City Sanitation Plan

Sinnar Municipal Council

January 2015

pas performance assessment system

CEPT UNIVERSITY

सिन्नर नगर परिषद, सिन्नर
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Foreword

Sanitation has received increased attention in recent years in India. It is an important agenda for Government of India as evident through the launch of Swachh Bharat Mission.For the Sinnar Municipal Council, keeping the city clean has always been an avowed goal, towards which both the elected members and the officers of the council have stirived to work hard.

Sinnar Municipal Council was selected by the Maharashtra Jeevan Pradhikaran (MJP), and the Department of Water Supply of Government of Maharashtra for preparing a city sanitation plan. Sinnar was supported by the All India Institute of Local Self Governments (AILSG) and CEPT University through the Performance Assessment System (PAS) Project.

During the course of preparation of this City Sanitation Plan, the officers of Sinnar Nagarpalika had many opportunities to attend workshops at MEETRA, Nashik and learn from experts about new sanitaiton technologies. Sinnar Council was also able to share its experience and learn form other cities in Maharashtra about good sanitationpractices.

I am particularly thankful to CEPT University and AIILSG, for their continuing support in implementing our plans to make Sinnar a open defecation free city with a well functining onsite sanitation system for waste management. We hope that within the next three years, we are able to achieve this goal. I am hopefulthatSinnarwill become a role model for other towns in Maharashtra.

Shri Sanjay Jadhav
Chief Officer
Sinnar Municipal Council

January 2015

Acknowledgements

The City Sanitation Plan (CSP) for Sinnar was prepared by the PAS team as part of its support to the Government of Maharashtra (GoM) on sanitation-related activities. The focus of the CSP was identifying appropriate sanitation solutions in small and medium towns. This initiative was taken in partnership with the Water Supply and Sanitation Department (WSSD, GoM) and the Maharashtra Jeevan Pradhikaran (MJP).

We would like to thank the Principal Secretary, WSSD (GoM) and Member Secretary, MJP, for their support. The training institution of the MJP, the Maharashtra Environmental Engineering Training and Research Academy (MEETRA) in Nashik also hosted a series of consultative workshops where draft plans were discussed among the stakeholders. We would like to thank MEETRA for its support and cooperation in convening the workshops.

We would like to thank the President and elected representatives of the Sinnar Municipal Council (SMC) for their active participation and support during the entire process of this CSP preparation. This CSP has not remained on paper; it is being implemented largely due to the efforts of the Chief Officer of the SMC, Mr Sanjay Jadhav. Support from other officials of the SMC, particularly Mr Patil, City Engineer, and Mr Deshmukh, Sanitary Inspector, was valuable in the preparation of this report.

The initial field work and data collection for this CSP was carried out by Micro Cloud Computing (MCC), Pune. The PAS team at CEPT and the All India Institute of Local Self Government worked further on analysis of information. The team worked closely with SMC officials in identifying various options and developing the final action plan.

Meera Mehta and Dinesh Mehta

January 2015

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Acronyms and Abbreviations

AILLSG	All India Institute of Local Self-Government
BAU	Business-as-usual
BE	Budget estimates
BOD	Biochemical oxygen demand
CEPT	Centre for Environment Planning and Technology
CPCB	Central Pollution Control Board
CTF	City Task Force
CBOs	Community-based organisations
CMT	Community Managed Toilets
CSP	City Sanitation Plan
CAGR	Compound Annual Growth Rate
CFC	Central Finance Commission
CO	Chief Officer
COD	Chemical Oxygen Demand
CPHEEO	Central Public Health and Environmental Engineering Organisation
CTs	Community toilets
DEWATS	Decentralised wastewater treatment system
DMA	Directorate of Municipal Administration
D2D	Door-to-door
DMA	Directorate of Municipal Administration
ESR	Elevated storage reservoir
EWS	Economically weaker sections
FGDs	Focus group discussions
FSM	Faecal Sludge Management
GoI	Government of India
GoM	Government of Maharashtra
GSR	Underground storage reservoirs
GR	Government Resolution
Ha	Hectare
HH	Households
IEC	Information
IHSDP	Integrated Housing and Slum Development Programme
ILCS	Integrated Low cost Sanitation
LSG	Local self government
lpcd	Litres per capita per day
MJP	Maharashtra Jeevan Pradhikaran
MLD	Million litres per day
MCC	Micro Cloud Computing
MMCNPIT	Nagar Panchayat and Industrial Township
MMBR	Moving Media Bio Reactor
MT	Metric Tons
NGO	Non-governmental organisation
NH	National Highway

NRAP	National River Action Plan
NUSP	National Urban Sanitation Policy
NRW	Non-revenue water
OD	Open defecation
O&M	Operation and maintenance
OSS	On-site sanitation system
PAS	Performance Assessment System
PPHa	Persons per hectare
PTs	Public toilets
PIP	Performance Improvement Planning
RE	Revised estimates
S-PIP	Services-oriented Performance Improvement Planning
SH	State Highway
Sq km	Square kilometre
SWM	Solid waste management
SLB	Service level benchmarking
SHGs	Self-help groups
STP	Sewerage treatment plant
TSS	Total suspended solids
SMC	Sinnar Municipal Council
SNP	Sinnar Nagar Parishad
WSSD	Water Supply and Sanitation Department
WSS	Water supply and sanitation
UIDSSMT	Urban Infrastructure Development Scheme for Small and Medium Towns
ULB	Urban local body

1. Introduction

This chapter provides the background of the preparation of a City Sanitation Plan (CSP) for Sinnar Municipal Council. It describes the approach and methodology used in preparing this Plan, highlighting the ongoing nature of the CSP process. It also gives an outline of the overall report.

The Sinnar City Sanitation Plan (CSP) has been prepared as a part of the PAS Programme at the CEPT University, which provides support to small cities in Maharashtra for improving sanitation services. CEPT University has worked in partnership with the Water Supply and Sanitation Department (WSSD), Government of Maharashtra (GoM), the Maharashtra Jeevan Pradhikaran (MJP) and Sinnar Municipal Council (SMC).

1.1 Background

To address the sanitation situation prevailing in small and medium towns, and in the context of the National Urban Sanitation Policy (NUSP) 2008, it is important to explore new technologies other than conventional underground sewerage systems. This requires assessing appropriate technology and business models that can be operated and managed well in these towns.

The CSP for the SMC focuses on city-wide sanitation solutions that are affordable for both users and municipal governments. It uses an outcome-oriented approach that promotes assessment of different technology options. This approach is based on the framework for Performance Improvement Planning (PIP) and a decision support tool (SANIPLAN) developed at the CEPT University. The framework focuses on assessing outcomes of various technical options and demonstrates the possibility of achieving same service levels with a less capital intensive option.

The city-wide sanitation assessment builds on new thinking in urban sanitation that goes beyond the household level access to an assessment of the full service chain, that is, from user interface to storage, conveyance, treatment and disposal or reuse. The Sinnar CSP also covers dimensions beyond excreta management and includes management of greywater, stormwater and solid waste as these are interlinked closely in the small city context. The CSP is also based on an assessment of options for low-cost sanitation and decentralised solutions for wastewater management that are more appropriate for small towns.

Several meetings and consultative workshops were held with state and city representatives over a period of 15 months to discuss and debate solutions, technologies and policy provisions for sustainable sanitation plans. Financing plans are an integral part of these CSPs to review affordability of solutions and to explore different sources of funds. The CSP has been developed for a 10-year

action horizon. However, a longer planning horizon is considered for some of the large capital intensive projects.

After the CSP preparation, the SMC has selected key priority areas for implementation. CEPT University is supporting the SMC to: ensure universal access to own toilets and preparation of an Integrated Faecal Sludge Management (IFSM) Plan as an immediate solution to tackling blackwater containment, transport and safe disposal. Specific studies have been initiated to explore use of service-level agreements and performance-based contracts with private sector partners as a way to ensure the city-wide delivery of sustainable sanitation services, generating benefits both to users, and in terms of public health.

Some glimpses of the consultative workshops for City Sanitation Planning held in Nashik (2012–13).

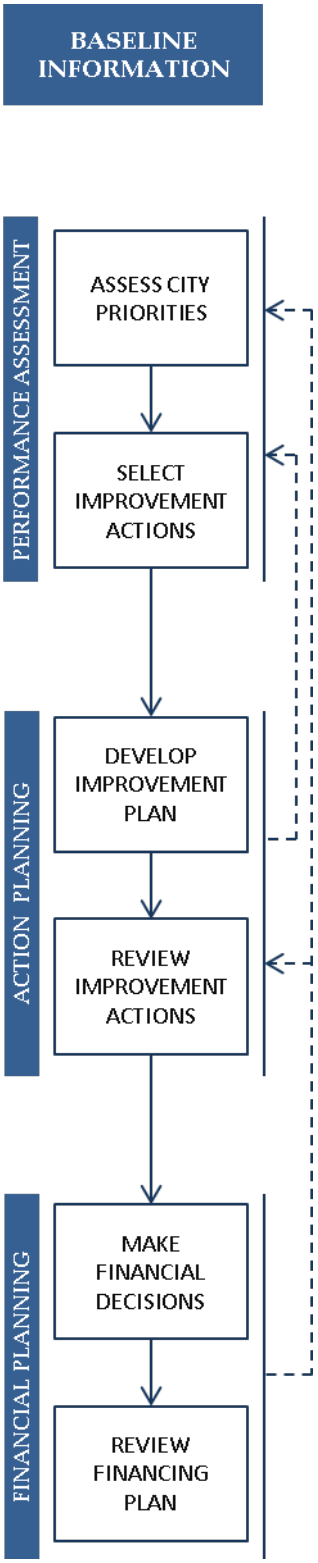
1.2 Approach and Methodology

The approach to the development of a CSP involved both technical and financial assessments. This was done through participatory processes backed by detailed field level assessments of different service sectors of access to sanitation, wastewater management as well as solid waste management.

A three-step process was followed for the development of the city sanitation plan. The first step involved assessing current performance on key Service Level Benchmark (SLB) indicators such as coverage, equity, service levels, efficiency and financial sustainability across all sub-sectors. In the second stage, improvement actions for each sub-sector were identified. Different technical options were assessed and discussed. Finally, detailed phasing and financial implications were assessed. Based on this approach a final plan has been developed. Throughout this process, consultations were held with the local authority.

The following paragraphs provide brief highlights of the approach and methodology.

In step 1 – **Performance Assessment** – the entire sanitation service chain was assessed for different service areas: user interface, collection, conveyance, treatment, safe disposal. Service levels are measured through performance indicators developed under the PAS Programme, which align with the SLB used by the Government of India (GoI). Sanitation indicators capture both on-site sanitation and sewerage systems. The different activities carried out include:



- **Mapping and database creation:** In the initial stage, baseline data was collected and mapped, where required, for a city-level assessment. In addition to interviews of key officials and elected representatives, focus group discussions (FGDs) were conducted to understand the existing situation and local practices. Transect walks helped to gain an understanding of topography and spatial development characteristics. Primary surveys were conducted in slums to understand the preferred choices for user interface, affordability and willingness to pay, etc. They also were used to validate the data collected from secondary sources.

- **ULB finances:** The financial health of the urban local body (ULB) was assessed through a detailed analysis of its budgets. Revenue streams and operational expenses were analysed for past five to seven years. These trends were used to project municipal finances for the next 10 years which could be used for financial planning. Central and state schemes and grants that have been accessed as well as those that can be accessed for implementation of CSP projects were also identified.

- **Gap assessment:** An analysis of SLB indicators along with additional indicators for on-site systems and equity pointed to the gaps in current services. Besides, gaps in management including financial and human resources, institutional arrangements were also studied. The gaps identified were also plotted in light of estimated growth in population and spatial development.

In Step 2 – **Action Planning** – key improvement actions needed to improve services were identified. This involved:

- **Waste management options:** Various technical alternatives for wastewater conveyance and treatment were reviewed and assessed in terms of land requirements, capital and operational costs, availability of labour/expertise, etc, in the context of Sinnar. This analysis helped a great deal in convincing various stakeholders to look beyond the expensive conventional sewerage systems.

- **Strategies and action plan:** Having analysed the gaps in service and studied various alternatives to meet the gap, strategies to meet the gaps through concerted efforts over the next 10 years were identified. Projects were phased so that universal coverage of toilets and 100 per cent safe management are achieved at the earliest. Phasing of other projects was based on urgency of the project, logical sequencing and availability of resources

- **Stakeholder consultation:** The analysis of the existing situation as well as proposals were discussed and debated with all the stakeholders including city officials, elected representatives and officers of the Maharashtra Jeevan Pradhikaran (MJP) through consultative workshops.

In step 3, focus was on **Financial Planning** to take into consideration life cycle costs of various improvement actions in addition to their capital costs. Thus, the analysis provided Financing Plans for both capital and operating costs. Various sources including inter-governmental transfers, borrowings, public private partnerships (PPP), beneficiary contribution and ULBs' own funds were assessed to finance capital costs. The operational costs were essentially met through internal transfers and tariff revisions. The financing plan was developed in an iterative manner to review sources of funds for capital works, tariff revisions and introduction of new taxes, where required, and transfers to the WSS sector from the general budget.

1.3 Report Structure

Chapter 2 of this report presents the city profile in terms of regional settings, demography and ecology. It also discusses the status of water supply in the city. Chapters 3, 4 and 5 discuss access to toilets, wastewater management and solid waste management, respectively. Chapter 6 presents the financial and institutional capacity of the SMC. These four chapters cover the performance assessment action planning components of the methodology. Relevant alternative technologies and processes are also discussed here. Chapter 7 discusses implementation strategies in terms of phasing and financing improvement projects. This is the financial planning component of the approach discussed above. Chapter 8 discusses the measures for institutional strengthening and awareness generation; these are essential soft components often neglected but important to successfully implement a plan.

The last chapter presents the two projects that the city has taken up as immediate steps and PAS Programme's continued support to the city in implementation of projects identified in this report. The City Sanitation Plan for Sinnar is an outcome of a consultative process over nearly 18 months. It should be recognised that city sanitation planning is an on-going process. Several factors affect the realisation of proposals in this plan: availability of grant funds, local preparedness to take up agreed activities and changing policies of state and national governments. Thus, a City Sanitation Plan document should be viewed as a part of this process and revised periodically.

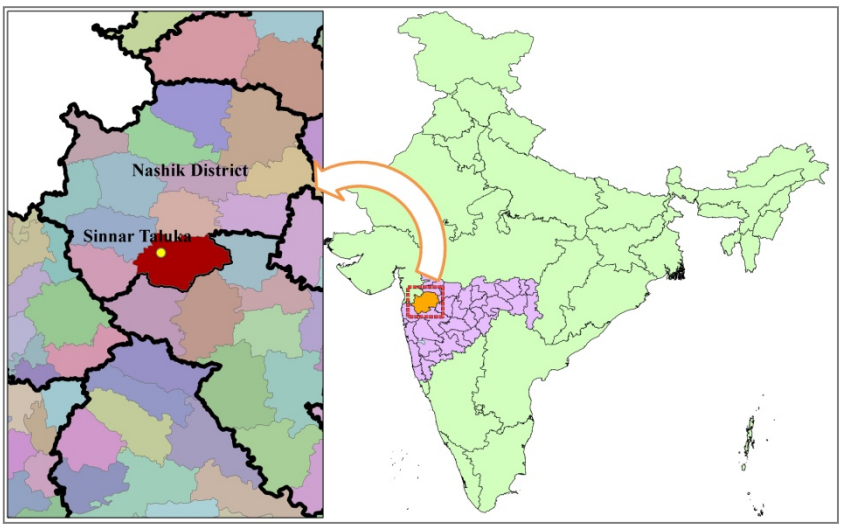
2. City Context

This chapter describes the town, and highlights its geographical location and regional settings. It elaborates on the demographic profile of the town and presents estimates of its population, taking into consideration past trends. Overall development patterns, urban sprawl, ecological factors such as climate, rainfall, soil structure, topography and natural drainage are also discussed.

2.1 Location and Regional Settings

Sinnar is a town in Nashik district in Maharashtra. The city gets a mention in Maratha history as the headquarters of Sangamner sub-division and also as the headquarters of the Chief Officer of the Emperor of Delhi. The town is located at 19°51'N and 74°00'E at a distance of 30 km south-east of Nashik. The town lies on the northern banks of river Saraswati and is located on Golden triangle of Mumbai-Pune-Nashik. Given its strategic location, the Maharashtra Industrial Development Corporation (MIDC) has developed two industrial estates; Malegaon and Musalgaon that house 174 medium and large industrial units and employ more than 75,000 people. The growth of industrial estates has resulted in a large scale influx of people into the city. Besides, being located on NH50 and in proximity to the religious town of Shirdi (less than 60 km away), Sinnar experiences a lot of through traffic.

Figure 1: Location and regional settings



2.2 Demography

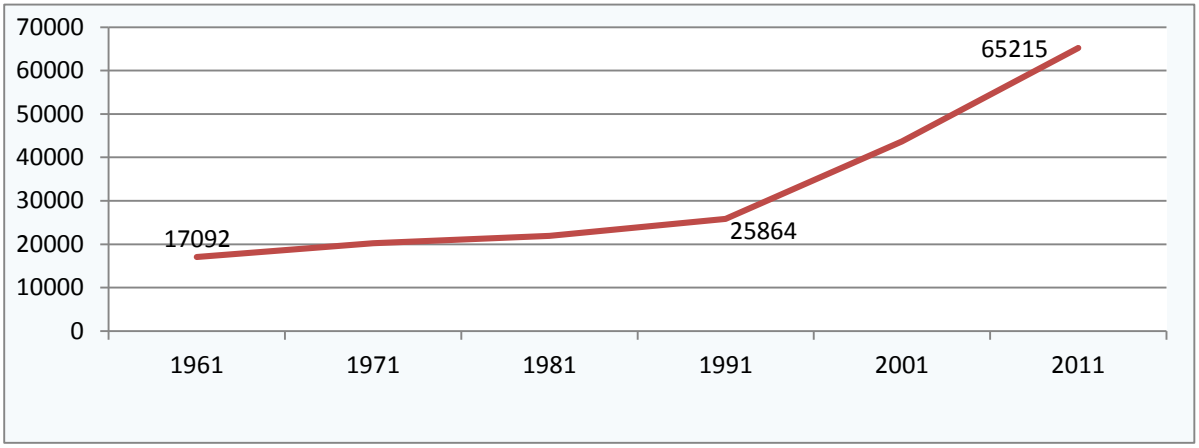
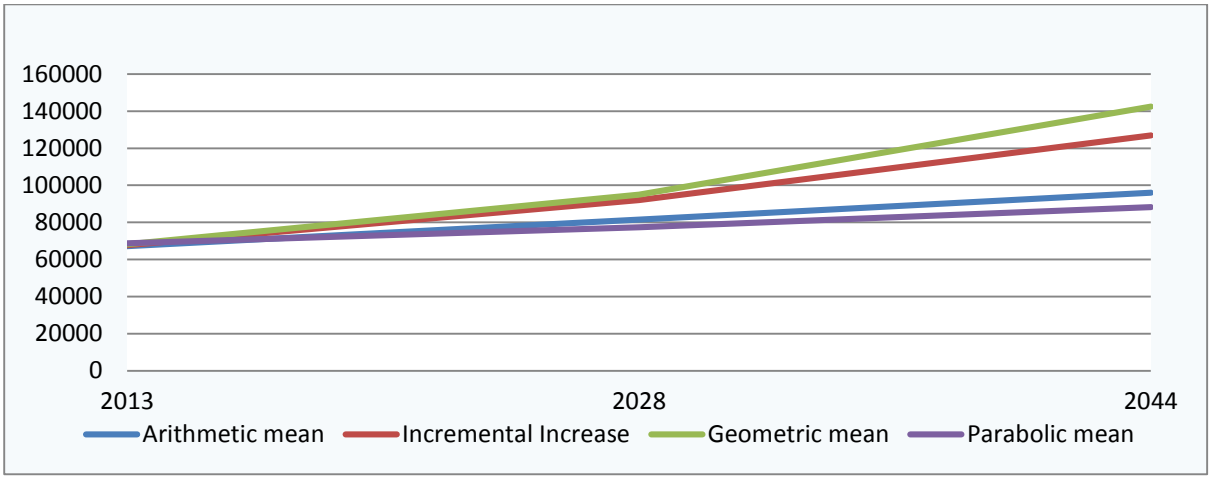


Figure 2: Population growth over the years

Population trends and forecast

According to Census 2011, Sinnar has a population of 65,299(34,633 males and 30,666 females). Sinnar has an average literacy rate of 71 per cent, male literacy is 77 per cent and female literacy is 64 per cent. Sinnar experienced a slow growth rate till 1991. The development of two industrial estates in the mid-1990s led to an influx of population, thereby making Sinnar one of the faster growing towns in the state. The other reason for increase in population is expansion of the city limits from a mere 5 sq km to 51.4 sq. km in 2009.

Figure 3: Population projections using various methods



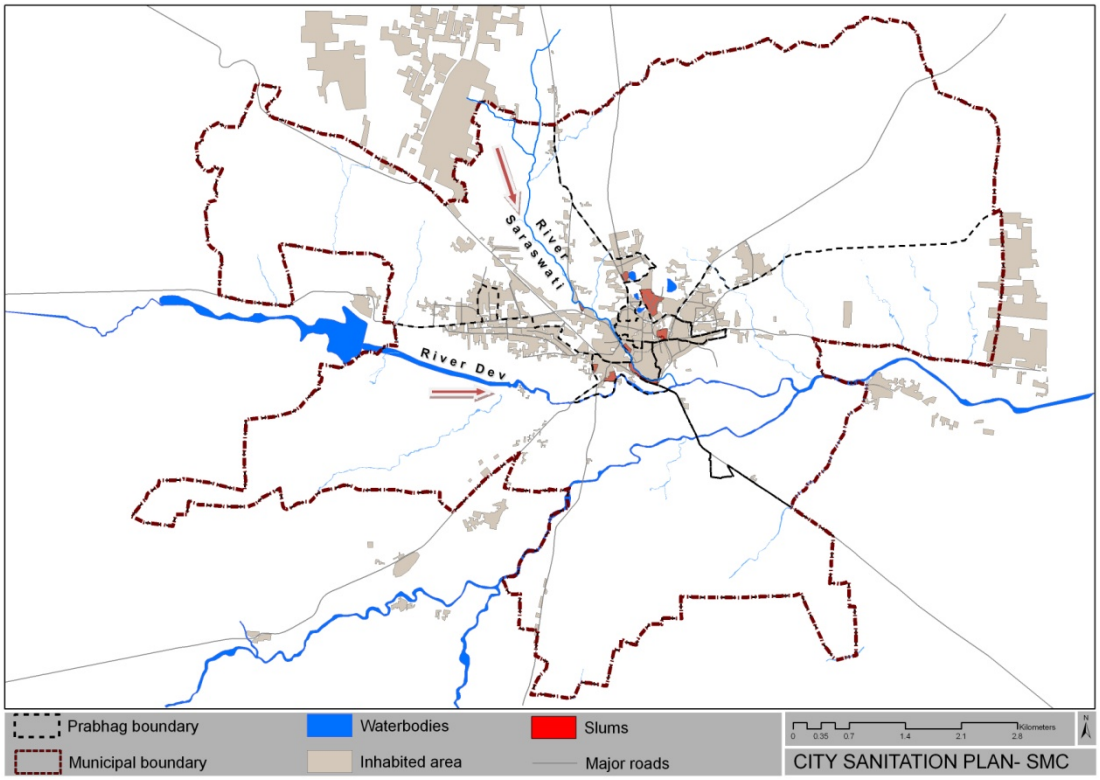
2.3 City Ecology

Climate and rainfall

The climate of Sinnar is pleasant throughout the year. The city receives an annual average rainfall of 650 mm, most of it in the monsoon season (in June to September). During summer, from February

to May, the temperature varies between 30°C and 40°C. Winters are cooler; temperatures may drop to 6°C.

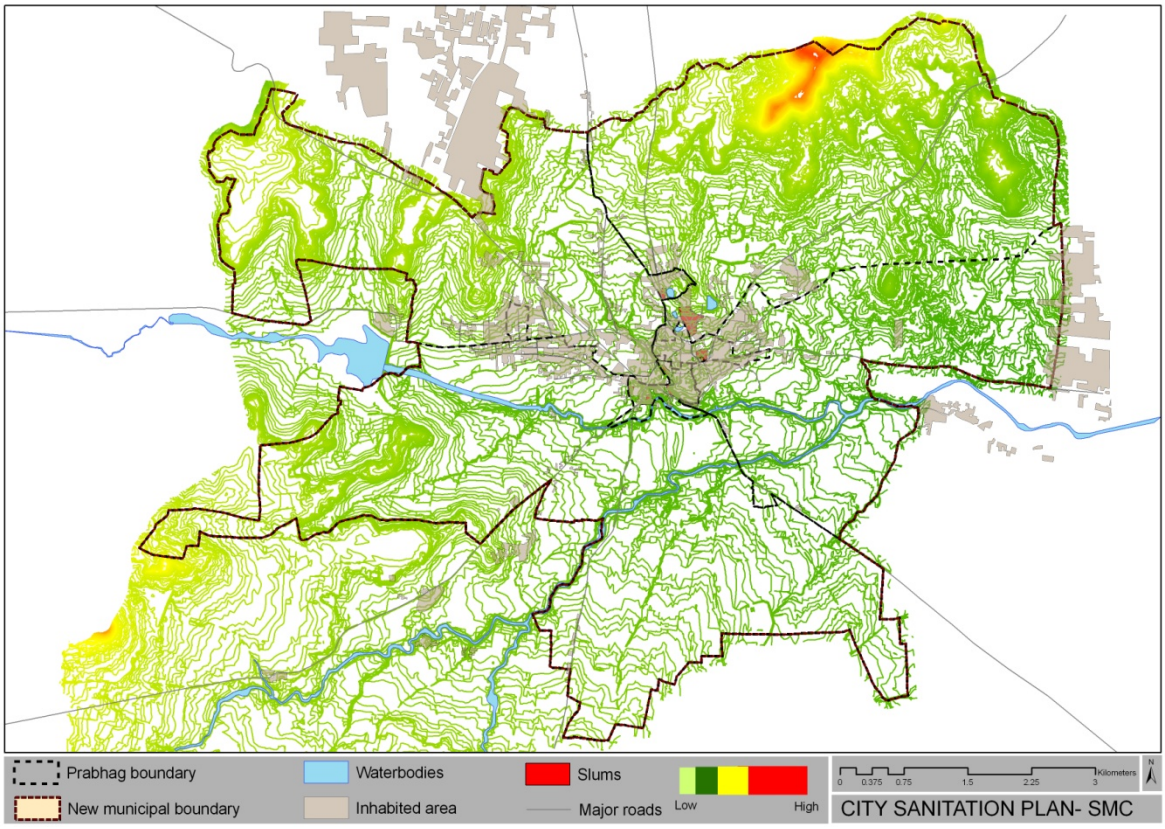
Figure 4: Natural drains and flow direction



Terrain and topography

The river Saraswati passes through the centre of the city and flows from west to east. The inhabited area is found towards the northern side of the river. Slopes are gradual either towards the river or smaller nallas. The highest point at 825m lies near the northern periphery while the lowest point at 632 m (above Mean Sea Level) lies on the river bank on the eastern boundary.

