-	-	-	-	3	TP		
Source: Town Panchayat Office of Periyanaicken-palayam, 2015														

Public Toilets in Narsimhanaicken-palayam												
Sl. No.	**Ward no.**	**Location of the Public Toilet**	**Water Supply**	**Toilet Seats**			**Urinal**			**O&M responsibility**	**User Fee (Y/N) If Y, ?**	**Functional Status / Remarks**
				Male	Female	Child	Male	Female	Child			
1	2	Pudhupalayam	Yes	6			-	-	-	Town Panchayat	No	In Use
2	2	Pudhupalayam	Yes		8		-	-	-			In Use
3	3	Balaji Nagar	Yes	8	8		-	-	-			In Use

Public Toilets in Narsimhanaicken-palayam												
Sl. No.	**Ward no.**	**Location of the Public Toilet**	**Water Supply**	**Toilet Seats**			**Urinal**			**O&M responsibility**	**User Fee (Y/N) If Y, ?**	**Functional Status / Remarks**
				Male	Female	Child	Male	Female	Child			
4	3	Bala vinayagar Nagar	Yes	5	5		-	-	-			In Use
5	6	Rakkipalayam	Yes	12	6		-	-	-			In Use
6	7	A.D. Colony	Yes	5	5		-	-	-			In Use
7	8	Palaiyur	Yes	5	5		-	-	-			In Use
8	8	Om Sakthi Nagar	Yes	6	4		-	-	-			In Use
9	12	Om Sakthi Nagar	Yes	6	5		-	-	-			In Use
10	13	Poochiyur	Yes	5	5		-	-	-			In Use
11	13	Poochiyur	Yes	1	1		-	-	-			In Use
12	13	Sennamanaickenur	Yes	3	3		-	-	-			In Use
Source: Town Panchayat Office of Narsimhanaicken-palayam, 2015												

Public and Community Toilets in Idigarai															
Sl. No	**Ward No.**	**Location of the Community Toilet**	**Water Supply**	**Water Closets**			**Urinal**			**Bath**		**O&M respon.**	**User Fee (Y/N)If Y?**	**Functional Status/ Remarks**
				Male	Female	Child	Male	Female	Child	Male	Female			
1	2	Main Road, Govindhanaickenpalayam		-	4	-	-	-	-	-	-	Town Panchayat	No	In Use
2	2	Main Road, Govindhanaickenpalayam		6	-	-	-	-	-	-	-	Town Panchayat		In Use
3	2	AD Colony, Govindhanaickenpalayam		4	4	-	-	-	-	-	-	Town Panchayat		In Use
4	2	Main Road (Disable Toilet)		2	2	-	-	-	-	-	-	Town Panchayat		In Use
5	3	Periyar Nagar		4	4	-	-	-	-	2	2	Town Panchayat		In Use
6	4	Krishnapuram		3	3	-	-	-	-	-	-	Town Panchayat		In Use
7	4	Chennamanaickenpalayam		-	8	-	-	-	-	-	2	Town Panchayat		In Use
8	5	Sengalipalayam		4	4	-	-	-	-	-	-	Town Panchayat		In Use
9	6	Sengalipalayam		-	8	-	-	-	-	-	2	Town Panchayat		In Use
10	6	Sengalipalayam		6	-	-	-	-	-	-	-	Town Panchayat		In Use
11	7	Maniyakaranpalayam		0	6	-	-	-	-	-	-	Town Panchayat		In Use
12	8	AD Colony		4	4	-	-	-	-	-	-	Town Panchayat		In Use

Public and Community Toilets in Idigarai														
Sl. No	**Ward No.**	**Location of the Community Toilet**	**Water Supply**	**Water Closets**			**Urinal**			**Bath**		**O&M respon.**	**User Fee (Y/N)If Y?**	**Functional Status/ Remarks**
				Male	Female	Child	Male	Female	Child	Male	Female			
13	13	Main Road, Idigarai		4	4	-	-	-	-	2	2	Town Panchayat		In Use
14	14	Nandhavana street, Idigarai		6	6	-	-	-	-	-	-	Town Panchayat		In Use
15	15	AD Colony, Idigarai		6	6	-	-	-	-	-	-	Town Panchayat		In Use
Source: Town Panchayat Office of Idigarai, 2015														

Details of Households without toilets in PN-Playam			
Ward No.	**Total No. of HHs**	**HHs without Toilet**	**Total Population**
1	305	5	1326
2	340	10	866
3	480	15	2540
4	830	177	1529
5	342	106	1172
6	390	10	1302
7	482	65	1324
8	422	50	1006
9	420	10	1027
10	345	35	1807
11	365	85	989
12	420	15	1478
13	680	450	2052
14	345	25	1486
15	730	15	2346
16	530	55	2437
17	325	15	1201
18	386	10	1219
	8137	1118	27106
Source: Town Panchayat office – Periyanaicken-palayam			

Sanctioned and Vacant Posts Matrix of TPs

Sanctioned and Vacant Posts Matrix of Periyanaicken-palayam				
Sl. No.	**Post**	**Periyanaicken-palayam Town Panchayat Staff details**		
		Total No. of sanctioned posts	**Total no. of present strength**	**Vacancies**
1	Executive officer	1	1	-
2	Head Clerk	1	0	1

Sanctioned and Vacant Posts Matrix of Periyanaicken-palayam				
Sl. No.	**Post**	**Periyanaicken-palayam Town Panchayat Staff details**		
		Total No. of sanctioned posts	**Total no. of present strength**	**Vacancies**
3	Junior Assistant	3	3	-
4	Bill Collector	3	2	1
5	Office Assistant	1	1	-
6	Sanitary Inspector	1	1	-
7	Sanitary Supervisor	1	1	-
8	Pump Mechanic	1	1	
9	Sanitary Worker (Full-Time)#	25	24	1
10	Sanitary Worker (On-contract)*	-	45	-
	Total	**37**	**35**	**2**
# the monthly income ranges between ` 18,000 to 23,000per month based on seniority * Sanitation workers on contract are paid ` 180 per day (paid on monthly basis). Their timings of operation are 6 to 11 am and 2 to 5 pm				
Source: Periyanaicken-palayam Town Panchayat, 2015				

Property Tax Assessments in Town Panchayats

Property Tax Assessments in Periyanaicken-palayam			
Sl. No.	**Year**	**Assessment Details**	**Amount (` in lakhs)**
1	2012-2013	7922	65.84
2	2013-2014	7895	77.01
3	2014-2015	8661	80.82
Source: Periyanaicken-palayam Town Panchayat, 2015			

Property Tax Details for the Year 2014-15 of Periyanaicken-palayam		
Ward No.	**No. of Assessments**	**Total Income from P-Tax (`)**
1	653	2,85,216
2	267	75,105
3	1036	3,48,551
4	463	1,10,188
5	377	79,040
6	511	1,05,783
7	503	2,22,553
8	322	83,190
9	331	1,04,514
10	257	48,719
11	224	44,705
12	312	72,212
13	600	1,53,460
14	404	90,126
15	898	3,33,812
16	1036	10,71,067
17	276	62,904
18	391	1,07,727
	8,861	**33,98,872**
Source: Periyanaicken-palayam Town Panchayat, 2015		

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