Figure 5: Topography of Sinnar



Spatial development pattern

The development pattern in the newer parts of the city varies starkly from those of the old settlements. While the old city grew organically, new development is systematically planned through layouts. In the old city, properties share a common wall, while new areas have more spaced out layouts with appropriate side margins. The old town of Sinnar is densely developed with a narrow and organic street pattern. Most of the houses are built on rectangular plots and attached to each other.

The old town exhibits a mixed use of commercial and residential properties, while the new city has demarcated and segregated residential and commercial areas. In the coming years, it is anticipated that newer populations will be accommodated in the new developing areas, for instance, Sharadwadi, Naygaon Road, Vijaynagar, etc. Sinnar has seen prolific population growth since the last decade. Due to industrial units, the population of Sinnar has increased at the rate of approximately 95 per cent from 2001 to 2011. New plotted developments of medium dense pockets are observed in the western and eastern parts of the town. At present, most roads in these areas are kutchha roads but with planned network. The development plan of Sinnar proposes new residential areas in the western and eastern parts of the city. These areas currently showcase new residential plotted development of around 6–12m (height). Two agricultural zones are also proposed – one each in the north and south.

Figure 6: Administrative divisions of Sinnar

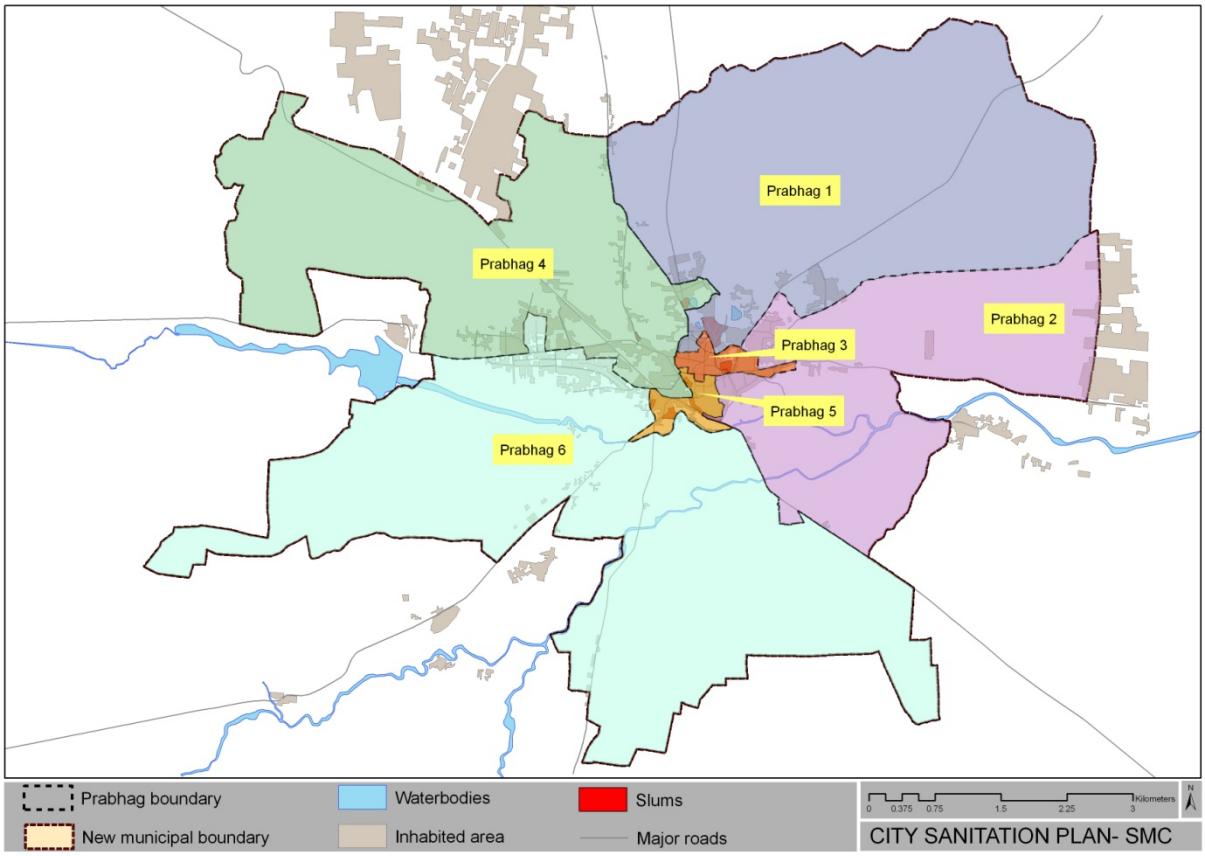
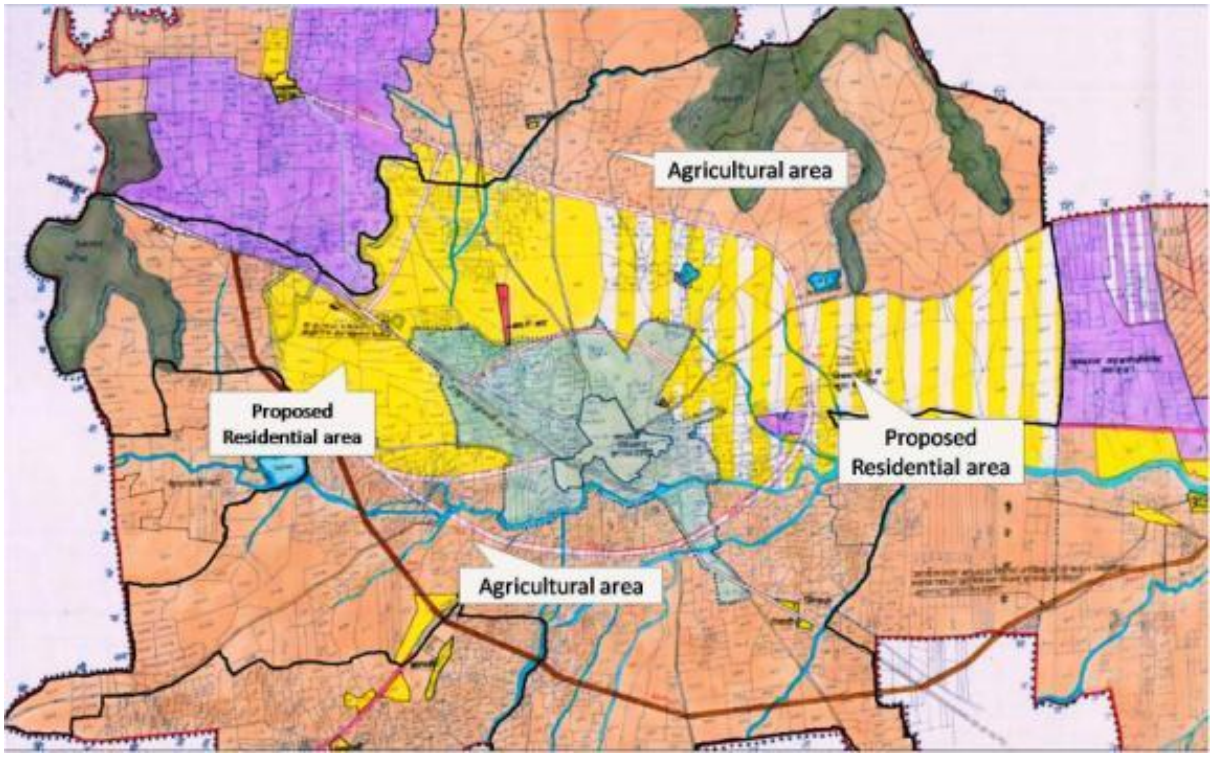


Figure 7: Development plan of Sinnar



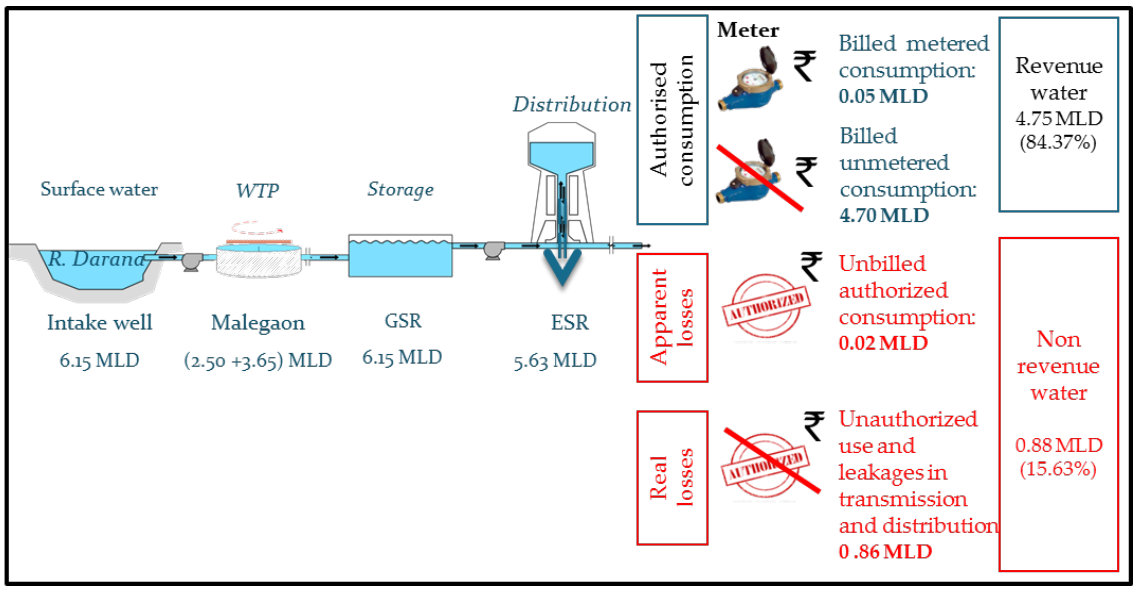
2.4 Water Supply in Sinnar

The water supply network for Sinnar town has been designed as a piped water supply system with the river Darna as the major source. About 4.77 MLD is supplied from the river against a total demand of 9.00 MLD. The very first water supply scheme was designed in 1976 (for design year up to 2001) for a population of 35,000 with 71.54 lpcd. The next scheme augmentation completed in 2005 (for design year of 2030) for 42,000 with 100 lpcd. However, population suddenly grew to 66,676 in 2012, much higher than the above estimation, resulting in increased load on existing water supply systems. Hence, a new augmentation scheme has been proposed in 2010. The scheme is designed for a population of 141,900, that is, for year 2042 for 135 lpcd at an estimated cost of Rs 8,220 lakh. However, considering the present condition of non-availability of water supply in newly developed areas, the scheme has been restricted only for newly developed areas.

Water Storage

From Darna river, water is drawn through an intake well of 4 m in diameter and conveyed to the treatment plant (2.5 + 3.65 MLD) in Malegaon through an 18-km long and 355-mm diameter MS pipeline. The treated water is transmitted through a 7.5-km long transmission line to a GSR.

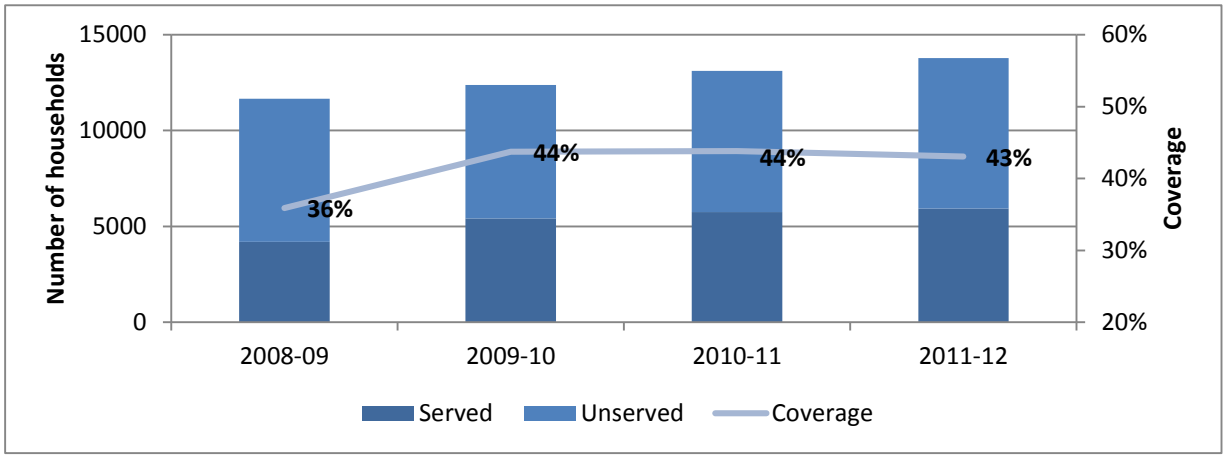
Figure 8: Water supply process: Sinnar



Water distribution and supply

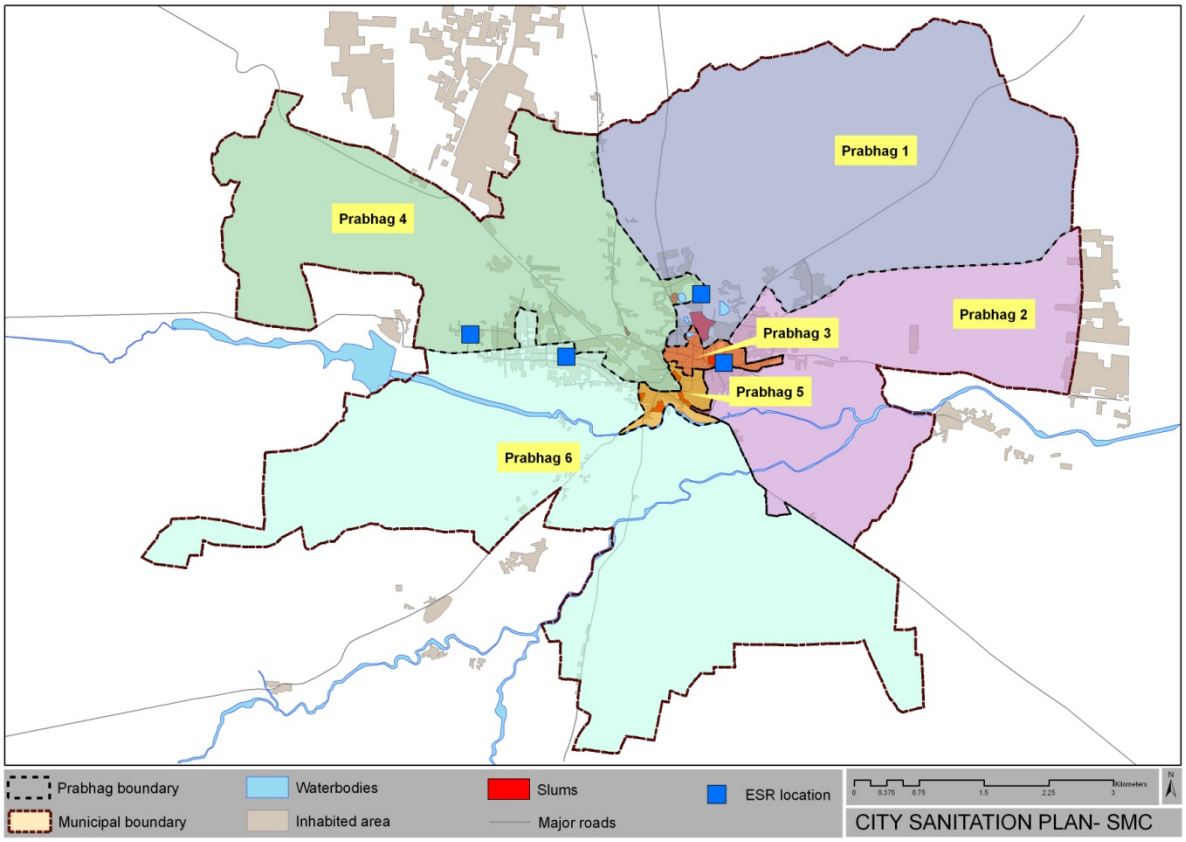
The GSR supplies water to seven elevated service reservoirs (ESRs) with a cumulative capacity of 5.5 million litres. Through a distribution network of nearly 50 km, water is supplied to nearly 6,000 connections in the city. The newly developed Saradwadi area lacks a distribution network. Water is supplied for 45 minutes every alternate day. Over the last four years, per capita supply of water has reduced from nearly 85 lpcd in 2008–09 to 65 lpcd in 2012–13. Non-revenue water (NRW) has reduced from 26 per cent to 16 per cent in the same period.

Figure 9: Water supply coverage trends in Sinnar



The key issues in water supply are low coverage and per capita supply as well as unavailability of network in newly developing areas.The new augmentation scheme proposed in 2010 is designed for a population of 1.42 lakh (for ultimate stage in 2042). Considering that newly developing parts of the city did not have distribution network, a smaller project of nearly Rs 1,300 lakh was proposed to be funded through the Maharashtra Sujal Nirmal Abhiyan (MSNA). The major components of the project are ESR, a distribution system of 26 km, membrane bio reactor (MBR) at the water treatment plant (WTP) and replacing pipes of about 7 km length. From the WTP the treated water is taken to different RCC ESRs for distributing water in the seven zones of the city. Each of the zones has RCC storage units of respective capacities as indicated in Figure 10.

Figure 10: Location of elevated service reservoirs



About 17 per cent population of the city lives in slums: 1,417 households in the city live in eight slum pockets. Secondary data suggests 1,700 individual water supply connections are currently provided to slum dwellers. Apart from this, there are around 18 standposts located in slum areas. Almost all slums are supplied with 65 lpcd of water.

3. Access to Sanitation

This chapter presents the existing situation in the city with respect to availability of toilets to households, in their premises or at community levels as well as at public places. The quality of infrastructure, operations and management practices are studied and issues identified. An analysis of gaps in availability, strategies for universal access as well policy and management strategies and their costs, are also discussed.

3.1 Household Sanitation

As per Census 2011, Sinnar has 13,112 residential households, out of which 8,243 have individual toilets and the rest rely on community toilets (CT) or practice Open defecation (OD). It is observed in slum pockets as well as non-slum areas that 13 per cent HHs practice open defecation,

Table 1: Existing sanitation coverage in Sinnar

Total households	13,112	100%
Households with individual toilets	8,243	63%
Households relying on community toilets	3,211	24%
Households practising open defecation	1,658	13%

Source: Census 2011.

The central city area is characterised by densely located old residential buildings and market places. Most houses have individual toilet facility with septic tanks or pits for on-site primary treatment.

On-site waste and septage management in household toilets

As per Census 2011, 74 per cent households have on-site treatment facility with septic tanks and 14 percent rely on pit latrines.

Table 2: Existing status of on-site treatment facility

Total households	13112
Households with individual toilets	8243
Households with toilets with septic tanks	6091
Households with toilets with pits	1126
Households with toilets with other type of disposal	1026

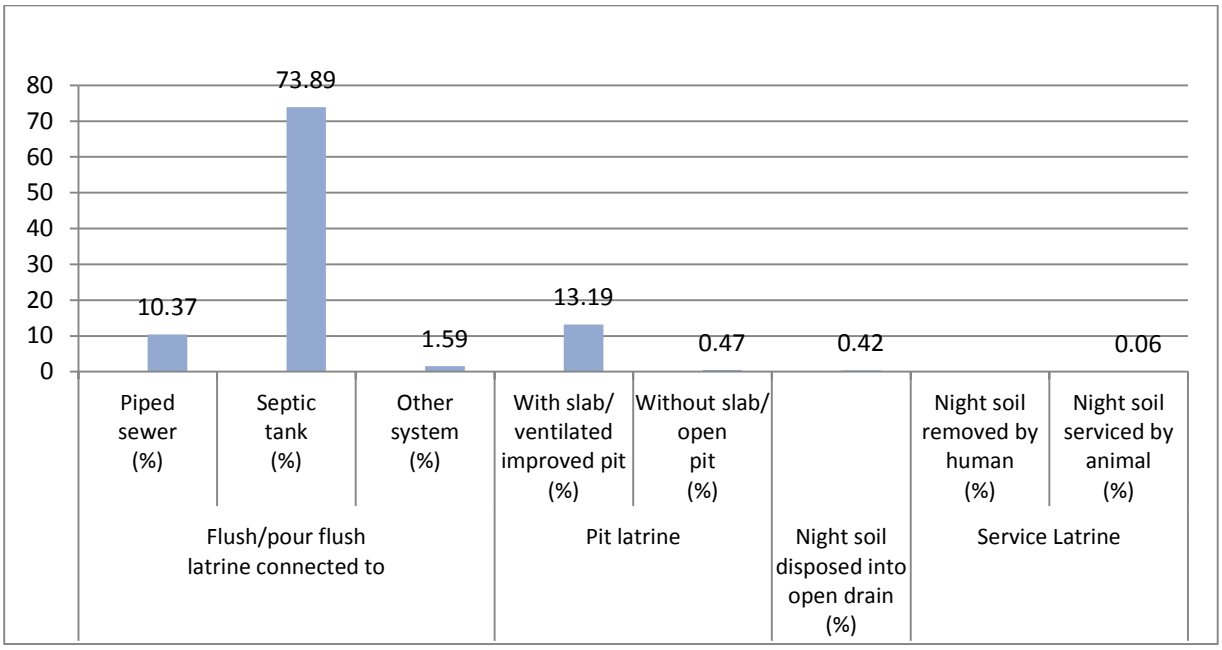
Source: Census 2011, Records from Sinnar Municipal Council.

The surveys conducted to assess the conditions of household-level toilets for CSP preparation revealed that in the central city, in case of lack of space for septic tank construction, pits are provided below the superstructure. The sizes of pits were found to be varying: from 3’ x 3’ (l x b) to 4’ x 5’, and depth varying from 4’ to 6’.[1] The newly developed areas in the city largely comprise group housing schemes/apartment or individual bungalow colonies, and are found to have properly

[1]Source: Primary survey. Refer to Appendix 2 for case studies of condition assessment of household-level sanitation facilities.

constructed septic tanks. The effluent in these areas flows in open due to absence of any kind of conveyance system. The upcoming colonies have rainwater and grey/blackwater discharge pipes separate from each other, and thus separate collection of both becomes easy. The rainwater is generally used for groundwater recharge in these new colonies.

Figure 11: Disposal of wastewater in Sinnar



Source: Census 2011.

Some glimpses of household-level sanitation.

Sinnar Nagar Parishad provides services for cleaning of septic tanks with the help of a motorised vehicle with suction machine. The charges levied are Rs 400–800 per septic tank cleaning. As per the records available with the local authority, on an average about 260 septic tanks are cleaned in the city on an annual basis. The service provision is demand-based and varies significantly upon the demand generated by the local people. The septage collected from the septic tanks is transported to the solid waste dumping site and is, currently, dumped without any primary treatment.

To assess the availability and status of on-site treatment and waste disposal in individual toilets, a survey was conducted in 75 household toilets. The surveyors observed the location of the toilet,

location and typology of on-site treatment facility, construction techniques, cost incurred for construction and cleaning, and maintenance practices followed. (Refer to Appendix 2 for case studies of household-level sanitation facilities). The assessment revealed the following observations:[2]

Table 3: Observations about on-site treatment facilities in Sinnar

Location of toilets	Usually on the external face of premise and closer to access road; in most cases attached to dwelling unit
Location of pits/septic tanks	In old town area, pit exactly below superstructure having no provision to access for cleaning In new areas, in front yard and beneath the ground level, off-centred from the superstructure
Construction and design norms	• Brick masonry with plastered lining from inside • In new constructions: septic tanks with proper construction with baffle walls • No design norms followed: size of septic tanks variesfrom 3'x4' to 4'x8' in old town, and 5'x8' to 6'x15' in new developments • Effluent discharged into abutting open/closed drain along road
Cleaning practices	No periodic cleaning of the existing pits and septic tanks Frequency of cleaning: not before 3 to 5 years Effluent, in all cases, discharged into drains
Knowledge about functioning of pits/septic tanks	Lack of knowledge about functioning of septic tanks as on-site primary treatment results in irregular sizes of septic tanks

Source: Primary survey

On-site treatment facilities in newly developing areas.

Sanitation Status in Slums

There are eight slum pockets in Sinnar which constitute around 10 per cent of the total population of the city. For CSP purposes, primary survey was conducted in slums with 4 per cent of sample size. The survey reveals that there are hardly any slum dwellers with individual sanitation facilities. Almost 42 per cent of households resort to open defecation in slums. There is no sanitation facility available in Devi Road and Satpirbhilati slums.

[2]Refer to Appendix 2 for case studies of household-level sanitation facilities.

Figure 12: Location of slum settlements

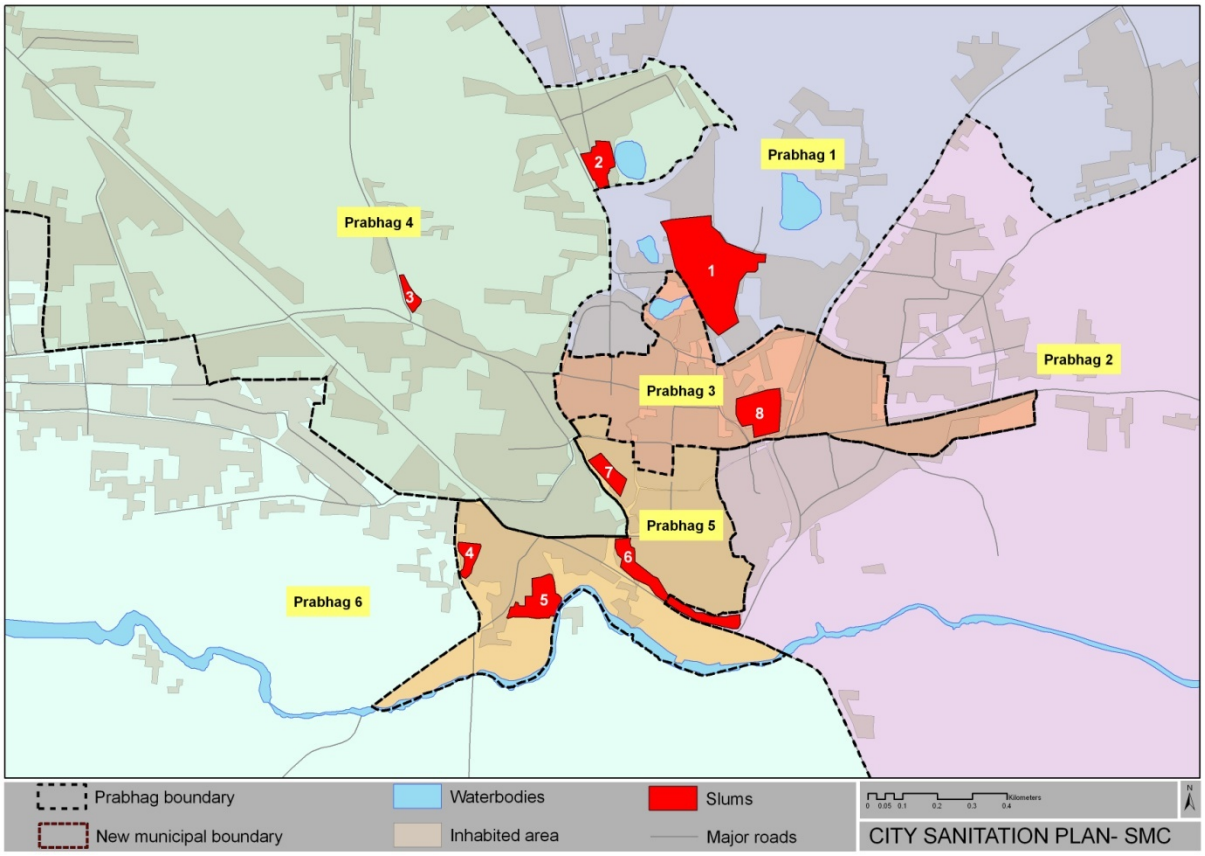
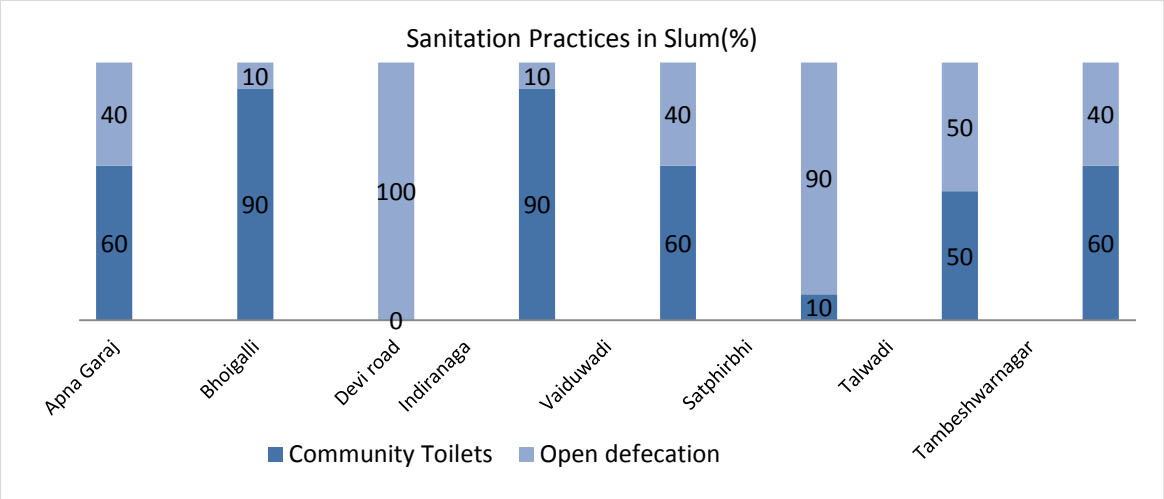


Figure 13: Sanitation practices in slums (%)



Source: Primary Survey; CSP Analysis

3.2 Community-level Sanitation Facilities

The Census 2011 recorded that 3,211 (24 per cent) households rely on community toilet facilities. The coverage of household-level toilet facility is considerably high in non-slum areas; in slum areas, people rely on community-level toilets. Community toilets are unhygienic and not properly

maintained, which is a factor why most of the slum population resort to open defecation. There are 18community toilet blocks with322seats, of which 280 are functional. Field surveys reveal that most of the blocks are in use and in working condition in terms of infrastructure but poor operations and management (O&M) leads to unhygienic conditions that render them unusable. Prabhag-wise details of existing community blocks is given in Table 4.

Table 4: Prabhag-wise details of community toilets

Community toilet details	Prabhag 1	Prabhag 2	Prabhag 3	Prabhag 4	Prabhag 5	Prabhag 6
Toilet blocks (slum/non-slum)	3/0	0/2	1/2	1/5	4/0	0/0
Seats	56	40	68	84	74	-
Functional seats	45	36	55	78	66	-
Managed by	ULB					
User charges	Not levied					
Type of on-site treatment	Septic tank					

Source: Primary survey and Sinnar Municipal Council.

From the primary survey conducted the during preparation of the CSP, it has been observed that most of the community toilet blocks in the city are located near the slums and are not maintained, which leads to high open defecation in slums. Toilet blocks have insufficient number of seats, which is another reason for high open defecation in the slum areas. The community toilet blocks in Indira Nagar and Joshiwadi slums were found critical in terms of infrastructural, on-site treatment and disposal facility and overall hygiene level. Refer to Appendix 3 for condition assessment of community-level sanitation facilities.

Figure 14: Location of community toilets and open defecation spots

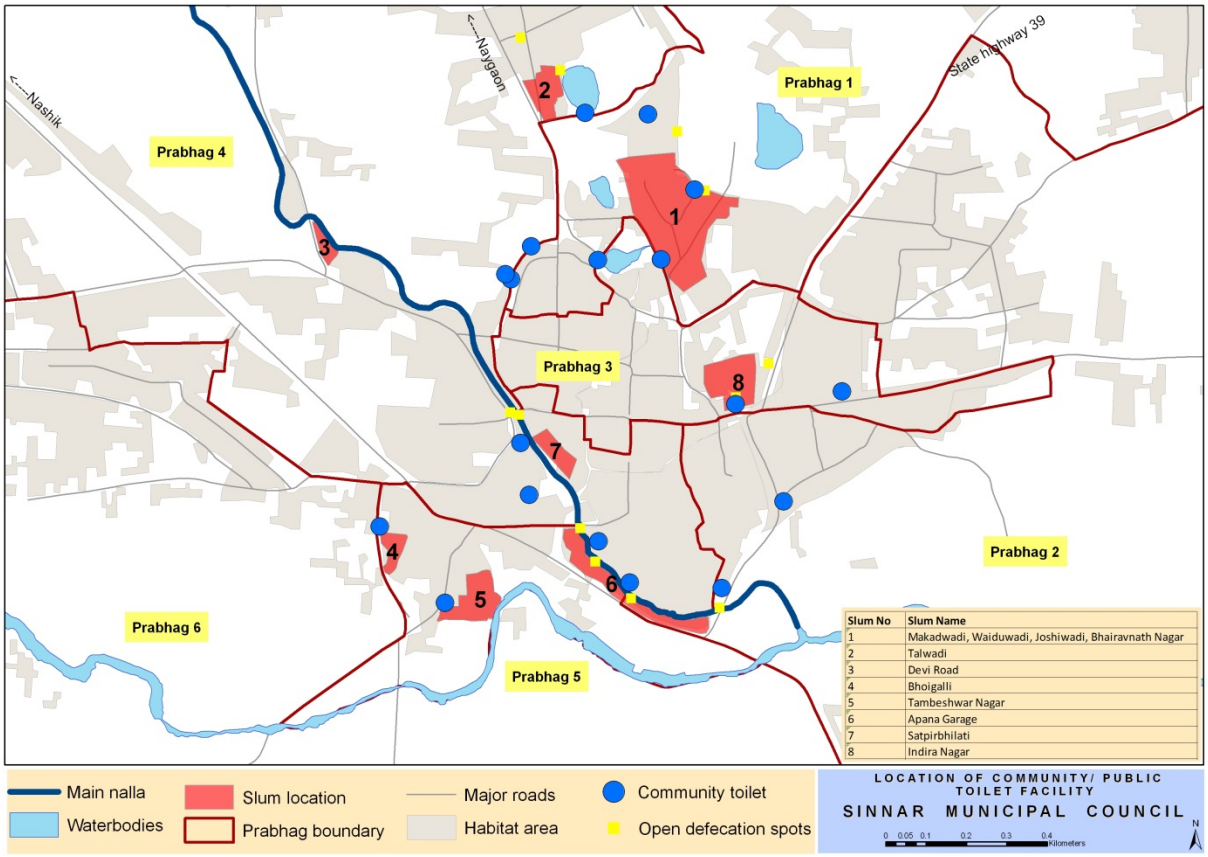


Table 5: Community toilet status in Indira Nagar slum

Slum population/households	835/167	Ruptured condition of septic tanks resulting in overflow of septage/sludge on ground; broken doors; inadequate seats resulting in open defecation practices and unhygienic environment
Seats for male users (functional)	20(20)	
Seats for female users (functional)	10(10)	

The condition of existing community toilet blocks in Indira Nagar.

Table 6: Community toilet status in Joshiwadi slum

Slum population/households	1405/281	Ruptured condition of septic tanks

Seats for male users (functional)	8(6)	resulting in overflow of septage/sludge on ground; broken doors; inadequate seats resulting in open defecation practices
Seats for female users (functional)	16(7)	

The condition of existing community toilet blocks in Joshiwadi slum.

On-site treatment and disposal facility in community toilets

All the community toilets have septic tanks provided along with the toilet block. However, in the absence of any maintenance and any periodical cleaning, almost all the tanks are defunct.

The state of existing on-site treatment facilities in community toilet blocks.

3.2.1 Operation and maintenance of community toilets

The local authority is responsible for cleaning and maintaining community toilet blocks. In most community blocks the water storage tanks are filled once a day. However, there is complete lack of maintenance and cleaning of the totoilet seats. Most toilet blocks lack basic infrastructure like doors and electricity, rendering them unfit for use.

Table 7: Key issues in community level sanitation

Location and user group	Most of the community toilets are located along the roads and commercial areas, which are used by visitors, adding load on the facility
Infrastructure availability and status	Inadequate toilet seats in slums In the absence of any maintenance, slum dwellers, especially children, defecate in open areas in community toilet premises, making the environment really unhygienic
	Basic infrastructure facilities like water availability, water storage tanks, doors and windows, taps and toilet pans are mostly unusable and in state of total neglect
	Almost all toilets lack electricity, making it difficult to access the toilets at night and

	in rainy season
	Almost all the **septic tanks are defunct** leading to unhygienic environment
	No consideration for children-friendly or physically-challenged-friendly toilets
O&M	Most of the community toilet blocks are very **old and lack in periodical maintenance** by local authority No user fees charged
	Lack of awareness about sanitation and hygiene in slum results in poor maintenance of the common sanitation facilities

3.3 Public Sanitation

Status of public facilities

The city has six public toilet blocks located at different public places. It has been observed during the field survey that most public toilets are unclean and unhygienic. Public toilets located in government hospital premises are in good condition and have regular availability of water supply and electricity, but O&M is an issue in these toilet blocks due to the constant and heavy usage from visitors. In case of public toilets in Nehru Chowk, there is no water supply and electricity; urinals are not in use and are seen as a dumping site for solid waste generated in the surrounding areas. Septic tanks are defunct and broken, allowing overflow of septage directly into roadside open drains and subsequently into the river. The details of availability of sanitation facilities for men and women are given in Table 8.

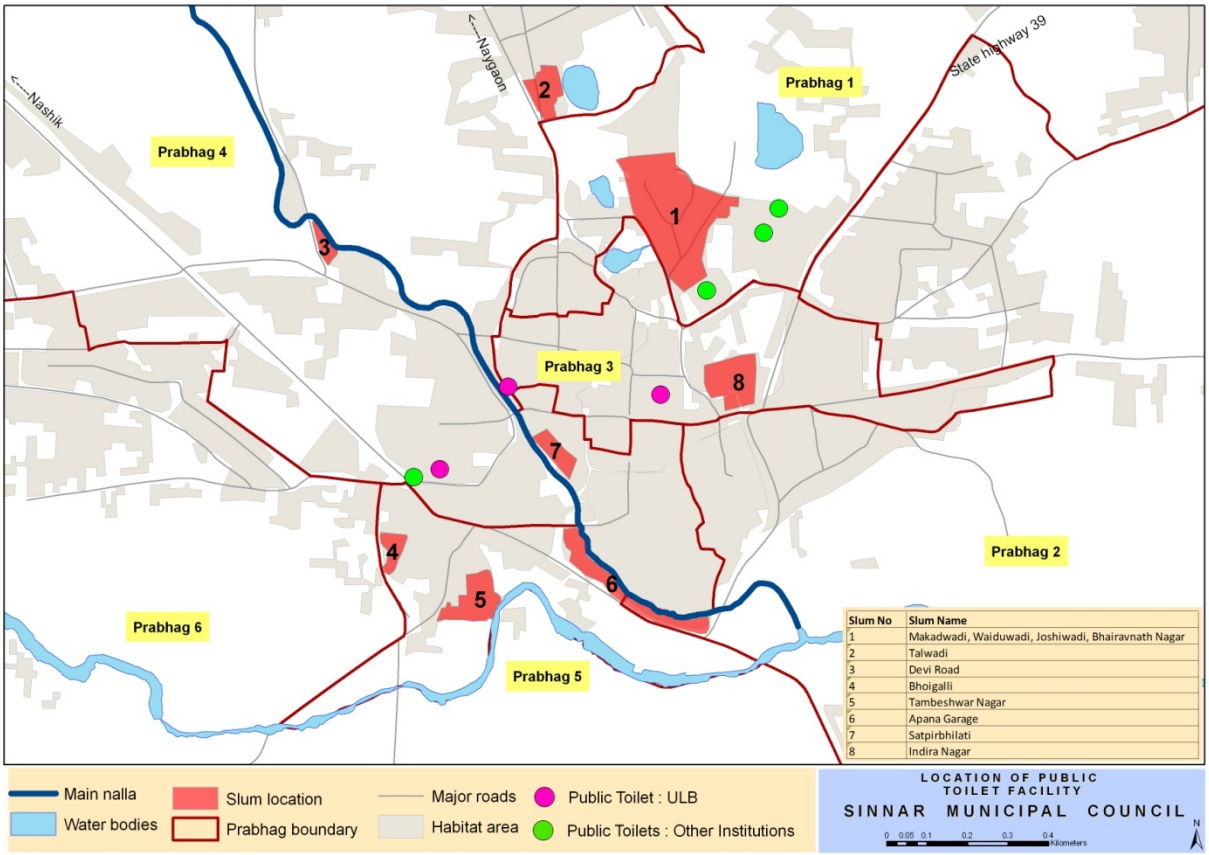
Table 8: Public toilets in Sinnar

	Location	Prabhag no.	Seats for Men[3]	Seats for Women	Urinals	Bath	Water & Electricity availability	Status	On-site treatment	Disposal	O&M by	No. of users /day
1	Market (Pratap Talkies)	3	8	12	-	-	No	Unclean/ unhygienic	Septic tank	Open drain	ULB	100-150
2	Market nr. Nagar Parishad	3	10	10	6+0	-	No	Unclean/ unhygienic	Septic tank	Open drain	ULB	60-70
3	Lonare Complex, behind bus stand	4	4	4	3+0	-	Yes	Unclean/ unhygienic	Septic tank	Open drain	ULB	100-120
4	Bus stand	4	4	4	6	2	Yes	Hygienic, well maintained	Septic tank	Open drain	Private operator	250-300
5	Police Station	1	2		-	-	No	Unclean/ unhygienic	Septic tank	No provisio	Institution	80-120

[3]The seats are functional. However; the toilet block lack in maintenance and regular cleaning; pertaining to unhygienic conditions.

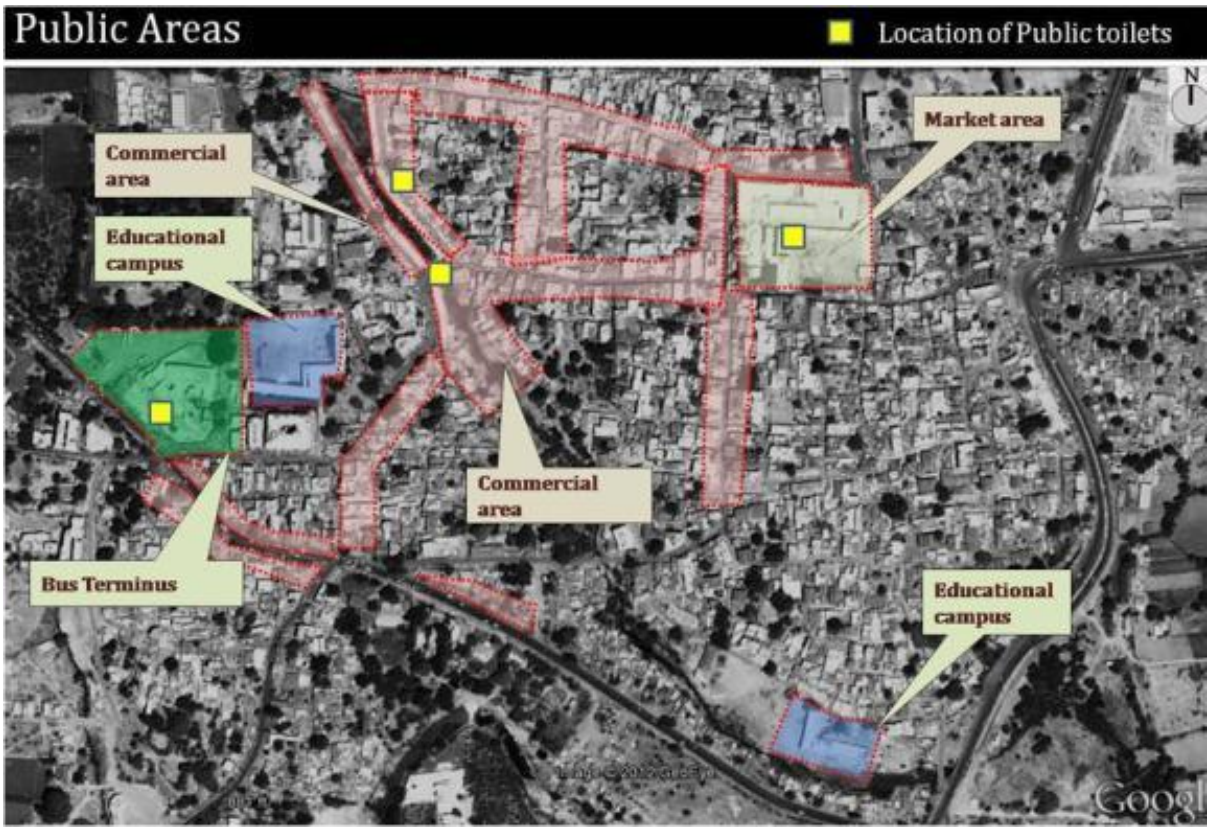
	Location	Prabhag no.	Seats for Men[3]	Seats for Women	Urinals	Bath	Water & Electricity availability	Status	On-site treatment	Disposal	O&M by	No. of users /day
										n		
6	Tehsil Office	1	4	5	-	-	Yes	Unclean/ unhygienic	Septic tank	Open drain	Institution	350-400
7	Govt. Hospital	1	2	2	10+0	-	Yes	Clean/neat	Septic tank	Open drain	Institution	50-75
8	Govt. Hospital	1	7	2	6+6	1+1	Yes	Clean/neat	Septic tank	Open drain	Institution	900-1000

Figure 15: Location of public toilets



The public toilet within the bus terminus premises has been constructed recently and is managed by the private operator with user fees. The toilet block is clean and well maintained. The public toilet in Market area near Nagar Parishad lacks water supply and electricity, and the doors are not functional. During the survey, the block was observed to be unhygienic and unfit for public usage. The toilet blocks in Market and Pratap Talkies are also unusable due to lack of maintenance.

Figure 16: Major zones experiencing floating population



The public toilet near Pratap Talkies.

There is no user fee for these toilet blocks. Educational institutes and government institutions in Sinnar maintain their own toilets. Most of the schools and educational premises have toilet blocks with adequate number of seats. Field surveys indicate, largely, that the school toilets in Sinnar are periodically cleaned and well maintained.

The public toilet in Market, near Nagar Parishad office.

3.4 Strategies to Increase Coverage of Toilets

This section summarises proposals for toilets as part of the CSP. Primary survey conducted during CSP preparation recorded people's perception and their willingness to pay for improved sanitation facilities. The strategies for household- and community-level sanitation facilities are suggested in the CSP on the basis of data analysis and outcomes of the survey. The demand and supply gap for public level sanitation have also been considered in the CSP.

People's perception and willingness to pay[4]

To understand people's perception, awareness and willingness to pay for improved sanitation services, surveys and focus group discussions (FGDs) were conducted in slum areas. Surveys reveal most of the respondents lived in kutchha houses; in only three slums did a small percentage of respondents reside in semi-pucca houses. There is high dependency on labour-oriented work and engagement in petty business as means of living. This leads to unstable sources of income. A considerable size of respondents also relied on salaried jobs (working in small shops and offices as helpers, assistants, etc) and fall in low-income brackets.

The main concerns of the respondents were inadequacy of toilet seats, upkeep and maintenance of community toilets, water and electricity facility in the toilets, clogging of drains due to open dumping of waste and resultant unclean surroundings. Almost all residents of Devi Road and Satpirbhilati practice open defecation due to non-availability of toilets in the community. With respect to waste management, it is observed that in slums where there is provision of door-to-door collection of waste though ghantagadis, there is no open dumping practised, while in areas where no such provision is made, people either use community bins or throw waste in the open.

[4]To understand people's perception, awareness and willingness to pay for improved sanitation services, a survey and focus group discussions were conducted in slum areas. Interview Schedule and focused group discussions were carried out. Approximately 10 per cent slum households were interviewed, that is, 150 out of 1,328 households.

Figure 17: Dependency on community toilets in slums

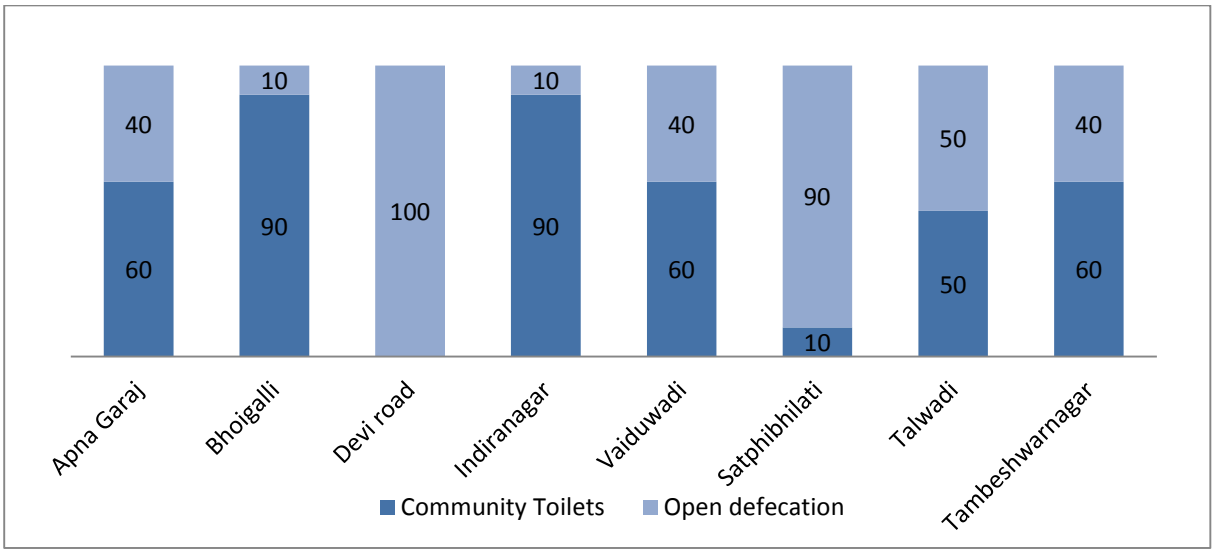
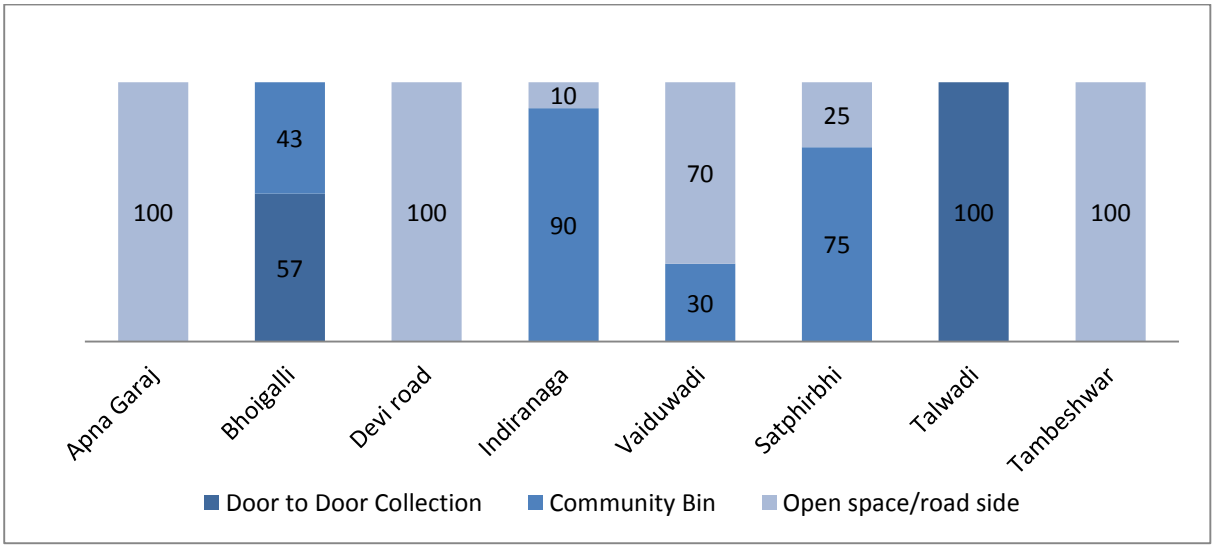


Figure 18: Waste collection and disposal practises in slums



A mixed response was observed with respect to willingness to pay for improved sanitation services. In slums where the income levels were better and services poor, people were convinced about paying for improved services, though some could not specify the amount. In slums where income levels were low, people were reluctant to pay due to unstable incomes, but were convinced that some amounts need to be contributed. It was evident during FGDs that slum residents in Indira Nagar and Tambeshwar Nagar were convinced about the need for people to contribute and take responsibility for the services provided.

Figure 19: Willingness to pay for toilet upkeep (Rs per month)

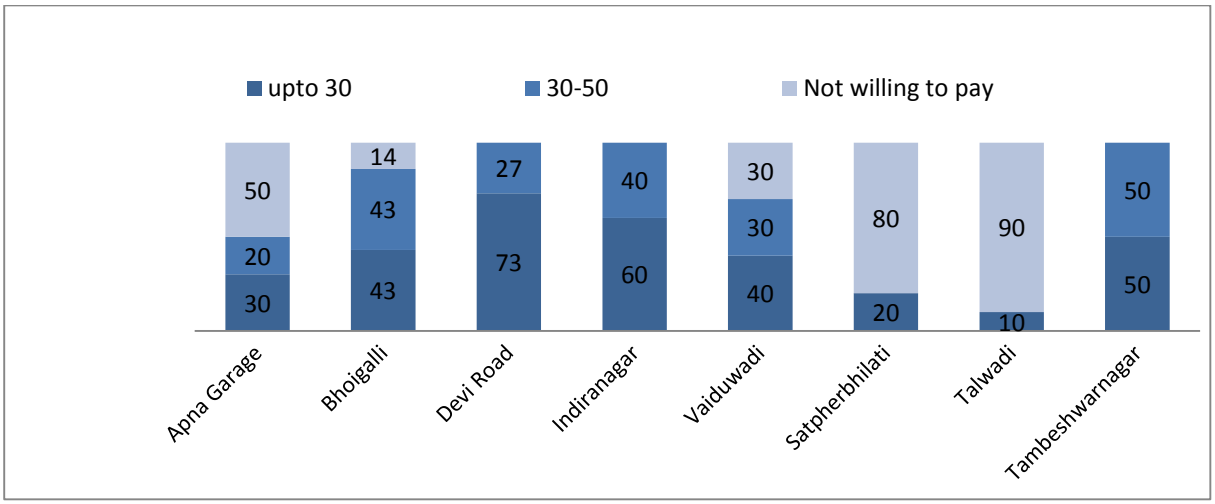


Table 9: People's perception and observations

Slum	People's perception	Field Investigators Observations
Apana Garage	• Need to close existing open drains and nalla to avoid waste dumping and avoid problems of clogging • Need more toilet seats in female blocks • No maintenance of toilet blocks • No door to door collection and insufficient community bins	General Observations ▪ Lower & middle income groups ▪ Mostly semi pucca structures Sanitation Related ▪ Natural drain/nalla flowing from near the slum. ▪ OD practice causing unhygienic conditions ▪ Unclean surroundings in slum area due to dumping of waste all over
Devi Road	• No toilet blocks • Domestic wastewater stagnation due to no conveyance system • No regular water supply in community taps • No facility for HH waste disposal-community bins or D2D collection	General Observations ▪ Fringe area ▪ Semi Pucca houses ▪ Low income group Sanitation Related ▪ Lack of domestic wastewater conveyance system ▪ Disposal of waste on road side and barren land ▪ 60 per cent HH willing to construct HH level toilets if capital cost provided to some extent ▪ Willing to pay for toilet upkeep facility ▪ Willing to take O&M responsibility if services provided

Slum	People's perception	Field Investigators Observations
Joshiwadi/ Makadwadi/ Waiduwadi	• Insufficient toilets and lack of O&M • Most people have cattle. So fodder waste, dung, etc dumped in open drains • Accessibility to community taps not uniform for all residents	**General Observation** ▪ Kutchha& semi pucca houses ▪ Lower economic group, engaged in daily labour, selling of milk, engaging in petty jobs, etc ▪ Huge slum area covering 600 odd HHs, divided in pockets **Sanitation Related:** ▪ Waste dumped right outside toilet areas ▪ OD outside toilet blocks
Satpirbhilati	• No toilet facility in or near the settlement • Hence OD along river • Lack of community bin or door to door collection • Domestic wastewater stagnation due to no conveyance system	**General Observation** ▪ Slum located along river ▪ Densely locate, kutchha houses ▪ People from low and middle income group **Sanitation Related** ▪ OD and dumping of HH waste near river ▪ Stagnation of wastewater running in drains outside houses leading to stench and unclean environment
Talwadi	• Lack of basic amenities like water and electricity in community toilets • Irregular cleaning of toilets and drains • Irregular collection of waste from community bins	**General Observations** ▪ Majority of the population coming from Lower economic group **Sanitation Related** ▪ Willingness to build individual toilet. ▪ Not willing to take responsibility of O&M of community toilets
Tambeshwar Nagar & Bhoigalli	• Insufficient seats • OD in open plot/along nalla • No water facility • No daily cleaning • Proximity of toilet block to road leading to use by floating population • Septic tank of community toilet is non-functional, leading to sewage flowing through open drains.	**General Observations** ▪ Semi pucca houses ▪ Relatively clean settlement ▪ Community toilet used by floating population and adjoining slum leading to frequent usage and unclean status ▪ Willingness to pay for toilet upkeep and take charge of O&M of toilets

Source: Primary surveys and focus group discussions.

Strategies for universalising access to toilets

As the provision of household-level sanitation to all cannot be achieved immediately, the community toilets should be refurbished for use. As mentioned above, community-based organisations (CBOs) can be introduced for the O&M of these community toilets. For this, certain slums can be selected to rehabilitate and initiate such O&M through CBOs or user groups. In addition, there are a few slums where there is lack of household- or community-level sanitation facilities. Thus, the percentage of open defecation is higher in these slums.

Based on willingness to pay and affordability survey in slums and interaction with officials from ULB-Sinnar, slums can be identified for pilot projects of provision of household/shared level sanitation or rehabilitation/construction of community toilet blocks. Selection criteria for prioritising slums can be considered based on a number of factors: percentage of households resorting to open defecation, availability of sanitation facilities, availability of space for construction of household-level sanitation facility, willingness of slum dwellers to pay for the sanitation facility, and so on.

Table 10: Possible pilot projects for household/shared and community toilets

Sr. No	Name of slum	Existing infrastructure	OD Spots	Space availability for HH/shared toilet	Willingness to pay	Prioritisation
1	Makadwadi, Waiduwadi, Joshiwadi, Bhairavnath nagar	Pitiable	Behind Tambeshwar temple	√	70%	
2	Talwadi	Pitiable	Near water body	√	10%	
3	Devi Road	No toilet block	In green fields	√	100%	Prioritising for HH/shared toilets
4	Bhoigalli	Good infrastructure	--	X	86%	
5	Tambeshwar Nagar	Pitiable	Along nalla	√	100%	Prioritising for Upgrading existing CTs in short term
6	Apana Garage	Pitiable	Along river	X	50%	Prioritising for Upgrading existing CTs in short term
7	Satpirbhilati	No toilet block	Along river	X	20%	Providing new CT block
8	Indira Nagar	Pitiable	No; space being located in dense area	X	100%	Prioritising for Upgrading existing CTs in short term

Source: Primary surveys and focus group discussions.

Household-level toilets

It is suggested that the ULB should aim to achieve 100 per cent coverage of toilets through owned toilets, either at individual household level or shared by two or four households, thereby making community toilets redundant. This will save the ULB operational expenses as well as free up small parcels of land at various locations. Some of the community toilets could also be converted to public pay-and-use facilities.

Table 11: Indicative costing for universal coverage through owned toilets

Number of households without their own toilet	4,869
Cost of one toilet with septic tank	Rs 30,000 [5]
Total cost required	**Rs14.61 crore**

NGOs such as Gramalaya or Sulabh, which have developed low cost models, could be invited to provide technical guidance to reduce cost of construction of toilets.

Pilot-level intervention for household-level sanitation

As an immediate intervention, one slum can be prioritised for providing individual/shared toilets based on people's perception and affordability status. Pilot-level intervention is required to demonstrate the approach of providing individual/shared toilets in slum areas. For provision of household-level sanitation, Devi Road slum has been selected, as currently there are no toilets. The slum also has space for construction of household toilets. Moreover, almost all slum dwellers are ready to pay for the improved sanitation facility. There are 98 households that need to be provided with individual toilet facility.

Table 12: Indicative costing for pilot household-level sanitation

Number of slum households from Devi Road slum	98
Cost of one toilet with septic tank	Rs 30,000
Total cost required	**Rs 29.40 lakh**
If applied to any scheme of the central or state government, such as Sujal Nirmal, ILCS:	
Approximate grant under government scheme	Rs 26.46 **lakh**
Approximate share of user (assuming 10%)	Rs 2.94 **lakh**

Community-level sanitation

It is expected that it will take a few years to achieve 100 per cent coverage through owned toilets. Till this is achieved, community facilities will be required to avoid open defecation. At present, most community toilet blocks are near the slums and are poorly maintained. To keep them usable till all households have a toilet, it is suggested to refurbish them so as to have clean access, adequate water at all times, hand washing facilities, doors and latches where absent, etc. For the on-site management system it is necessary to assess the condition and functioning of all the septic tanks and, if required, to rebuild them with proper technical design and detailing. The O&M of these blocks can also be handed over to CBOs or NGOs to improve their usability.

The local authority could also initiate O&M of community blocks through involvement of CBOs or NGOs to ensure their upkeep.

[5] Considering prevailing local rates.

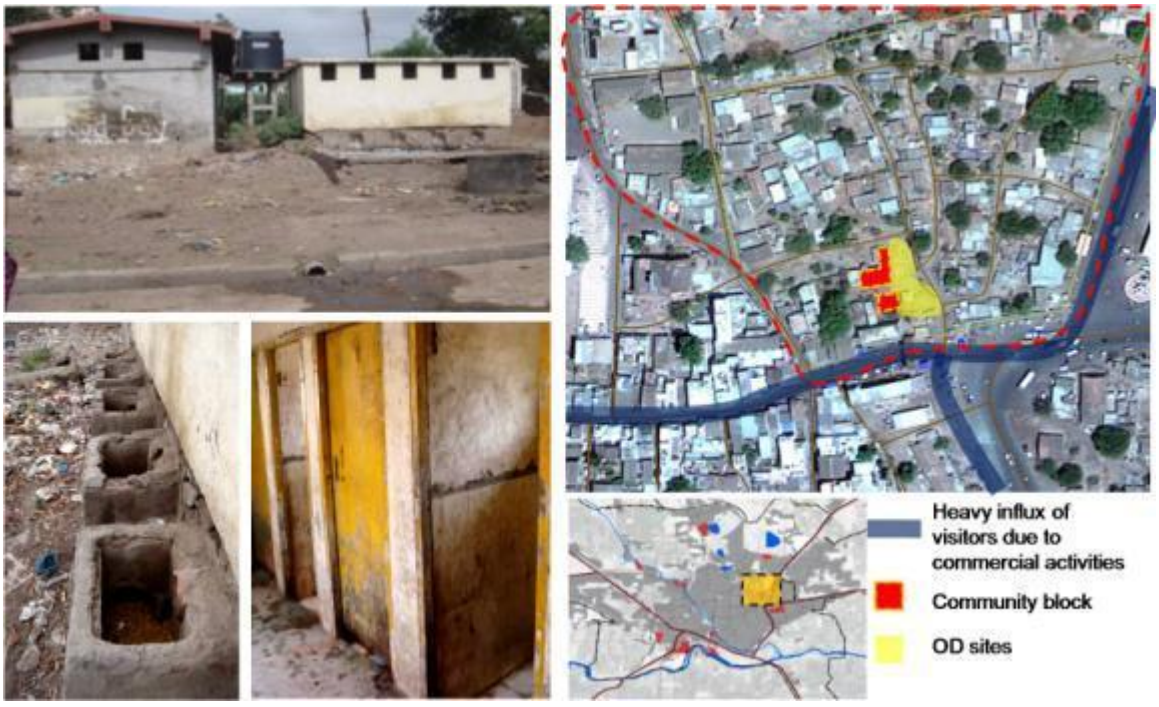
Table 13: Indicative costing of refurbishing community toilets

Number of community toilet blocks to be refurbished	18
Cost of refurbishing one block	Rs 150,000[6]
Total cost required	**Rs 27 lakh**

Pilot: Rehabilitation and upgradation of community toilets

From surveys in slums and FGDs with slum dwellers, interviews of officials from SMC, it has been noticed that the condition of community toilets in Apana Garage, Indira Nagar and Tambeshwar Nagar is very bad. Defunct community toilets have resulted in an increase in open defecation: slum dwellers from Apana Garage use the space along the river for open defecation while those from Tambeshwar Nagar use the space along the nalla – thus polluting natural water bodies. Moreover, there is no space available for construction of individual toilets. Considering all aspects, it is advisable to rehabilitate existing community toilets and involve private sector or CBOs/NGOs in their O&M.

The community toilet in Indira Nagar.



[6]Considering prevailing local rates.

The community toilet in Tambeshwar Nagar.

Table 14: Indicative costing for pilot project for rehabilitation of community toilets

Improvements	Costs
Cost of rehabilitation of three community toilet blocks, that is, Indira Nagar, Apnanagar, Tambeshwar Nagar Improving septic tanks, water facility, taps and toilet pans, electricity, Cleaning of toilet block premise	Rs 4.50 lakh
Involving private sector in O&M Letting out day-to-day maintenance of block to SHG/CBO/NGO	Rs 15,000/month

Pilot: Providing new community block

Satpirbhilati slum lacks almost any kind of sanitation facility; nearly 90 per cent slum dwellers practise open defecation along the river. A survey reveals that 50 per cent of slum dwellers have average monthly income of up to Rs 3,000. Hence, the affordability level of this slum is lower as compared with others. Moreover, there is no space available for construction of individual toilets. Therefore, considering the low economic profile, the high percentage of open defecation and lack of space availability, it is suggested that community toilets of six seats (three each for men and women) be constructed.

Table 15: Indicative costing for pilot community toilet block in Satpirbhilati

Improvements	Costs
Cost of construction of community block Consisting of three seats each for men and women, and three urinals for men. All connected to a septic tank for primary treatment	Rs 5 lakh
Involving private sector in O&M Letting out day-to-day maintenance of block to SHG/CBO/NGO	Rs 5,000/month

Public Toilets

Near the market and commercial area, it has been noticed that the lack of a hygienic, well-maintained public sanitation facility is a main concern. A few government institutions, such as the Tehsildar's office, also lack sanitation facilities. However, other public spaces such as the bus stand and educational premises do have sanitation facilities. It is, therefore suggested that a public toilet be constructed at the Tehsildar's office. The proposed toilet block will also serve other institutions and commercial areas in the vicinity. The toilet block could have four seats each for men and women, and five urinals. It can be managed on a user fee basis. As an immediate intervention, it is

suggested that the infrastructure of two public toilet blocks in Pratap Talkies and Lonare Complex behind the bus stand be upgraded. Around 200–250 people use the toilet, and about 100–150people are expected to utilise the facility per day. The rehabilitation of these blocks will include provision of water facility, taps, electricity, and improved infrastructure with on-site treatment of septic tanks. On a pilot basis, private contractors/local SHGs/CBOs can be involved for O&M of public toilets. Charging user fees of Rs 2 per person, it is expected to get Rs300 per day (about Rs 9,000/month) per block.

Table 16: Indicative costing for public sanitation

Component	Cost
Upgrading infrastructure of two public toilet blocks	Rs 6 lakh
Introduce regular O&M of public toilets	Rs 10,000/month
Construction of public toilet block in Tehsildar office premises	Rs 5 lakh

3.5 Summary of Strategies

Table 17: Summary of strategies for universal access to toilets

Goal	Current status	Nature of actions needed	Costs (Rs crore)	Timeframes
Achieve 100% coverage of toilets through own toilets	63% HHs have their own toilets	**Construction of HH toilets** For 4,869 HHs that do not have a toilet, as per Census 2011	14.61	2015–19
		Promote household-level sanitation Use of audio-visual media, distribution of pamphlets, putting up posters, etc, through a sustained IEC campaign to bring about the shift	Refer[7]	2015–24
Interim arrangements of hygienic community-level facilities	Most community toilet blocks are dilapidated	**Refurbishment of community toilet blocks** Improving septic tanks, water facility, taps and toilet pans, electricity, cleaning of toilet block premises	0.27	2015–17
		Pilot project Refurbishment of CT blocks in Indira Nagar, Apnanagar and Tambeshwar Nagar	0.045	2015–16
		Hand-over of operations and maintenance to private sector/NGO/CBO	5,000 per block	2016 onwards
	Satpirbhilati slum has no community-level facility not HH-level toilets	**Construction of a community block** Consisting of three seats each for men and women, and three urinals	0.05	2015–17
Improve/provide facilities in public areas	Existing facilities are inadequate and in deplorable condition	**Refurbishment of public community toilet blocks** Improving septic tanks, water facility, taps and toilet pans, electricity, cleaning of toilet block premise of the two toilet blocks in Nehru Chowk	0.06	2015–17
		New toilet block In Tehsildar's office premises; will also cater to other institutions and commercial areas in its vicinity	0.05	2015–17

[7]Estimated costs for IEC campaign are given in the Chapter on 'Role of IEC activity'.

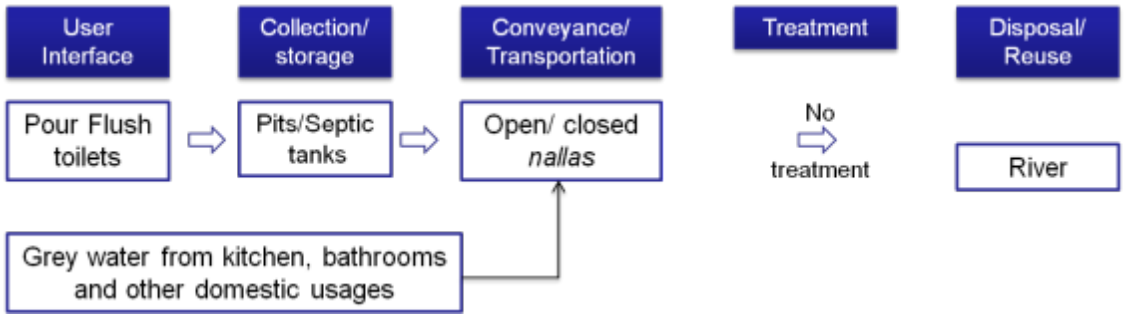
4. Wastewater, Septage and Stormwater Management

This chapter presents the existing picture of wastewater and stormwater management in the city. The quality of infrastructure, operations and management practices with respect to conveyance and treatment are studied and issues identified. An analysis of gaps in availability, strategies for improvement as well policy and management strategies and their costs are discussed.

4.1 Generation of Wastewater by Sanitation zones

At domestic level, wastewater is generated mainly through individual toilets, bathrooms, kitchens and wash areas (known as *mori*, a place for washing and cleaning of clothes, etc).The current water supply in the town is about 65 lpcd. With an existing population of 65,299,[8] and considering 80 per cent of wastewater generation, the total amount of wastewater generated is about 3.40 MLD. Figure 20 shows a schematic flow of domestic wastewater management practises across the town.

Figure 20: Schematic flow diagram of wastewater (current)



Blackwater/effluent from septic tanks is discharged into drains.

An approach to develop sanitation zones or clusters is adapted in the CSP, to analyse liquid waste management in a spatial context. The delineation of these clusters is attempted with reference to topography, natural drainage pattern, homogeneity of urban development, roads and flow direction

[8] Census 2011.

of the water, etc. Often, in small towns, natural drainage pattern is an important aspect that affects wastewater management practices.

Greywater from kitchens and bathrooms is discharged into drains.

As Figure 21 shows, Zones 1, 5, 6 and 7 have least habitation and most of the area is earmarked for agricultural use. Zones 2, 3 and 4 show habitation and, in fact, major growth is expected to occur in Zones3 and 4. As per development plan for the outer area of Sinnar town, the southern side along the river Saraswati has been earmarked for agricultural activities, and the eastern and western areas for residential use. The cluster-wise wastewater generation for different phases is also mentioned in Table 18.

Figure 21: Sanitation clusters (zones) based on topography

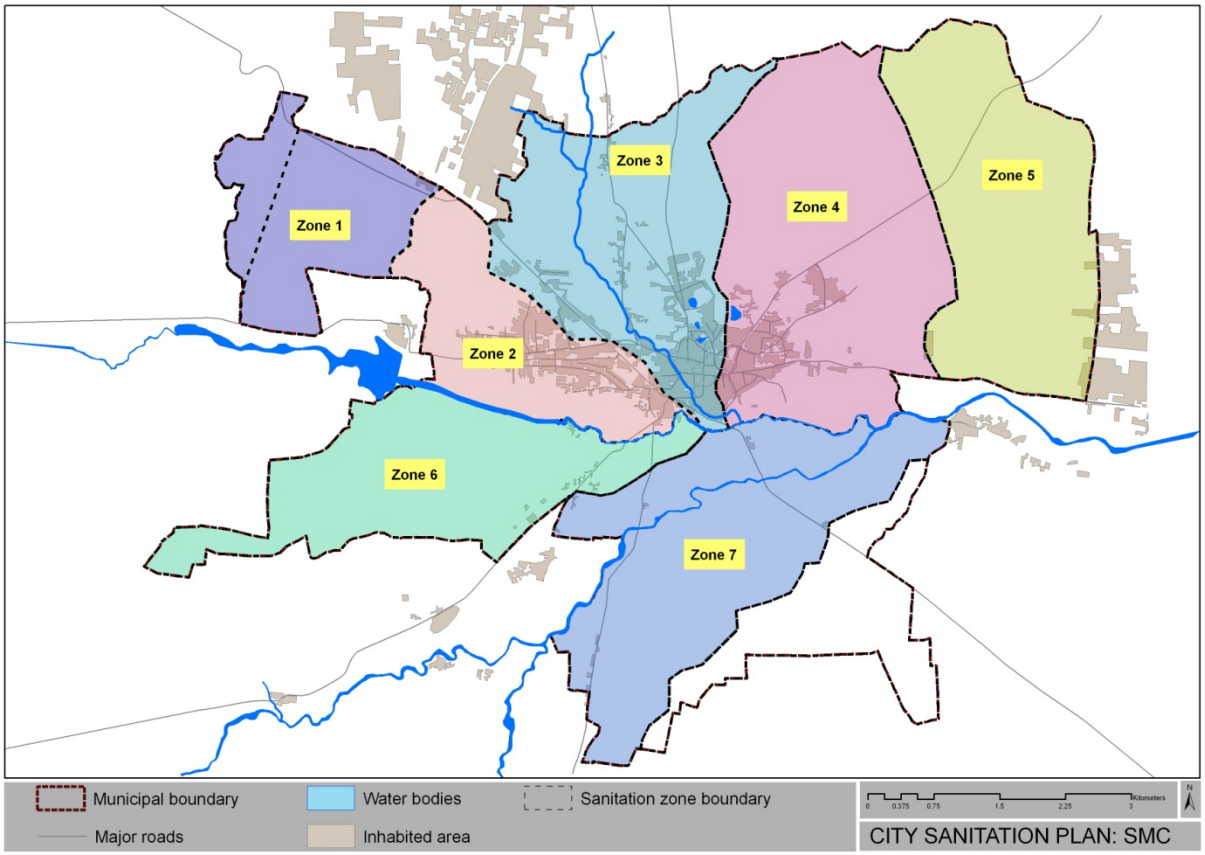


Table 18: Cluster wise generation of wastewater

Zone	Year 2012		Year 2013		Year 2028		Year 2043	
	Population	WW generation in MLD	Population	WW generation in MLD	Population	WW generation in MLD	Population	WW generation in MLD
1	--	--	--	--	--	--	--	--
2	19,575	1.01	20,451	2.2	28,512	3.07	42,750	4.61
3	26,100	1.35	27,268	2.94	38,016	4.1	57,000	6.15
4	19,575	1.01	20,451	2.2	28,512	3.07	42,750	4.61
Total	65,250	3.37	130,500	7.34	522,000	10.24	2,088,000	15.37
Note: Zones 5, 6 and 7 are reserved for agriculture and will not be inhabited								

The clusters show homogeneity of urban development characteristics, housing typology and street pattern, topography and flow direction of the water. The quantity of wastewater generated in the city in various phases is shown Table 19.

Table 19: Generation of wastewater at city level

Year	Year 2012	Year 2013	Year 2028	Year 2043
Population projection	65,251	68,170	95,041	142,500
Wastewater in (MLD)	3.39	7.34	10.24	15.37

4.2 Existing Conveyance System

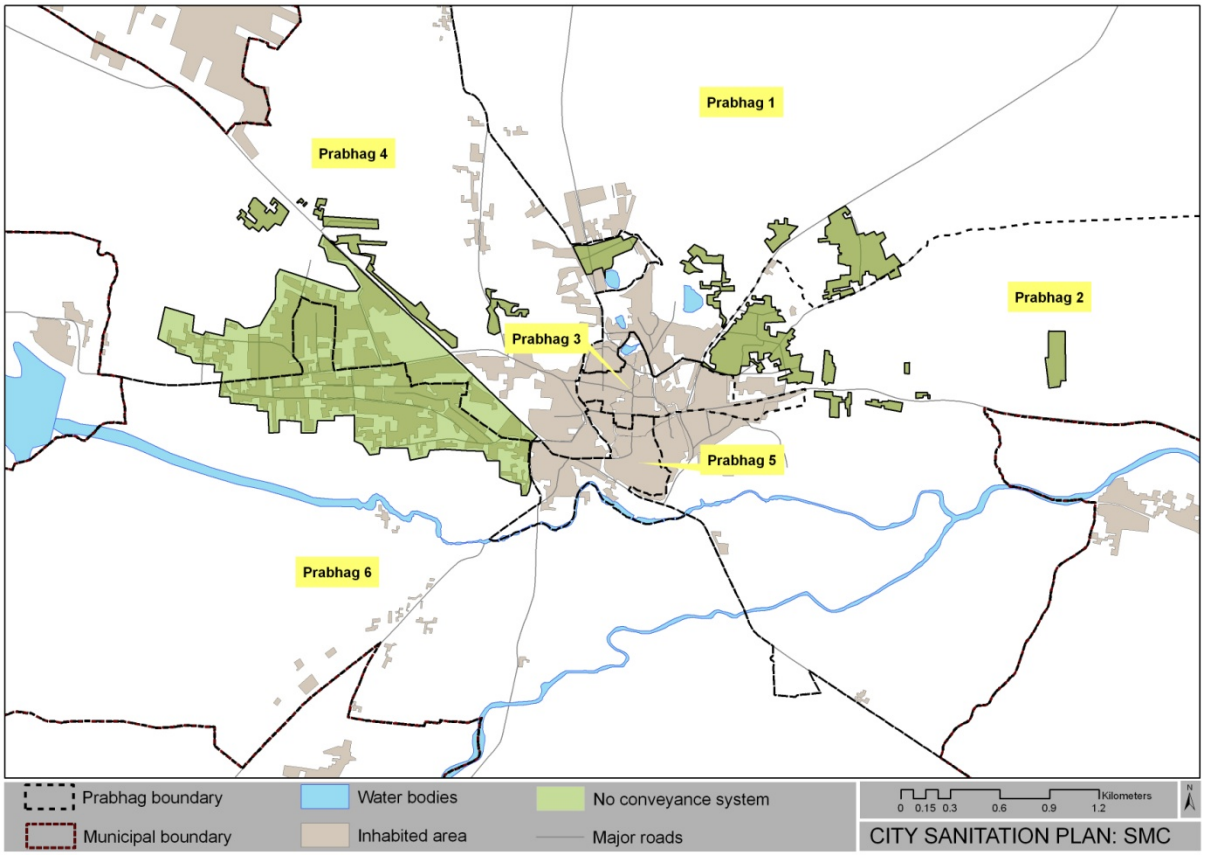
Sinnar does not have an underground sewerage system. Effluent from septic tanks or pits of individual, community and public toilets is directly discharged into open or closed drains along the streets, as is greywater from kitchens and other wash areas.

The central old city area in Prabhag 5 has open drains along roadsides while newly developing areas (for instance, Sharadwadi and Vijaynagar outside the old municipal limits) completely lack in any kind of conveyance system. The water collected from the on-site collection and treatment facility is carried to the river Saraswati to the south of the town through its tributaries and natural drains flowing across the town. However, in the absence of city-wide coverage of drains, only about 55 per cent of the wastewater is conveyed through the river; the rest is let into soak pits, open areas and depressions along the road. Though drain channels have been constructed in some colonies, they lack a holistic network of conveyance – resulting in improper collection, conveyance, and disposal of domestic wastewater in the area.

Figure 22 shows the existing conveyance system in the town – only 23 per cent of the total habitat area has covered drains, which include the central market area, commercial areas near the market and some of the residential colonies. About 45 per cent of the households do not have any type of

drainage system for conveying their wastewater and are largely dependent on soak pits for disposal of effluent and greywater.

Figure 22: Zones of conveyance system coverage



The existing conveyance system in the old city area.

Existing Treatment and Disposal

There is no facility to treat domestic wastewater generated in the town. Septic tanks are the only means of primary treatment in some households. Blackwater is directly discharged into open drains and from there into the river Saraswati.

To assess the characteristics and pollution levels of the wastewater, samples were collected and tested for various parameters including BOD, COD, TSS, and pH value. The samples were taken from different locations, at various stages of the wastewater management system, such as, effluent of septic tank, blackwater in open drains along roads, natural open drains into which roadside drains carrying wastewater converge, and from the river in which the natural drains finally converge.

Figure 23: Locations from where wastewater was collected for quality testing

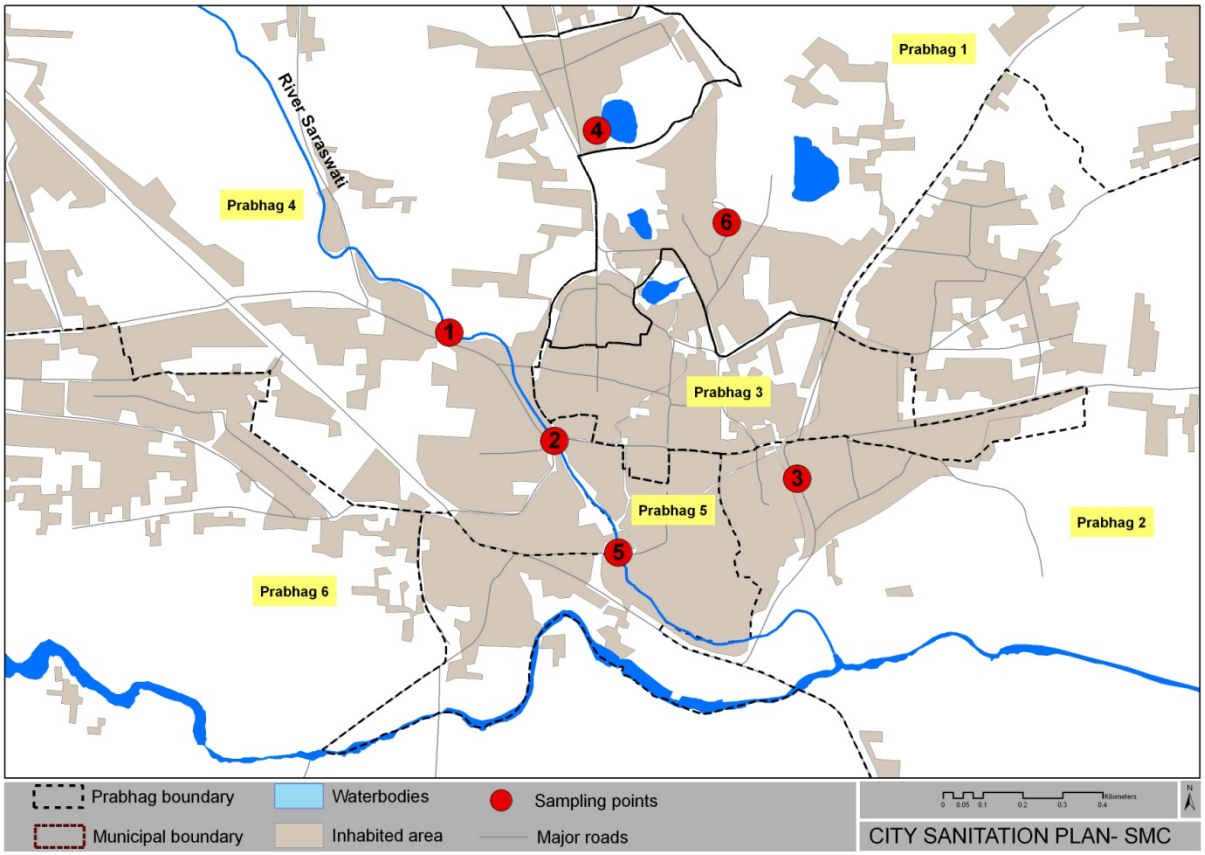


Table 20 shows the locations of the wastewater samples and subsequent results after lab testing.

Table 20: Analysis of sampling results

Sample location	BOD, mg/l	COD, mg/l	TSS, mg/l	pH
Permissible limits	**30**	**250**	**600**	**6.5-8.5**
1.Drainage outlet – Khasdar bridge	222	360	186	6.9
2. River water near Bazaar bridge	198	310	263	7
3.Open Drain – Indira Nagar	375	610	274	6.8
4.Septic Tank – Talwadi	360	540	249	7.4
5. Open Drain – Vanjar Galli	228	340	194	6.9
Beyond CPCB effluent standards		Within the CPCB effluent standards		

Source: Reports on analysis of wastewater samples from Polytest Lab, Pune.

Open drain channels – carrying the domestic wastewater of the central city area – discharge into the river near Khasdar bridge. The results showed BOD value of 222 mg/l, which is considerably high.

The Saraswati river flows through the town and carries a large part of untreated domestic wastewater. Samples were taken at various points to test the river water. Water quality near Bazaar bridge showed BOD levels of 198 mg/l, which is much higher compared with the desired standard of 30 mg/l. Most of the domestic wastewater from the central city area, in Prabhags 3 and 5, is discharged directly into the river. Open drains in Indira Nagar slum carry greywater from the slum houses and effluent flowing from the septic tanks of the community toilet block.

Samples were also collected from the open drains of Talwadi slum. The BOD levels of the wastewaters from these drains were found to be at alarming levels when compared with the desired standard level of 30mg/l. The test results show that the septic tanks in the community blocks do not function properly; this implies improper primary treatment of liquid waste discharged from septic tanks.

Septage Management

Sinnar relies on an on-site sanitation system, along with a system of open/closed drains along the main roads and soak pits. The effluent from septic tanks/pits of individual or community toilets is discharged directly into open or closed drains along the streets. Field surveys show that all existing individual and community toilets (largely pour flush latrines) are connected to septic tanks. However, there are two practical problems for their cleaning and emptying. First, in the old town area, these tanks are sometimes constructed below the toilet superstructure; second, in most other cases, the tops of septic tanks are sealed, making access for emptying difficult. Surveys have also revealed that septic tanks in the cities are oversized and do not prescribe to the norms suggested in IS codes and Central Public Health and Environmental Engineering Organisation (CPHEEO) manuals. Samples of wastewater collected from various points across the town also suggest low efficiency of primary treatment in septic tanks. Due to long cleaning cycles of septic tanks, septage solidifies in the tanks and treatment efficiency is thus reduced due to reduction in retention time of wastewater in the tanks. Due to this, wastewater from the septic tanks enters the drains without primary treatment. Personal interviews revealed that, in many cases, septic tanks were cleaned once in five to seven years; some, in fact, were yet not cleaned.

In this context, septage management is a crucial component of wastewater management. The faecal part settles at the bottom of septic tanks; this needs to be removed regularly with suction machines. In Sinnar, the septic tanks are cleaned by the local authority. The prevalent charges are Rs 400–800 per septic tank cleaning. However, SMC records reveal that only about 260 septic tanks are cleaned by the suction machine annually. Often, septic tanks are cleaned only after they are full and overflowing. Instead of regular cleaning, septic tanks are cleaned based on demand generated by the local people. The septage collected from the septic tanks is transported to the solid waste dumping site and is dumped in the open, without any primary treatment, with the rest of the solid waste.

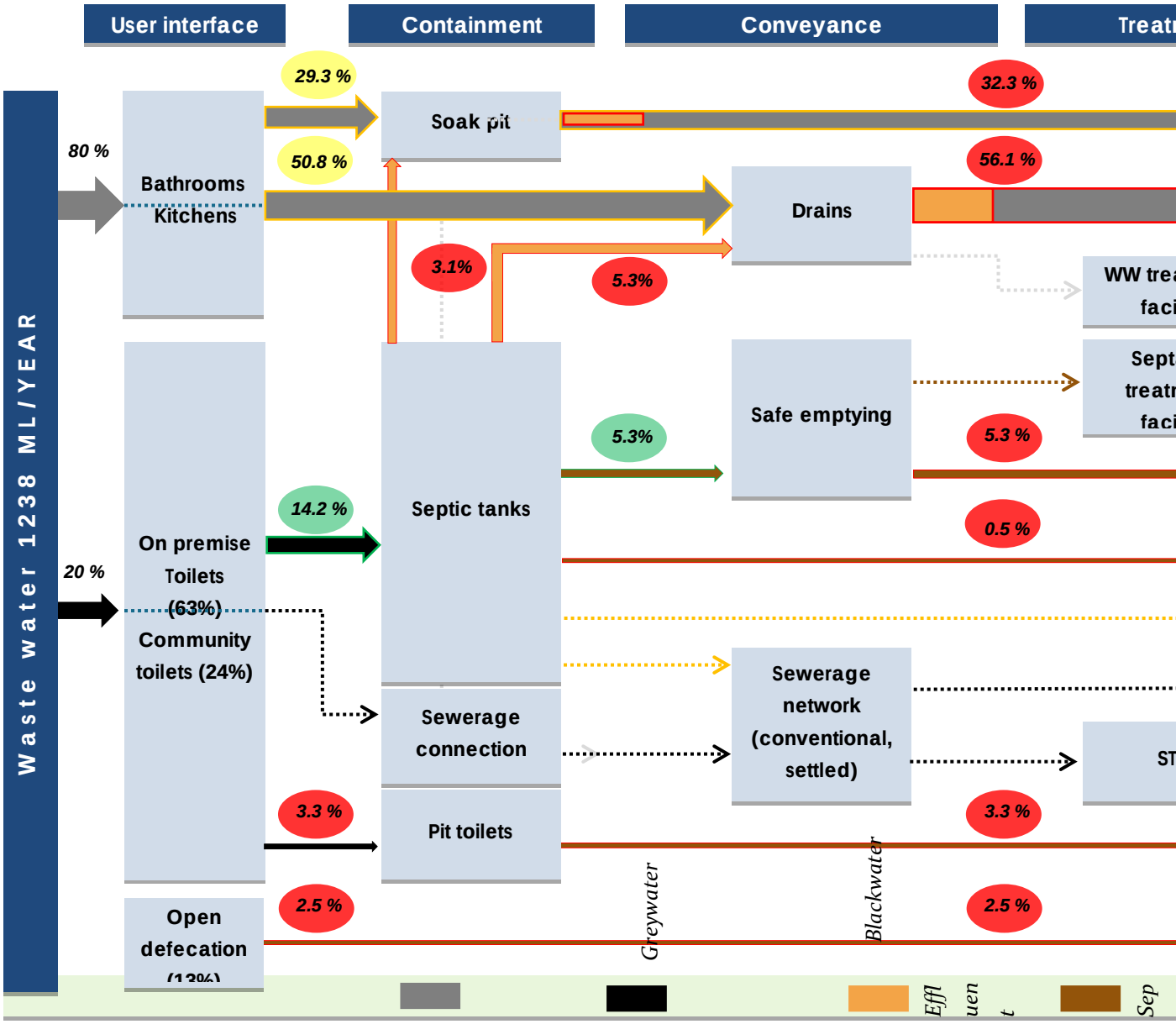
Key issues in wastewater management

The town lacks a proper conveyance system and relies on open drain channels along the streets. Currently, both grey- and blackwater are discharged together into open drain channels. The newly developing areas (south to river) lack conveyance system and wastewater, after primary treatment through septic tanks, is discharged into soak pits or in the open. In the town, domestic wastewater is also discharged into natural drains and rivers without any treatment and leads to pollution. At times, disposal of solid waste into nallas leads to water clogging, as there is no regular cleaning of nallas. There is a need to enforce building bye-laws, to develop an on-site treatment facility and introduce appropriate treatment of faecal sludge.

As illustrated in wastewater flow diagram for Sinnar in Figure 24, a large part of greywater currently flows through drains and is discharged into land/water bodies without any treatment. The diagram illustrates that 56 per cent of the volume of greywater gets discharged without any treatment. The soak pit route is also used only for 29 per cent of greywater and it ends up untreated.

For blackwater volumes: septic tanks, in case of household toilets, are able to primarily treat 14.2 per cent of volume but this entire volume does not get safely emptied. Less than 6 per cent of blackwater volume is safely emptied and even this does not go through proper treatment procedures. Thus, a very negligible volume of blackwater gets partially handled across the service chain. Building bye-laws state that it is necessary to develop an on-site treatment facility for septic tanks, followed by soak pits. However, very few buildings (especially newly developing ones) follow the system. There is, thus, a lack in implementation and enforcement of bye-laws. Surprisingly, the newly developing areas lack in conveyance network.

Figure 24: Existing wastewater flows in Sinnar



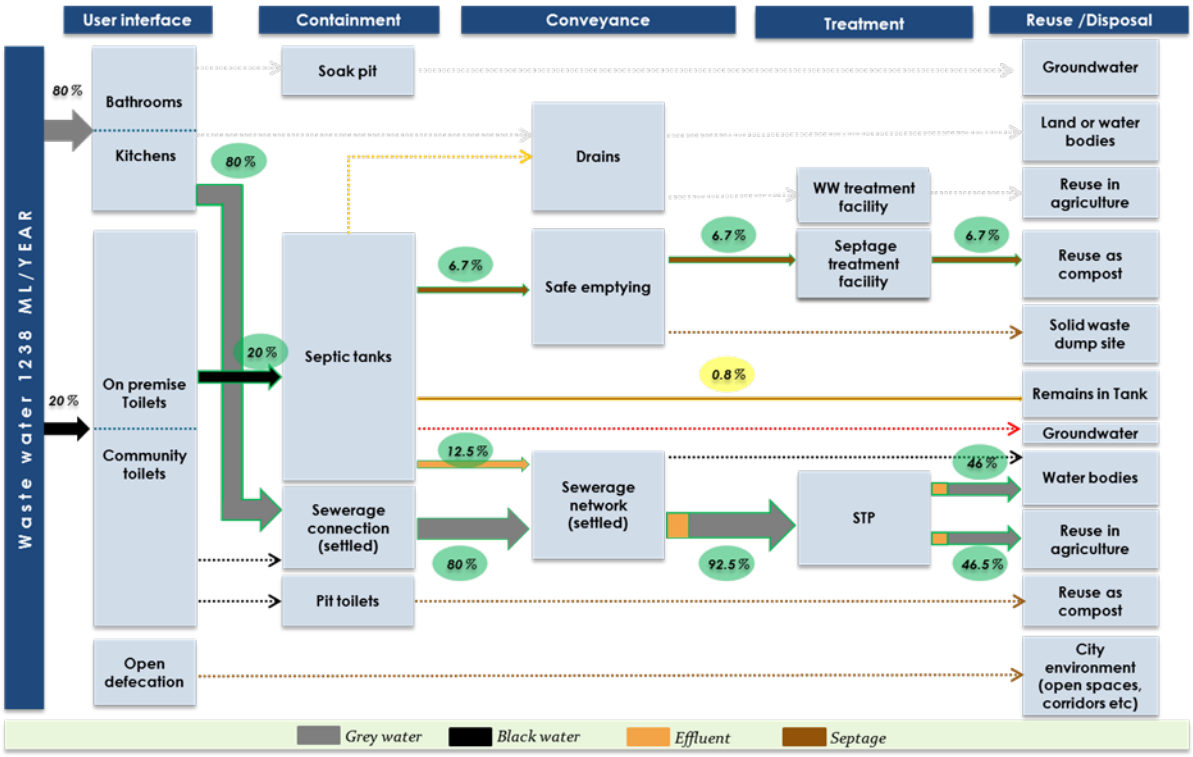
Sinnar is favoured by natural topography and drainage patterns which can be considered for designing of any gravity-based conveyance and treatment facility. The town slopes towards the river Saraswati in the south, which is a favourable condition for designing a conveyance system.

Figure 25: Existing sanitation service chain

User interface	On-site collection and primary treatment	Conveyance system	Treatment/ disposal
Pour flush toilets	Pit system Septic tank	Open and closed drains along roads connected to natural drains	Into river without treatment

In the improved scenarios, it is assumed that both black/greywater will be appropriately treated and then disposed or reused for other purposes. As evident in Figure 26, a sustainable wastewater management plan for Sinnar will essentially involve handling the entire wastewater volumes and their proper treatment across the service chain. In the improved scenarios, it is also assumed that both black/greywater will be appropriately treated and then disposed or reused for other purposes. As evident in the figure 26, none of the volumes will be highlighted through red or yellow traffic lights. Green lights illustrate that entire wastewater volumes are treated through septic tanks, sewage treatment plants (STPs) or appropriately reused in the service chain. The respective volumes for effluent and blackwater and methods for treatment are illustrated below.

Figure 26: Targeted wastewater flows after CSP interventions



4.3 Existing Stormwater Management

The city of Sinnar has developed in a west-south direction, and the nalla flows north–south, crosscutting Sinnar into two parts; the Saraswati flows along the south boundary of Sinnar. The overall slope of the city is towards the south (towards the river). The stormwater collected from the city flows towards the south, through the tributaries of the river and natural drains flowing across town. The length of open drains in the city is about 10.38 km, whereas the total road length is about 126 km. Broadly, the city is divided into two major drainage zones as demarcated in Figure 27.

In terms of topography, the city is situated on rocky terrain with a gradual slope towards its southern boundary limits. The river Saraswati and its two tributaries collect wastewater and stormwater from almost 75 per cent of the habitat area. Apart from the river and tributaries, there are three lakes in

the northern part of Sinnar. One of them is located within boundary of Gondeshwar temple which, along with its surrounding areas, has been identified by the Archaeological Survey of India (ASI) as a heritage site. Therefore, in the future, there is the potential to develop the site as a heritage tourism resource site. Another lake flows adjacent to the slum areas of Vaiduwadi, Joshiwadi, Makadwadi and Bhairavnath Nagar. The wastewater and stormwater flowing along the roads of these slum areas flows towards this lake. Figure 28 shows the location and catchment of these three lakes.

Figure 27: Drainage pattern

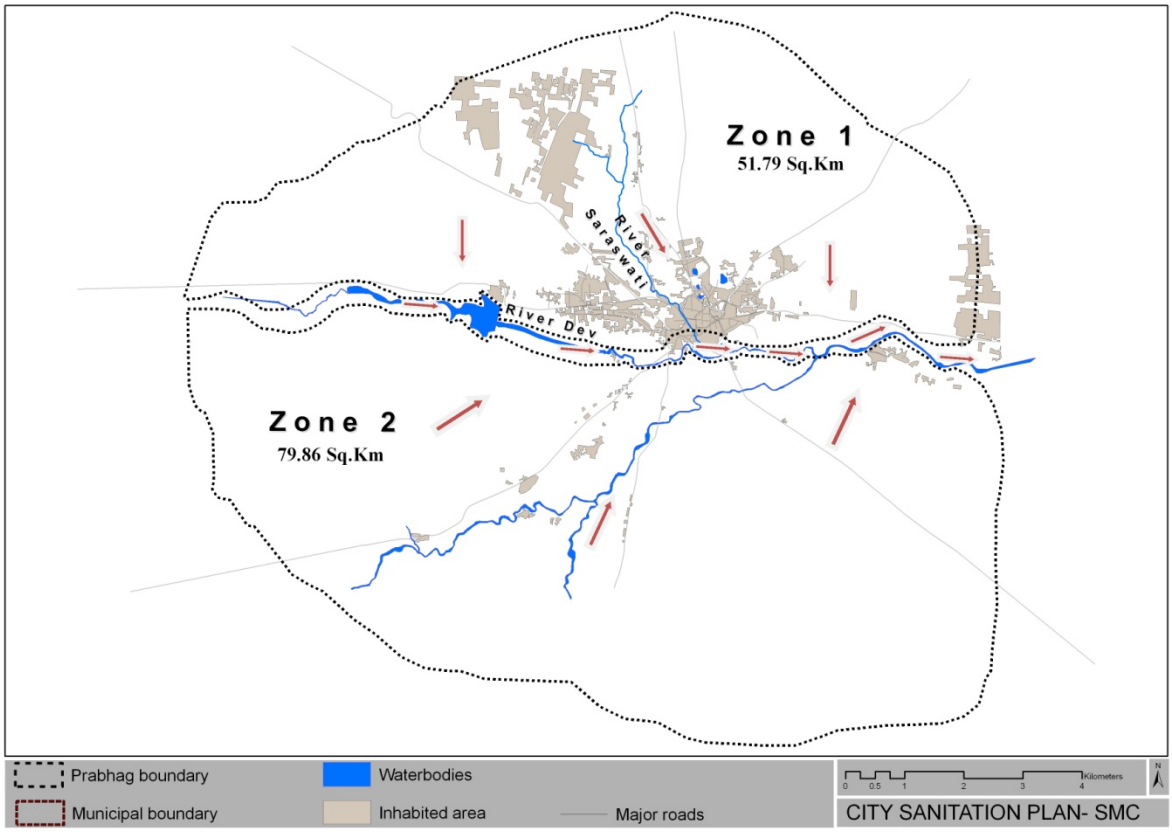
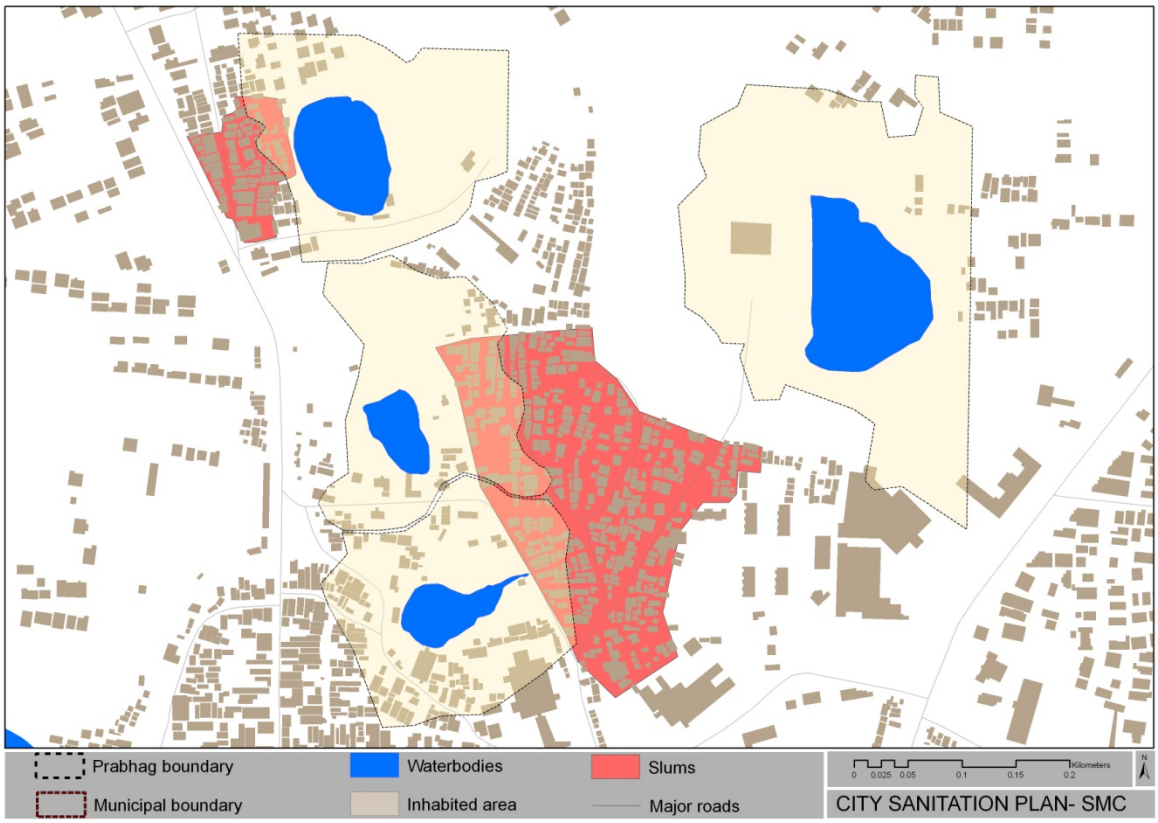


Figure 28: Catchment area of three lakes



The city lacks a dedicated system for conveyance of stormwater and wastewater. It gets conveyed through roadside drains and ultimately reaches natural drains/ nallas and the river. Mixed with waste and pollutants, it is disposed off directly into the three lakes without treatment or filtration. Gross lack of treatment and proper conveyance system characterises stormwater management in Sinnar.

Major drains/nallas carry stormwater and wastewater for the city.

Dumping of solid waste into the drains/nallas reduces their water-carrying capacity. Desilting of tributaries was done by the local authority last year (year 2012) before the monsoon. The river now is again polluted due to disposal of solid waste and wastewater without treatment. Thus, as a long term measure along with desilting of stormwater channels, proper conveyance of wastewater is also important.

Desilting of natural water bodies.

4.4 Suggested Improvements in Wastewater Management

Possible waste management options for sanitation improvements

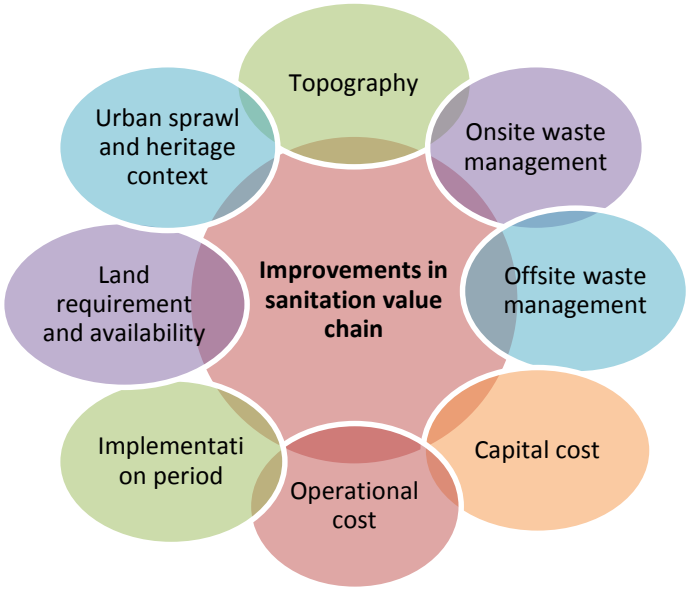
At present, the town does not have a dedicated sewerage system to collect and convey domestic wastewater; a network of open and closed drains along the streets serves as the only means of conveyance. Almost 23 per cent of the area is catered to by open drain channels. However, these drains are not constructed according to technical design considerations. In addition, mixing of solid waste is a commonly observed problem that affects the efficiency of the drains. In light of existing liquid waste management practices, various technological options to carry and treat domestic wastewater in the town are reviewed and assessed in the city context. Appendixes 4 and 5 have details of alternatives of wastewater treatment. In order to suggest the suitable option for collection and conveyance system, following techniques and technologies were considered in the city context.

Table 21: Comparative analysis of conveyance system in city context

No	Conveyance systems	Capital cost	O&M cost	Efficiency	City context	Remark
1	Rehabilitation of drains	Low	High	Not recommendable in the long run	Good coverage of open drains available in old town; new developments lacking in any kind of network	Suggested in old town area as immediate intervention
2	Small bore/settled sewer	Low	Moderate	Efficient when topography is favourable	With septic tanks available at individual household level, the solid free sewer is easily achieved avoiding intercepting tanks.	Suggested for the full town as long term intervention
3	Simplified sewer	Moderate	High	High	Can be developed in new development, but this would make the existing functioning system of septic tank redundant	--
4	Conventional sewer	High	High	High		
5	Septic tank emptier	Low	Low	High	This can be done for the whole city as all households have their toilets connected to septic tanks	City-wide intervention in the short term

Having reviewed various possibilities for improvement in wastewater management with reference to the sanitation service chain, Figure 29 delineates the approach adapted to formulate area-specific strategies.

Figure 29: Selection of appropriate improvements in sanitation service chain



There are various combinations of systems that can be possibly adapted for wastewater conveyance and treatment of wastewater. However, considering the topography of the town, population, as well as the growth trends and financial status of the ULB, certain systems were shortlisted for comparative analysis of land requirement, cost effectiveness and time required for implementation of the system. For comparative analysis, the urban area development in the town is categorised as:

Old town area, characterised by densely developed residential and commercial areas with narrow inorganic streets. There are open and closed drains along the streets, which carry domestic wastewater into river Saraswati.

Newly developing area, marked with residential colonies and group housing schemes, which have proper facility of primary treatment through septic tanks but lack in conveyance network as well as treatment mechanism. At some places, in absence of proper road network and road sections developed, wastewater is carried through kutchha nallas.

Future development areas, which with reference to the development plan, are designated and earmarked for future development but are lying vacant in the present context. Considering future growth trends, Table 22 compares the wastewater conveyance and treatment alternatives.

Table 22: Comparative analysis of wastewater conveyance and treatment alternatives

Location	Existing		Proposed strategies		Cost A+B (Rs in crore)[9]	Remark		
	Conveyance	Treatment	Conveyance	Treatment		Area required	Cost effectiveness	Ease of implementation
City-wide	Open / closed drains and soak pits	-	Rehabilitation of drains (Rs 5.32 crore)	ASP[10] (Rs11 crore)[11]	16.32	No need of extra area than present conveyance system	Comparatively lesser cost of conveyance	Considerably time effective Immediate implementation
				DWATS (Rs 21.06crore)[12]	26.38	Need to acquire land at several places	Cost effective alternative	Time effective with easy implementation
			Initiate settled sewer (Rs 30.91[13] crore)	ASP (Rs 11crore)	41.91	Lesser area required	Cost effective conveyance system provided primary treatment is put in place	Lesser time needed for implementation
				DWATS (Rs21.06crore)	51.97		Cost effective alternative for conveyance system	Setting up DWATS treatment option may be time-consuming due to land acquisition in pockets
			Conventional sewer (Rs 45.40 crore)	ASP (Rs 11crore)	56.40		High cost alternative	Needs a span of few years for implementation
				DWATS (Rs21.06crore)	66.46	Treatment system requires acquisition of land in pockets	High cost alternative of conveyance system	Needs a span of few years for laying conventional sewer lines

[9]Details of estimated costs are given in Appendix 6.

[10]ASP was suggested by ULB officials because, having considered the present growth rate of Sinnar, sewer load will increase tremendously in the future. Therefore; it is advisable to initiate ASP which has better efficiency than other alternatives. Such water can be used for industrial purposes. Costing as per settled sewer DPR prepared by the SMC.

[11]A span of 15 years is considered. Since it is a centralised treatment plant, it is considered for a population of 65,000. Specifications given as per the SMC.

[12]Considering the population of old town area as 65,000, as given by the SMC and with 135 lpcd of water supply. Estimated sewage generation is 7.02 MLD and the cost for DEWATs is assumed as Rs 30,000/kl.

[13]Costing as per settled sewer DPR prepared by the SMC.

Location	Existing		Proposed strategies		Cost A+B	Remark		
City-wide proposal	Drains or no drains		Refurbishment/upgrading septic tanks and provision of soak pits and procurement of new emptier trucks	Faecal treatment facility	1.25	Area required for soak pits needs to be identified in old town area	Low cost alternative	Easy implementation

Note: Since underground network is a long-term intervention, wastewater generation assumed is according to population projections. As mentioned above, rehabilitation of drains can be only a short-term intervention and cannot be a suitable solution for a span of 30 years. Thus, wastewater generation is assumed accordingly.

Rationale for selecting a solution

As shown in Table 22, various options for wastewater conveyance and treatment were considered and solutions were selected for the city based on the city context, technology type and costing of the option.

Rehabilitation of drains: Major portions of the old city areas are covered by either an open/closed drain system. The effluent from septic tanks and greywater is conveyed through these drains. However, these drains need to be rehabilitated and covered in some areas. The capital and operating costs for these solutions are not as high as compared with conventional and non-conventional sewer systems, but as per CPHEEO guidelines, rehabilitation of drains can only be an interim solution and not a permanent one.

Settled sewer: As per Census 2011 and field work undertaken in the city, 74 per cent household toilets are connected to septic tanks and all the community and public toilets are also connected to septic tank systems. The effluent coming out of these septic tanks is not conveyed properly. To improve upon the already existing infrastructure, settled sewers can be considered wherein the effluent coming out of the septic tanks is conveyed through a small diameter pipe, which can be laid at lower gradients to a treatment facility. In addition, the city has good slopes, so liquid can be conveyed to the treatment facility without any major pumping requirement. The benefits of this system is that this can be laid at shallower depths, pipe materials can either be RCC, UPVC or any other material, and the pipe diameters can be small as this has to convey only the liquid portion. The capital and operating costs of this system are less as compared with other sewer systems like simplified and conventional sewer system. However, for successful implementation of this system, septic tanks need to be emptied at regular intervals of two or three years (as suggested by CPHEEO manual and IS codes) so that the solids do not enter the network system, otherwise they will choke the settled sewer system.

Simplified sewer: This is an off-site sanitation system where solids are also conveyed with the liquid portion to the treatment facility. This is different than conventional sewer in terms of its layout. It can be laid within plot boundaries and the slopes needed for it are less as compared to conventional sewer system. The capital and operating costs are also less as compared with conventional sewer system. In the city's context, this system would be difficult to lay: the old part of the city is very dense and this system would make the functioning on-site system redundant. Moreover, the concept of simplified sewers is still very new in an Indian context, and not many cases are available as case studies.

Conventional sewer: This is also an off-site sanitation system which conveys the solid and liquid portions to the treatment facility. The capital and operating costs of this system is very high as compared with other sanitation systems: the slopes are high as the system has to also carry solids, because of which the pipes are laid at deeper depths and manhole depths also increase at each intersection. At some places pumping would also be required to pump the wastewater to the next wastewater network grid and also at the treatment facility. In the city's context, this system is

difficult to be laid as the old city is very dense, road width is narrow and this system would make the existing functioning on-site system redundant.

For treatment of wastewater, decentralised treatment facilities along the river were considered. However, unavailability of land at appropriate locations makes it difficult to consider this option. Thus, it is suggested that the treatment facility would need to be located downstream of the river.

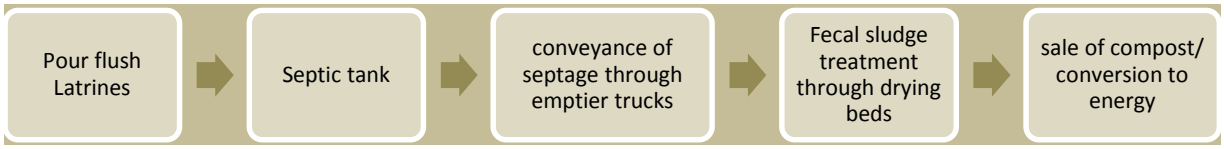
Strategies for improving wastewater and faecal sludge management

Having reviewed various possibilities regarding sanitation systems, Sinnar can consider the following option: In the short term, for the old area, it is suggested that existing drains are rehabilitated to ensure proper gradient and cross-section to carry domestic wastewater. The drains will be redesigned to cater for wastewater, additional surface stormwater loads; existing drains will be covered to avoid mixing of solid waste. In the new town areas, the existing system of septic tanks and soak pits for collection and treatment of black and greywater would be continued. In addition, Integrated Faecal Sludge Management (IFSM) activities would be taken up and septage from septic tanks will be collected regularly through emptier trucks to ensure at least a three-year cleaning cycle. Considering the current situation in Sinnar, various management models can be considered to provide regular services for cleaning of septic tanks through involvement of private players, who can offer services by charging a nominal fee. The collected septage will be carried to treatment plants for final treatment. The treated septage will be converted to compost and can be sold for agricultural use. In next phase, as a mid-long term strategy, it is suggested to upgrade the existing conveyance system of rehabilitated covered drains to the settled sewer in old town area as well as the new town areas which will be connected to a wastewater treatment facility. Thus, this option provides each household in Sinnar access to personal toilets in the long term and includes a city-wide settled sewerage system which is connected to a treatment facility.

Integrated faecal sludge management

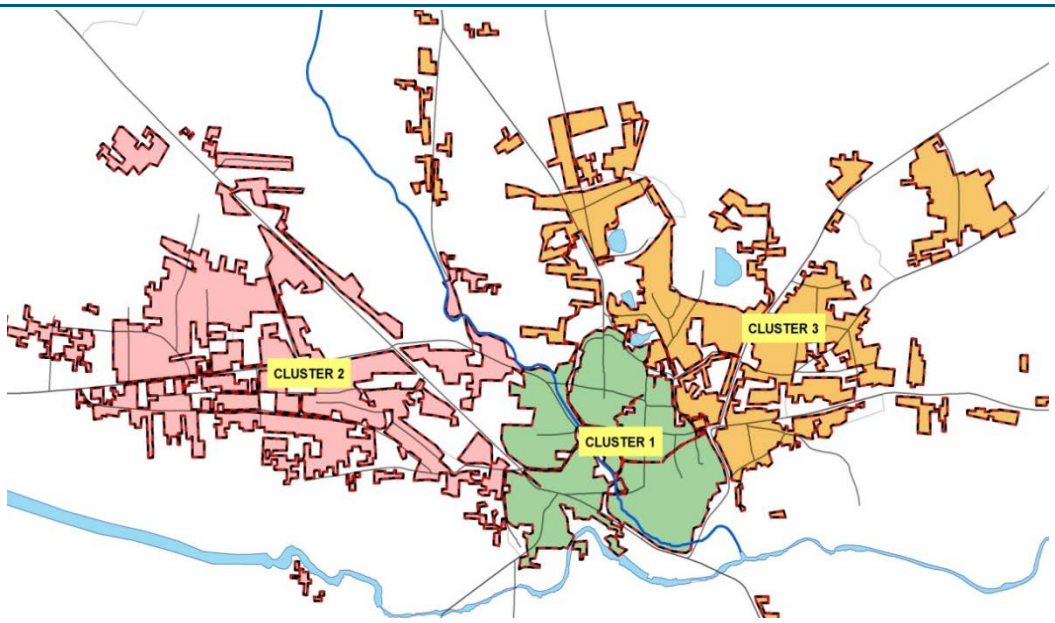
Having reviewed various possibilities of sanitation systems, the SMC can aim for a city-wide faecal sludge management or septage management system through the use of septic tanks for collection and treatment of blackwater at household or community levels. In this option, the septage from septic tanks will be collected regularly through emptier trucks to ensure at least a three-year cleaning cycle. The collected septage is carried to septage treatment plants for final treatment. The treated septage will be converted to compost and can be sold for agricultural use. The proposed service chain is shown in the figure below.

Figure 30: Phasing of regulated septic tank emptying service



This solution is flexible and builds on existing systems without differentiating between new developments and old city areas. Thus, the faecal sludge management plan for Sinnar will include activities related to asset creation in terms of building/retrofitting septic tanks, creating septage treatment facilities and procurement of vehicles to ensure regular cleaning. Additionally, it will also plan for soft support items such as formulating regulations for on-site sanitation, creating databases on on-site sanitation arrangements in the city through surveys and exploring possibilities for private sector involvement in septage management. Figure 31 provides the possible phasing of desludging services in Sinnar. This is based on a three-year cleaning cycle, to maintain which the city officials need to ensure that ~2800 septic tanks are emptied every year and the sludge is subjected to proper treatment.

Figure 31: Phasing de-sludging services



Currently, the city authorities in Sinnar clean only about 260 septic tanks on an annual basis. This varies depending upon the demand generated by the local people. The collected septage is transported to the solid waste dumping site and is dumped in the open without any primary treatment, with the rest of solid waste dumping. To ensure the discipline of regular desludging of septic tanks, awareness programmes backed by a regular and affordable service will be provided. This may require procuring additional suction vehicles by the SMC or exploring contracts with private service providers based on a management feeand levying appropriate taxes for sustaining this service.

Considering the current situation in Sinnar, various management models can be considered to provide regular services for cleaning of septic tanks through involvement of private players, who can offer services by charging a nominal fee. The SMC currently charges Rs 400–800 per septic tank cleaning trip. It is also possible to consider models to invite private parties to procure the cleaning equipment or construct a septage treatment plant on a public-private partnership basis. There is also

a possibility of earning additional revenues through conversion to compost or energy conversion, and by levying appropriate sanitation taxes for providing septic tank emptying services.

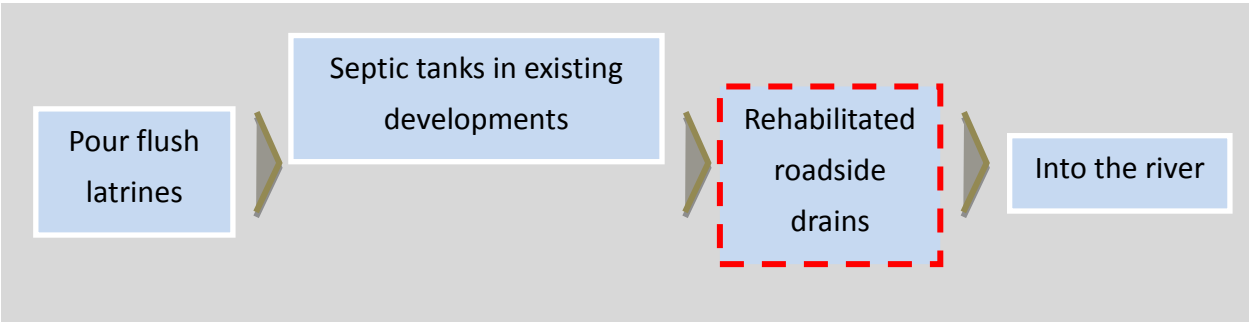
Such a comprehensive on-site sanitation and septage management practice ill facilitate a fully sanitised city through effective and low cost sanitation systems. It will also be more flexible and under the effective control of the SMC. However, it will require significant institutional support (for instance, comprehensive training programmes for SMC staff and sanitary inspectors) and social marketing efforts to sell the concept of septage management to the people. Some of these activities can be outsourced to local academic institutions and NGOs. To implement the city-wide IFSM proposal, citizen groups will need to be closely associated in design and implementation. Awareness related to periodic cleaning and maintenance of septic tanks will need to be created. Awareness activities will also include contractors to design and build the right kind of septic and soak pit systems. Training of SMC staff will be needed to ensure provision of regular cleaning services and ensure treatment of sludge and sale of compost. In terms of phasing, the initial months will require a detailed assessment and preparation of plans and detailed cost estimates. It will also include exploring the possibility of contracting private sector for septic tank emptier services. Support for such assessment can be provided by the CEPT University and the AIILSG under the PAS Project.

Conveyance system for effluent and greywater

At present, the town has no dedicated sewerage system to collect and convey domestic level wastewater. Open or closed drains along the streets serve as the only means of conveyance in old town areas. Almost 31 per cent of the households in municipal areas are catered by open drain channels. However, these drains are not built according to technical design considerations. Also, mixing of solid waste is a commonly observed problem which affects the efficiency of the drains. As an immediate intervention, it is suggested to make use of the existing practises and pattern of conveyance system. It is suggested to rehabilitate the existing open drains in which following aspects will be tackled:

- Redesigning the drain sections to cater for wastewater and additional surface stormwater loads.
- Covering of the existing drains so as to avoid mixing of solid waste.

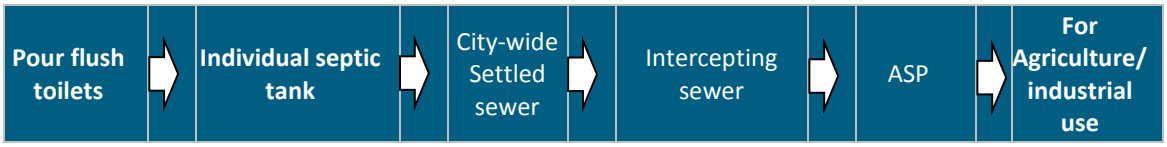
These closed drains (which latter will be replaced by a suitable sewer network) will be connected to the river.



For the newly developing areas, the existing system of soak pits would be continued, wherein the effluent from septic tanks and greywater would be disposed off into the ground through soak pits and the drains would be rehabilitated, wherever required.

In the next phase, it is suggested to separate the conveyance of stormwater and wastewater by laying a city-wide settled sewer network for wastewater. This network would eventually be connected to conventional treatment plant through an interceptor sewer.

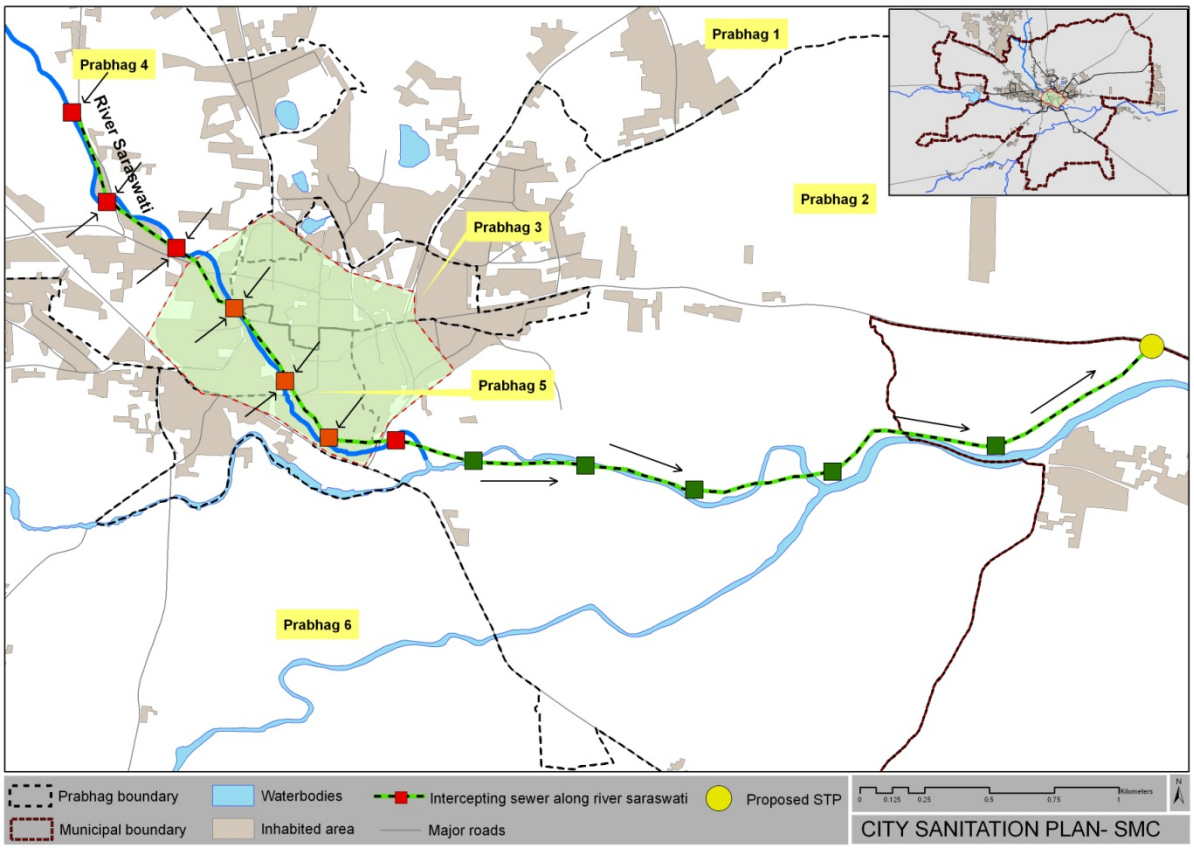
Figure 32: Suggested long term service chain for Sinnar



Intercepting sewer along the river Saraswati

Considering that the town in general slopes towards the river and that the treatment facility is proposed downstream, it is suggested that the city lays intercepting sewers along the river on both sides. The settled sewer network will be connected to this intercepting system(see Figure 32) and wastewater will conveyed to the treatment plant located outside the inhabited area, 6 km away from the old town area on the Sinnar–Shirdi road.

Figure 33: Schematic sketch of intercepting sewers along the river



Suggested improvements for treatment system

The activated sludge process (ASP)[14] is a technique to enrich the amount of bacteria in the basins by recycling them from the final clarifier to the basin. This technology needs quite a lot of energy for aeration and for the pump to recycle the sludge. The operation is much more intensive than for aerated ponds or aeration ponds. The sludge in the basin and the return sludge have to be carefully controlled. Septage collected from septic tanks can also be treated in ASP through Digester and Belt filter. The filtered sludge is used for agricultural purposes; water is again treated through the STP. Table 23 summarises the strategies suggested for conveyance and treatment of wastewater.

Table 23 : Suggested strategies and costing for wastewater management

Component	Intervention	Phasing	Cost (Rs crore)
Integrated faecal sludge management service	Provide access covers and refurbishment of septic tanks	2015 onwards	-
	Procure suction emptier trucks	2015–17	0.30
	Develop a treatment facility for faecal sludge	2015–17	0.95
Wastewater management	Rehabilitate and cover the existing open drains to a desired section as per terrain and gravity flow	2015–18	5.32
	Lay a city-wide settled sewer network to convey greywater and effluent from septic tanks	2020–23	30.91
	Lay an intercepting sewer along river Saraswati with a conventional activated sludge process (ASP) wastewater treatment facility	2022–23	11.00
Support policy actions	Continuing with existing system of soak pits in new town areas until settled sewer is laid	2015 onwards	
	Formulate/modify bye-laws/guidelines for effective on-site sanitation	2015–16	
	Empanel service providers and regulate tariffs for desludging/cleaning	2015 onwards	
	Levy user charges for wastewater services	2015 onwards	

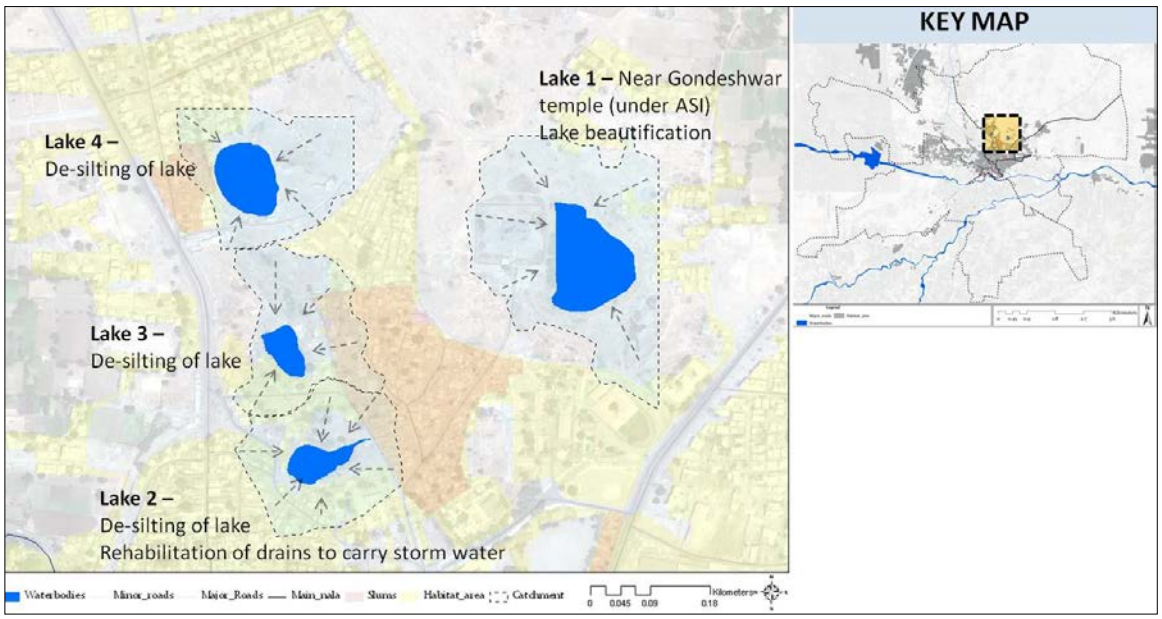
4.5 Strategies for Stormwater management

As mentioned earlier, desilting of nallas is an annual activity performed before the monsoons as they are filled with silt carried by stormwater and are dumped with solid waste. The city needs to focus on conserving natural water bodies and maintaining the natural drainage pattern. It is therefore suggested that the city undertakes desilting of nallas in first phase and channelise them later to avoid dumping of solid waste in them.

Apart from nallas, the three lakes in northern parts of the city also need to be conserved along with their catchment areas. The following improvements are thus suggested.

[14]ULB officials suggested ASP because, having considered the present growth rate of Sinnar, sewer loads will increase tremendously in the future. Therefore, it is advisable to initiate ASP, which has better efficiency than other alternatives. Such water can be used for industrial purposes.

Figure 34: Catchment area of lakes



Lake 1: Near Gondeshwar temple. One of the three lakes lies within the compound wall of the Gondeshwar temple. The temple precincts have been identified by the Archaeological Survey of India (ASI) as a heritage structure. Thus, it can be conserved under heritage conservation and development. However, it needs further assessment for the proposal of beautification of lakes.

Lake 2: Near Makadwadi and Vaiduwadi. The lake catchment area has been identified Figure 34 based on topographical analysis, and it has been noticed that the land occupied by Makadwadi and Vaiduwadi slums have slopes with the required gradient towards the lake. Thus, it is suggested to rehabilitate existing drains for stormwater conveyance to the lake after filtration, which will ensure recharging of the lake. In future, a lake beautification project can be initiated.

Lakes 3 and4: Desilting of lakes.[15] Desilting of lakes in the northern part is suggested, which includes removing silt and water hyacinth. As long-term projects, the lake could be used to collect rainwater and recharge groundwater. The surroundings can be beautified to convert the lake front into a public space. Technical and policy level (which focus on legal instruments) interventions will also be necessary. Punitive measures to deter dumping of solid waste and defecation along nallas as well as letting off waste water into nallas are suggested.

[15] For details of cost estimation, refer to Appendix 10.

Some glimpses of the existing situation of lakes in Sinnar

Figure 35: Lake conservation project and recharging (near Vaiduwadi, Makadwadi slums)

Table 24: Summary of suggested interventions for stormwater management

Interventions	Phasing	Expenditure (Rs)
Desilting and channelisation of natural drains/nallas	2015–17	Rs 0.57 crore
Lake 1 A detailed survey of the heritage precincts of the Gondeshwar temple will be required for any development as it is monitored by Archaeological Survey of India	2015–17	Policy
Lake 2 Near Vaiduwadi and Makadwadi: Rehabilitation of drains for stormwater conveyance and disposal to lake after filtration[16]	After 2024	Rs 0.14 crore
Lakes 3 and 4 Desilting of lake	2015–17	Rs 0.05 crore

[16]With the consideration that city-wide wastewater conveyance system is in place.

4.6 Summary of strategies

Based on alternatives considered for wastewater conveyance (in earlier sections), the strategies suggested for wastewater treatment have been summarised here.

In the short term existing drains in the old town area can be used to convey the effluent and greywater. In the newly developing areas, soak pits can be used for disposal of greywater and effluent from septic tanks. In future, settled (or small bore) sewers can be laid for conveyance of wastewater. Given the favourable terrain in Sinnar, a settled sewer can be designed efficiently, in a cost-effective manner. The settled sewer design can take wastewater directly to treatment facilities through an interceptor sewer. Decentralised facilities along the river were considered for treatment. However, due to high land costs and unavailability of land at appropriate locations, it is difficult to consider this option. Thus, the treatment facility would need to be located downstream of the river.

Thus, two main proposals are suggested for wastewater management: the first is to introduce an IFSM service to improve performance of on-site sanitation system; and the second is for conveyance and treatment of wastewater. For the latter, it is suggested that for the next 5 years the city could rely on a rehabilitated drain and soak pit system. At a later stage, a settled sewer system with appropriate wastewater treatment can be taken up.

Table 25: Summary of strategies for wastewater and stormwater management

Goal	Current status	Nature of actions needed	Costs (Rs crore)	Timeframe
Safe collection and conveyance of all the wastewater and septage generated in the city	Wastewater is conveyed through a network of open and closed drains	Rehabilitate and cover the existing open drains to a desired section as per terrain and gravity flow	5.32	2015–18
		Continue with existing system of soak pits in new town areas until settled sewer is laid		2015 onwards
		Lay a city-wide settled sewer network to convey greywater and effluent from septic tanks	30.91	2020–23
	2% septic tanks are cleaned annually against 33% required to maintain a three-year cleaning cycle	Develop an integrated faecal sludge management service that maintains a three-year cleaning cycle	0.30	
		Formulate/modify bye-laws/guidelines for effective on-site sanitation		2015–16
		Empanel service providers and regulate tariffs for desludging/cleaning		2015 onwards
Treatment of all the wastewater and septage	Untreated wastewater is let off into river Saraswati	Develop a conventional wastewater treatment plant	11.00	
	Untreated septage is disposed at dumping site	Develop a faecal sludge treatment facility	0.95	
Financial sustainability of sanitation service	No user charges/tax dedicated for sanitation	Levy user charges for wastewater services		2015 onwards
Safe conveyance of stormwater	Natural drains and water bodies are silted and observe dumping of solid waste	Desilting and channelisation of drains	0.57	
		Desilting of lakes	0.19	

5. Solid Waste Management

This chapter discusses existing solid waste management practises in the town and highlights existing demand gaps in infrastructure and management issues. It suggests improvement strategies.

Solid waste management includes a chain of activities – from generation of waste through various areas to collection/segregation, treatment and finally disposal at dumping ground. The diagram and photographs illustrate the service chain for solid waste management in Sinnar.

Figure 36: Service chain for solid waste management

Secondary data and field surveys point out that the overall system for solid waste management in the city is inadequate. At present, the ULB is able to perform only the collection and transportation of solid waste up to the dumping site with its available resources. Due to absence of non-functional treatment facilities, treatment and scientific disposal of solid waste is not possible. The following sections elaborate on the details of the solid waste management process in Sinnar.

5.1 Generation of Solid Waste

In Sinnar, solid waste is generated from residential areas, commercial/market areas as well as institutional buildings/campuses, and also collected through nalla cleaning and road sweeping. In 2011–12 the city generated waste of 900MT/month (about 30 MT/day) and the total waste collected amounted to 882MT/month (about 27 MT/day). The total waste collected by available vehicles and resources is about 10MT/day (about 80 per cent of total 12.5 MT/day generation of solid waste[17]). The details of source-wise generation of waste were not available with the ULB. Being an Industrial

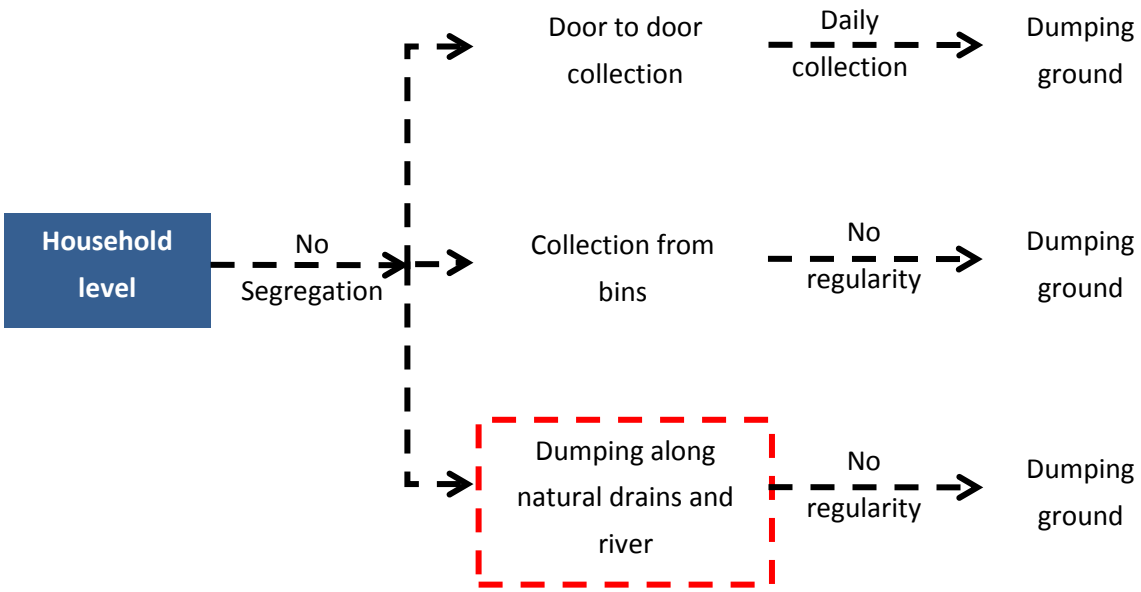
[17]As discussed with ULB officials, SMC. The contract includes labour for collection of solid waste in the whole city.

town, Sinnar has a large number of people who don't stay in Sinnar but commute to work in the town. This floating population also adds to the solid waste generated in the town.

5.2 Existing System for Collection and Treatment of Solid Waste

In Sinnar, solid waste is collected through three methods: door-to-door collection through ghantagadis; collection of waste from community bins; and collection of waste through street sweeping and cleaning of roadside drains/nallas. Figure 37 shows the service chain for solid waste management in Sinnar.

Figure 37: Existing waste collection system in Sinnar



Source: SMC

Door-to-door Collection of Waste

About 80 per cent[18] of the waste is collected through door-to-door collection system in Sinnar. There is no formal practise of segregation of waste at the user end. Door-to-door collection is done by different vehicles, such as ghantagadis, auto-tippers, tractors, etc. The city is divided into four divisions for this purpose. There are certain peripheral areas which are not covered under the process of daily collection. Division-wise details, of number of vehicles used for door-to-door collection, are given in Table 26.

Table 26: Division-wise availability of vehicles for SWM in Sinnar

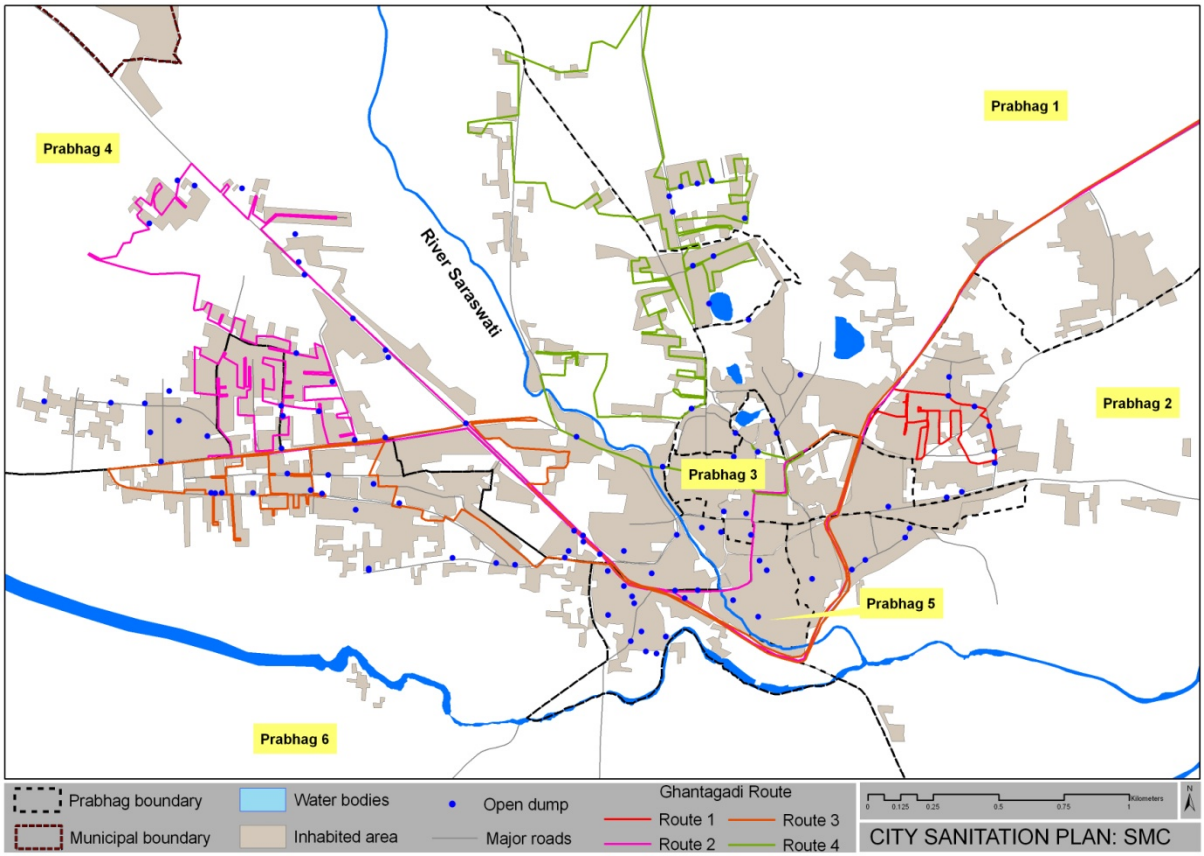
Division	Number of residences	Number of shops and hospitals	Vehicles	
			ULB	Private operator

[18]There is no survey data available for door-to-door waste collection. The ULB uses three ghantagadis and one auto-tipper for door-to-door collection, and the vehicles are weighed regularly. Calculations suggest that the solid waste collected from door-to-door collection is about 8 MT/day.

Division	Number of	Number of shops	Vehicles		
Division 1	2,879	--	1 Auto tipper	1 tractor on rotation used for collection of waste from bins and market areas	1 tractor As and when required
Division 2	1,948	131	1 Ghantagadi,		
Division 3	2,392	--	1 Ghantagadi		
Division 4	2,585	1,232	1 Ghantagadi		
Total	**9,804**	**1,363**			

In door-to-door collection, waste is collected from domestic and institutional/commercial areas and is managed by the ULB. The authority has also defined proper routes for particular divisions. Figure 38 shows the routes of ghantagadis.

Figure 38: Ghantagadi routes for D2D collection and location of solid waste dump site



Source: SMC and Primary Survey

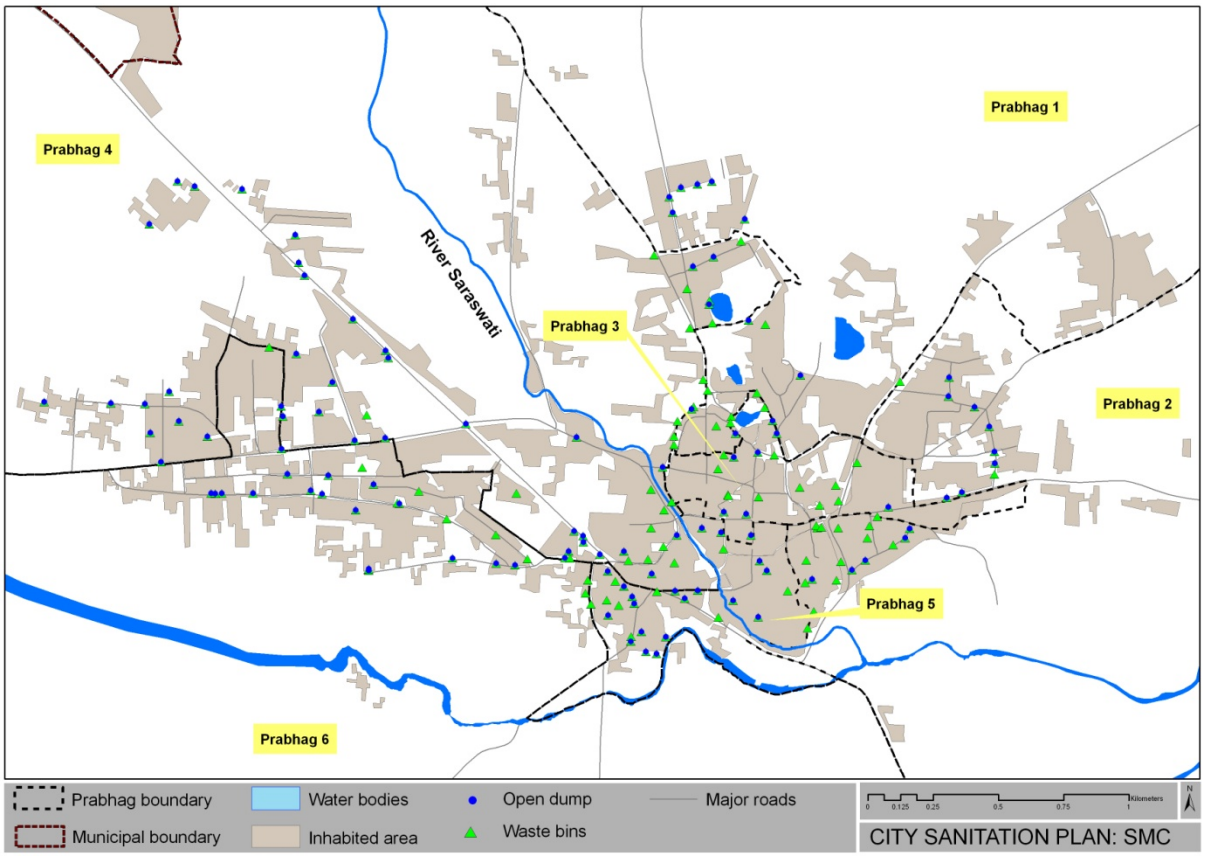
Door-to-door collection of waste at the residential level is done by a private contractor and engages 45 sanitation workers.[19] The ghantagadis used for door-to-door collection are owned by the ULB and the human resources are provided by the private operator. The collected waste is directly transported to the dumping site located about 4 km in the north-west of the city.

[19]This is a contract for the entire city (in rotation).

Waste collection from Community Bins and Cleaning of Nallas

The rest of the city is covered via 181 community bins (of capacity 0.3 MT). Field visits revealed that, due to limited resources, the bins are not cleaned regularly and thus give rise to foul smell and unhygienic environment in their surroundings. A tractor is used for collection of waste from bins.

Figure 39: Location of community waste bins and open dumps



Source: SMC; field observations.

The condition of some community waste bins.

About 30 community bins are made of concrete and fixed to the ground. As the workers find it difficult to clean and collect waste from these bins, it has been observed that they often burn the waste in such bins. During pre-monsoon and festival periods, the ULB hires JCB machines and labour

on a contractual basis to clean and collect solid waste from the major nallas three or four times/year.

Collection of Waste through Street Sweeping and Cleaning of Road Roadside Drains

The ULB uses tractors for collecting waste through street sweeping – this is a daily activity conducted by about 35 ULB workers engaged for this task.

Clogging of drains due to solid waste dumping alongside or inside nallas.

The staff and their availability, engaged for various activities under solid waste management process in the ULB, are discussed here.

Table 27: Staff availability for solid waste management activities in Sinnar

Component	ULB staff	Private contractor
Collection	--	Door-to-door collection in residential areas 45 private sanitation workers
Transportation		
Road sweeping	25 sanitation workers	--
Nalla cleaning	10 sanitation workers	Pre-monsoon and festivals, for three or four times/year
Toilet cleaning	5 sanitation workers	--

Table 28: Contract conditions for other cleaning works in the ULB

	Labour contract for cleaning works in the ULB
Conditions of contract and ULB responsibilities	• Yearly contract issued • Labour charge fixed at Rs 245 inclusive of taxes (per labourer) • Payment terms: Billing per month • Tasks: Collection of waste in municipal council boundaries, cleaning of nallas, waste material, debris, dead animals and transportation to compost depot, removal of weeds, digging of kutchha gutters • Timings:7–11 am and 2–6 pm

	Labour contract for cleaning works in the ULB
Contractor responsibilities	• Provision of cleaning equipment (brooms, etc) • Appointment of mukadams at own expense to supervise the labourers. • Relevant taxes to be borne by contractor • Maintain record of daily labour provided and works performed
Contract for provision of tractor trolley with drivers	
Conditions of contract and ULB responsibilities	• Yearly contract issued • Rs 700 per trip • Payment terms: Billing per month • Tasks: Collection of waste, waste from nallas, rivers, waste material, debris, dead animals in council boundary to be transported to compost depot • Timings: 7–11 am and 2–6 pm
Contractor responsibilities	• Provision of cleaning equipment (brooms, etc) • Maintenance and security of vehicles • Relevant taxes to be borne by contractor

Garbage Transportation System

The ULB owns a tractor-trailer, a three-wheeler auto-tipper and three ghantagadis for door-to-door collection of solid waste. The collected waste is directly transported to the dumping site. The city is divided in to four zones for door-to-door collection in residential areas. The tractor-trailer is used for collection of waste in non-residential areas, nalla cleaning and street sweeping, as well as for cleaning open dumps and community bins. The ULB also hires a tractor-trailer on a contractual basis as required. Currently, there is no transfer station in the city and the collected waste is transported directly to the dumping site (situated 4 km from the city).

Table 29: Details of solid waste collection equipment

Sr No	Vehicle type	No	Capacity	Trips/day	Operated by	Total waste collected
1	Tractor-trailer	1	2 MT	1	ULB	2
2	Tractor-trailer	1	2 MT	As required(1)	Contractor	–[20]
3	Ghantagadi for door-to-door collection	3	2 MT	1	ULB	6
4	Three-wheeler auto-tipper	1	1 MT	2	ULB	2
Total waste collected						**10 MT/day**

Note: Each vehicle was weighed to assess the daily collection of waste.

Table 30: Solid waste management in Sinnar

Area	Collection	Transportation	No	Treatment and disposal
Residential area	Door-to-door (D2D) – coverage 60%	Tempo (ghantagadi)	3	Dumping ground located
		Three-wheeler auto-	1	

[20]Solid waste collection by the hired tractor-trailer is not considered in the total collection of solid waste since it is used on a contractual basis as and when required.

Area	Collection	Transportation	No	Treatment and disposal
		tipper		4 km away from the city
Residential (uncovered by D2D) and non-residential area	Waste bins from residential and non-residential area	Tractor-trailer	1+1 (if required)	
	Open dumps			
	Along roadside drains			

The different vehicles used for SWM in Sinnar.




5.3 Garbage Treatment and Disposal System

Currently, the city has a solid waste treatment plant which was constructed with the funds that were available from the 12th Finance Commission. However, due to contractual issues and lack of human resources the plant has stopped functioning. At present, the ULB dumps municipal solid waste at the dumping site without any segregation and treatment process. There is no scientific waste disposal facility/technology for disposing the municipal waste in a scientific manner. As mentioned, the present dumping site is situated about 4 km from the city in the north-west.

5.4 Suggested Strategies for Solid Waste Management

Collection and Transport

Only 80 per cent area in Sinnar is covered under door-to-door collection of waste, and the new developments are not covered under daily collection due to limited resources. In non-residential areas, collection of waste is through community bins. Field observations revealed that these bins are emptied irregularly, thereby making the surroundings unclean and spreading odour. Further, the waste bins were found to be inadequate in public areas. Some of the bins are made of concrete, making them difficult to empty and clean – staff often just burn the waste in them. The unavailability of litterbins for street sweeping often results in discarding of waste in open drains. Inadequate infrastructure for cleaning of roadside drains and natural nallas causes lack of regular cleaning, compromising the efficiency of drains to convey wastewater.

To mitigate these issues, it is suggested to cover 100 per cent of the city, including all slums and newly developed areas. It was observed that the routes of the collection vehicles could be rationalised to cover additional areas. The existing contract for collection needs to be amended to cover these areas. Additionally, the ULB will need to procure three additional ghantagadis to cover the remaining areas through the D2D collection system. Some suggestions are also presented for the vehicles that will be required in the future and some indicative costs.

Table 31: Required vehicles and indicative costs for residential and non-residential areas

Year	Year-wise population and solid waste generation in respective years									
	Population	MSW in MT/ Day	Estimated requirement of Vehicles							
			Residential *				Non-Residential**			
			Total reqd	Existing vehicles (nos)	Gap	Estimated cost (Rs lakh)	Total reqd	Existing vehicles (nos)	Gap	Estimated cost (Rs lakh)
2013	67,692	16.90	7	4	3	25[21]	1	1	0	0
2015	69,321	17.33	7	7	0	0	1	1	0	0
2028	92,130	23	9	7	2	12	2	1	1	6
2043	126,914	31	11	9	2	12	4	2	2	12

Three-wheeler auto-tripper: 1 MT capacity (Rs 6 lakh).
*Ghantagadi: 2 MT capacity (Rs 8 lakh); used for D2D collection.
**Tractor-trailer: 2 MT capacity (Rs 8 lakh); used for nalla cleaning

Considering two trips/day for auto-tipper and one for ghantagadi of 2 MT.
The ratio of vehicle requirements for residential and non-residential areas is considered as 80–20, based on assessment of current situation.

Additionally, to begin segregating waste at source, it is suggested that the ULB involves rag pickers in the process. They individually collect recyclable waste from community bins. The ULB could bring them together and facilitate the formation of a formal group involved in segregation before disposal of waste. Parallel efforts will be required to educate households to segregate waste at source.

[21]The cost assumed for a ghantagadi of 2 MT is Rs 8 lakh. However, the ULB has already purchased three vehicles at a total cost of Rs 25 lakh. Hence, it is taken as Rs 25 lakh instead of Rs 24 lakh. In future, the cost of vehicles may vary.

Treatment and Disposal

A treatment plant at the dump site is currently defunct. No waste is, therefore, treated; it is crudely dumped. It is suggested that the plant be operationalised at the earliest. However, a detailed assessment will be required to ascertain financial and technical requirements to operationalise the plant. Further, the regional plan of Nashik Metropolitan area, which is under preparation, has proposed a regional dumping site for the region. This site will cater to the needs of Sinnar.

Table 32 summarises the suggested interventions with their costs.

Table 32: Strategies for solid waste management

Goal	Intervention	Cost (Rs crore)	Timeframe
Universal solid waste collection service	Initiate pilot for rationalisation of ghantagadi routes to increase efficiency	Policy	2015
	Increase D2D coverage from 80% to 100% through modification in contract	0.24[22]	2015 onwards
	Procure vehicles for collection	0.25	2015–17
	Initiate a pilot project for collection of waste from commercial areas	0.05[23]	2015
	Replace 30 concrete bins with containers of 1 MT capacity for easy emptying	0.28[24]	2015–17
Segregation of waste	Involve informal groups like rag pickers in collection of recyclable waste	policy	2015 onwards
	IEC campaign for segregation of waste at source		2015 onwards
Treatment and safe disposal	Operationalise the defunct treatment facility	Will need a detailed assessment	2016–17
	The regional plan of Nashik Metropolitan area is under preparation in which a regional landfill site which will also cater to Sinnar is proposed		
Financial sustainability of the service	Levy user charges/tax for SWM; gradually increase so as to achieve 100% cost recovery	Policy	2015 onwards

Due to staff unavailability with ULB, private staff is mobilised on 'need to' basis to carry out solid waste related works. Currently, the key posts of Sanitary Inspector and Mukadam, both of whom are responsible for monitoring, are vacant. In their absence the contractor shoulders the responsibility of monitoring waste collection. Given the dearth of human resources, it is suggested that the ULB continues to engage the private sector in the provision of SWM related services.

[22] Contract cost of Rs 2 lakh per month for entire city.

[23] Inclusive of additional human resources and equipment required for the pilot project.

[24] Block cost of one bin of 4.5 cubic metres' capacity is Rs 45,000 and construction of a RCC platform is Rs 50,000.
The total cost is thus 95,000 per bin.

6. Capacity Assessment

This chapter assesses the financial and technical capacity of the SMC. A discussion on financial health through an analysis of its budgets is followed by an analysis of available human resources against those required and measures taken by the SMC to meet the gap.

6.1 Municipal Finance

Section 101 of the MMCNPIT Act mandates all municipal councils in the state to make provision for expenditure through their budget and maintain accounts of their receipts and expenses. The SMC follows a cash-based accounting system. It maintains a consolidated budget that includes all its functions. The Budget is presented in three parts: revenue, capital and extra-ordinary accounts. No separate budget is maintained for services for water supply, sanitation and solid waste management. Thus, though budget documents were available for last five years, it was necessary to recast these budgets to properly capture service details. This also helped to better align the revenue and capital accounts. The recasting was done as per the accounting guidelines provided in National Municipal Accounting Manual (NMAM).

Table 33 presents a summary of the municipal finances of the SMC based on the recast budgets for six years. Over 2006 to 2011, the overall budget size has ranged from about Rs 1 crore to 5 crore. Table 34 shows details of sources of revenue income. The SMC is mainly dependent on grants from the GoM with an average contribution of 49 per cent of its revenue receipts over the past six years. The major grants received by the SMC include: dearness allowance grants, Nagar Parishad assistance, mudranshulka (stamp duty), entertainment tax grants and the Central Finance Commission grants. Most of these grants are transferred by the GoM on a regular basis and are predictable sources of income for the SMC. Amongst its own sources, property tax and other local taxes are the major sources of revenue which contribute 25 per cent and 8 per cent, respectively, to total income. The major non-tax source (21 per cent) comprises rents from municipal properties.

Table 33: Summary of municipal finance of Sinnar (recast budgets)

Items	2006 Actual	2007 Actual	2008 Actual	2009 Actual	2010 Actual	2011 Actual
Opening Balance	177.1	236.8	326.7	237.9	360.8	268.5
Revenue Account						
Revenue Receipts	412.0	451.1	428.7	461.6	465.0	843.8
Revenue Expenditure	342.3	408.2	374.8	399.9	596.6	683.5
Operating Ratio	0.8	0.9	0.9	0.9	1.3	0.8
Capital Account						
Capital Receipts	110.5	164.7	219.4	62.3	182.6	275.4
Capital Expenditure	251.4	193.3	198.9	194.6	238.3	269.3
Capital Utilisation Ratio	2.3	1.2	0.9	3.1	1.3	1.0
Extraordinary Account						
Extraordinary Receipts	101.5	71.3	74.9	50.1	68.1	137.7
Extraordinary Expenditure	91.3	73.1	62.2	37.1	49.8	97.3
Summary						
Total Receipts	624.0	687.1	723.0	573.9	715.7	1,256.9

Total Expenditure	685.1	674.5	635.9	631.5	884.7	1,050.1
Closing Balance	116.1	249.3	413.8	180.3	191.9	475.3

Note: Amounts in Rs lakh.
Source: Budget books of the SMC. See Appendix 1 for further details.

Table 34: Sources of revenue income

Source of revenue	2006	2007	2008	2009	2010	2011
Property tax	43.0	56.7	50.2	53.8	46.1	133.1
Other taxes	47.6	48.6	48.3	45.3	44.9	55.1
Other own sources	121.0	138.1	132.9	151.4	156.4	161.0
Grants	200.4	207.8	197.4	211.1	217.6	494.6
Total	412.0	451.1	428.7	461.6	465.0	843.8

Note: Amounts in Rs lakh.
Source: Budget books of the SMC. See Appendix 1 for further details.

Property tax is applicable on all properties in the city. It is calculated using the ratable value method in Sinnar that takes into consideration function, carpet area, type and age of the structure. An assessment of properties is carried out every four years and was last done in FY 2010–11. It found 14,667 properties liable for property tax within SMC limits. In between the two assessments, annually a supplementary list of new properties is prepared. In FY 2013–14, the SMC raised a demand of 352.79 lakh from these properties, averaging Rs 2,405 per property, of which it collected Rs 102.7lakh achieving a collection efficiency of only 29 per cent. It could also collect only 29 per cent of the Rs 443.9lakh due in arrears.

Water tax is collected from all the individual water supply connections on a flat rate basis. The rates are Rs 960 per connection per annum for domestic and Rs 3,900 for non-domestic connections. In 2013–14, the SMC raised a demand of Rs 70.7 lakh from 9,423 connections. It collected almost all of the new demand raised, and only Rs 69.8 lakh of the Rs 158.7 lakh due in arrears. The SMC thus needs to improve on collection of arrears.

The total revenue expenditure of the SMC increased by nearly 75 per cent between FY 2006–07 and FY 2011–12. In 2011–12, nearly 37 per cent of the SMC's revenue expenditure was on administration and establishments. In 2010–11 its expenditure on establishment increased by nearly 85 per cent because of adoption of the 6th Pay Commission recommendations. For 2013–14 the SMC has budgeted Rs 310 lakh for this. As a consequence its expenditure on General administration department increased from roughly 25 per cent to more than 30 per cent. The SMC spends more than 40 per cent of all its revenue expenses on services related to water supply, sanitation and SWM. Its combined per capita expenditure in these three services was Rs 461 in FY 2011–12 compared to Rs 1,447 suggested by a recent GoI Committee[25] that laid out norms for municipal expenditure of basic services.

Table 35: Main categories of revenue expenditure

Main head of expenditure	2006	2007	2008	2009	2010	2011
General administration department	99.5	102.8	95.0	97.8	204.2	221.2
Water supply, sanitation and SWM	131.0	159.8	189.0	166.9	246.5	290.3

[25]The High Powered Expert Committee (HPEC) was constituted by the MoUD with Dr Isher Ahluwalia as Chair in May 2008. The Report of the Committee was published in March 2011.

Other departments	161.7	145.6	90.8	135.2	145.9	172.0
Total	392.3	408.2	374.8	399.9	596.6	683.5

Note: Amounts in Rs lakh.

Source: Based on budget books of the SMC. See Appendix 1 for further details.

The capital account shows considerable volatility, largely due to the fact that the SMC mainly depends on grants from the GoI and GoM. These grants are subject to the acceptance of proposals submitted for various schemes. The major capital grants availed by the SMC are for slum development and for construction of its office. In recent years, some of the central and state schemes require at least a 10 per cent contribution by the ULB. It is thus essential for the SMC to maintain adequate surplus to avail the benefits of these schemes.

Table 36: Grants received by SMC for Capital works

Sector	2006	2007	2008	2009	2010	2011	2012*	2013**
Slum Improvement & Housing (Dalitwasti sudhar yojana Anudaan, Alpasankyank bahut kshetra)	33.1	42.0	48.0	4.1	11.2	50.0	182.1	30.0
Implementation of DP (Development fund, UD 6 anudaan, Vadhiv Haddha Vikas Yojana Vishesh Anudaan)	0.0	0.0	47.0	3.0	8.9	53.3	71.1	660.0
Roads (Road fund grant)	34.2	7.3	31.0	0.0	100.3	42.1	49.3	75.0
Water Supply, Sanitation and SWM (12th FC -SWM, Watermeter special grant, Dalitwasti pani purawatha yojana anudaan, Nagari dalitwasti (Nav Baudha) Individual water connection & latrine construction, Sujal nirmal scheme Saradwadi water Supply project, UIDSSMT Kadwa Water Supply, Sujal Nirmal scheme water and electricity audit)	22.7	32.7	18.9	55.2	1.6	19.9	831.7	3080.1
Unspecified (Viashistyapurna anudaan, District level Suvarna jayanti Nagarotthan Abhiyaan)	0.0	55.0	70.0	0.0	60.7	67.4	278.5	400.0
Others	3.0	5.5	0.0	0.0	0.0	42.6	303.9	311.1
	93.0	142.5	215.0	62.3	182.6	275.4	1716.5	4556.2

Note:

* Revised estimates for 2012–13.

** Budgeted estimates for 2013–14.

Sources: Based on SMC budget books. See Appendix 1 for further details.

The analysis for 2006 to 2011 suggests that the SMC had a revenue account surplus ranging from Rs 20 lakh to 160 lakh. A part of this surplus was also utilised for capital expenditure, as is evident from capital utilisation ratio of more than 1 over this period.

To calculate the SMC's internal investment capacity, estimates of revenue surplus are derived on the basis of revenue income and expenditure forecasts. These are based on past trends with the latest data on 'actuals' for FY 2011–12used as base. For taxes, the tax base (number of properties for property tax, number of connections for water tax) is projected and multiplied by respective growth rate of average tax per property). For revenue expenditure in water supply, sanitation and solid waste management, past trends of key budget items were assessed and projected. For example: for water supply, revenue expenditures were projected separately for administrative expenses, bulk water, O&M expenses, energy bills and contingencies. For other revenue sources, as well as revenue expenditure of other departments, projections are based on the growth trends over the past five years. For revenue expenditure, projections are based on past trends for each department.

Based on these forecasts, over the 10-year period till 2025, the SMC will be able to invest about Rs 1,000 lakh based on its internal surplus. If appropriate measures are taken to improve collection efficiency of local taxes to 90 per cent, it will be possible to increase the investment potential by over Rs 1,100 lakh. The SMC can also explore further expenditure control measures to generate additional investible surplus.

Table 37: Revenue surplus of SMC over 10 years in various scenarios

	Estimated revenue surplus over 10 years
Trend-based projections (Business as Usual – BAU)	1,075
Financial improvement actions	
Improving collection efficiency of property tax (current tax to 90% and arrears – 75%)	1,161

Note: Amounts in Rs lakh.
Source: Based on trend-based projections of SMC revenue income and expenditure.

6.2 Institutional Arrangements

Sinnar Nagar Parishad is governed by the Maharashtra Municipal Council, Nagar Panchayat and Industrial Township (MMCNPIT) Act, 1965. Section4 of the Act categorises the municipal councils based on its population. Accordingly, Sinnar is a Class 'C' municipality.

Existing Arrangements in Sinnar

Sinnar has23 wards divided into six Prabhags for administrative purposes. Three nagarsevaks are elected to the Council from each ward. The Council is led by the President (Nagaradhyaksha) elected by the nagarsevaks from amongst themselves. The Council, through the President, the advisory committees for different departments and consultative committees appointed by the General Body, is responsible for the administration of the town. The executive wing for this elected body is led by a Chief Officer (CO), an officer belonging to the State Services (Executive Cadre). The CO is supported by officers heading various departments. The key departments include Public Health, Revenue and Accounts, Administration and Water Supply. The sanctioned staff strength of the SMC is 149, of which 134 are currently filled. Figure 40 presents the organisational structure of the executive wing, including details of sanctioned and vacant posts: key positions such as that of the Sanitary Inspector and Mukadams in the sanitation department, or Junior Supervisor in the water supply department, are currently vacant.

Table 38: Administrative departments and responsibilities in Sinnar Municipality

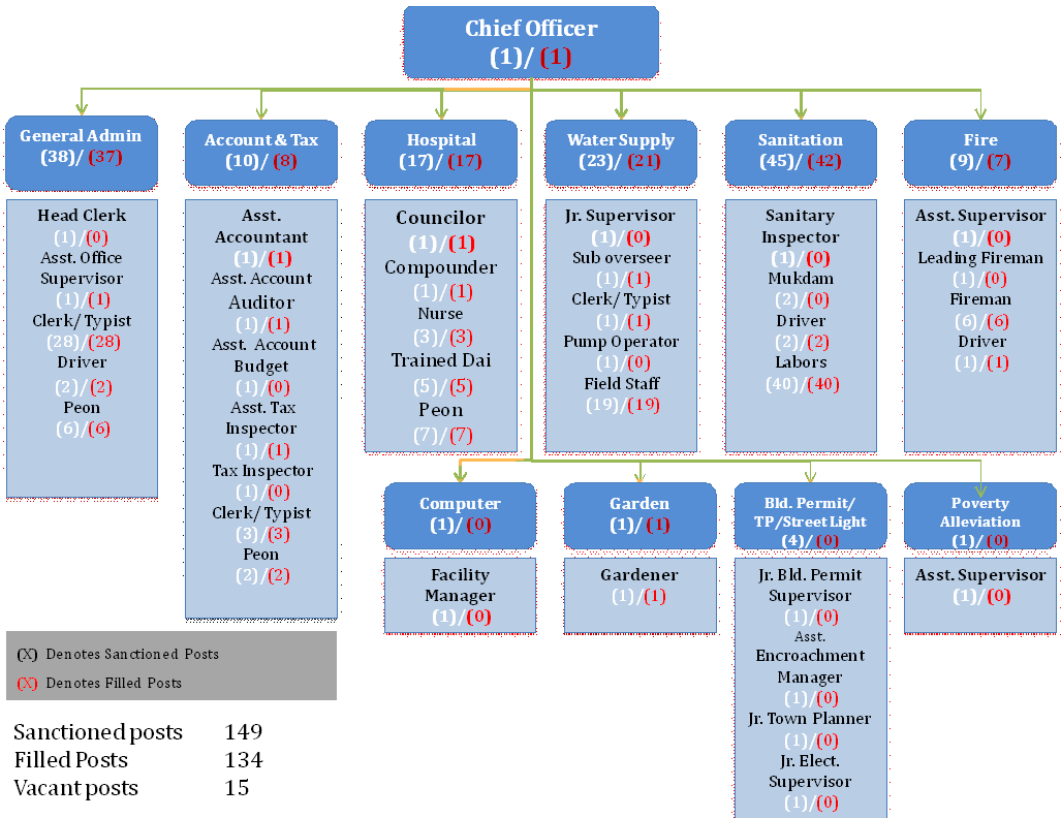
ULB department	Roles and responsibilities
General Administration	Record maintenance Public relations Grievance redressal

Revenue and Tax Department	Levying of taxes, tax collection Assessment of fees and charges Accounting
Water Works Department	Water supply to the town Repairs and maintenance New connections Construction and civil works related to water works
Public Health Department	Maintaining cleanliness and hygiene through: • Garbage collection and disposal • Street sweeping • Nalla cleaning and disinfecting • Maintaining gardens • Cleaning of community and public toilets and septic tanks

Source: SMC.

The qualifications for each post are decided upon by the Directorate of Municipal Administration (DMA), which guides and directs the ULBs on administration aspects. The DMA sanctions establishment posts of all the Municipal Councils; revision is done every five years. Cadre-related posts are filled by the DMA directly and the rest of the posts are filled by the ULB. Discussion with the ULB officials revealed that the qualification requirements were changed in 2006. Hence, the staff appointed prior to year 2006 may not meet the current prerequisites for the job. Staff members perform their responsibilities primarily through on-the-job learning. The required qualification for staff in Sinnar Municipality is given in Appendix 1.

Figure 39: Organisational structure: Executive wing of Sinnar municipality



Outsourced Activities

To meet the gaps in service delivery, private parties are roped in on a contract basis.

- **Contract to provide labour for cleaning works:** A yearly contract is issued for this activity: labour charge is fixed at Rs 245 inclusive of taxes (per labourer). The billing is done monthly and tasks include collection of waste in Municipal Council boundaries, cleaning of nallas, waste material, debris, dead animals and transportation to compost depot, removal of weeds, digging of kutchha gutters, etc. The timings are between 7–11 am and 2–6 pm. The ULB can reduce the number of workers hired any time if required; there is a provision for fining and/or replacing the contractor if work is not found satisfactory. The contractor is responsible for provision of cleaning equipment (brooms, etc) and appointment of mukadams at his own expense to supervise the work. The contract also requires maintaining records of daily labour provided and works performed.
- **Contract for provision of tractor trolley with drivers:** A yearly contract is issued to supply vehicles to the ULB at a rate of Rs 700 per trip. The contractor is entrusted with collection of waste, waste from nallas, rivers, waste material, debris, dead animals in Council boundary to be transported to compost depot. The ULB can reduce the number of vehicles hired, if own provision is made; and there is a provision for fining and/or replacing the contractor if work not satisfactory in the contract. The contractor provides the vehicles, and is also responsible for maintenance and security of vehicles.

7. Implementation Strategy

This chapter summarises improvement actions and phasing across the sub-sectors for toilets, wastewater and solid waste management. Within the backdrop of existing municipal finances, it summarises investments (capital and O&M) for sanitation improvement options and arrives at a sustainable financial plan with estimates of internal surplus, external resource mobilisation and tariff revisions required.

7.1 Phasing and Financing Strategy

The financing plan for a 10-year (2015–2024) sanitation improvement strategy in Sinnar is based on an analysis of its municipal finances as well as an assessment of the possibility of accessing funding from other sources. It is developed for both new capital investments and O&M expenditure needed to sustain new services. Ongoing SMC projects are taken into account.

Based on the assessment and actions needed to achieve improvement in sanitation across sub-sectors and service chain, seven specific projects are identified that will be implemented in the next 10 years. These projects will be supported by ongoing activities for awareness generation among leaders and residents of Sinnar as well as capacity building of the local council.

Table 40: Projects for urban sanitation – Implementation strategy for Sinnar CSP

Sr no	Project	Base cost (INR crore) 2012 prices
	Access to toilets	
1	Household toilets with partial subsidy as incentive	14.60
2	Community toilets: New blocks and refurbishment of existing ones	0.32
3	Public toilets: New blocks and refurbishment of existing ones	0.11
	Wastewater and stormwater management	
4	Wastewater conveyance (settled sewer network) and treatment	47.23
5	Desilting and rehabilitation of natural water bodies (phase 1)	0.63
	Integrated faecal sludge management	
6	Provide regular IFSM service with sludge treatment	1.25
	Integrated solid waste management	
7	Tipper trucks, replacement of concrete bins, extension of waste collection contract	0.53
	Awareness generation	
8	Awareness generation and IEC campaigns	0.30

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The Financing Plan was developed in an iterative manner to incorporate three key aspects:

- **Identifying potential sources of funds for capital investment**: Based on an assessment of opportunities for capital finance, the first step was to identify a number of possible sources of funds for capital expenditure of all major projects identified

- **Priorities, phasing and project development**: Develop appropriate phasing of projects over the 10-year CSP period based on local priorities, the SMC's implementation capacity, as well as expectations of availability of grant resources and local financial capacity. This phasing can be modified iteratively based on expectations of capital financing. Appropriate steps will

be needed to develop more detailed project proposals for each of the projects in relation to technical design as well as financing. Steps related to implementation will need to be identified based on appropriate plans to engage private sector contractors for service delivery. Phasing and implementation details will also help to identify total project costs, incorporating both price increases and management costs.

- **Municipal finance assessment**: The financing strategy will require SMC contribution, which will need to be made from its internal surplus. This depends on availability of such surplus either on the WSS account or from general ULB resources. The extent of transfer from such surplus depends on the priority the ULB places on capital expenditure for water and sanitation. As reviewed earlier in municipal finance assessment, the SMC does generate internal surplus and this can be enhanced by improving collection efficiency of taxes and charges. The SMC can also explore mobilising debt from local banks or financial institutions. However, it is likely that to meet the full costs of all projects over a 10-year period may require some tariff revisions either in property taxes or for water and sanitation. The local viability of such tariff increases will need to be assessed for a financially feasible plan.

Exploring Sources of Funds for Capital Investment

Traditionally, most city sanitation plans are developed to avail grants from state or national governments. However, the approach in this plan was to assess potential sources of funds for all projects in Table 39 using both conventional sources, such as grants from state/national governments, as well as assessing new sources. Five main sources are identified:

Household and community contributions: First, is the use of a demand-led partial incentive subsidy scheme for on-premise or group toilets where each eligible household will get a fixed subsidy. While this is about 20 per cent of the cost of a toilet, with more households sharing a group toilet the share of subsidy will increase. However, households will meet between 20 per cent and 80 per cent of the cost of a toilet. In case of refurbishment of existing septic tanks, households will meet the full costs.

Private sector contribution through a PPP model: A second strategy is to develop a business model around activities where it is possible to involve the private sector through a PPP contract. This is possible when revenues from a service are adequate to cover the returns on capital investment. In Sinnar, two areas are identified for a PPP arrangement: the emptying service component of an IFSM service, and provision of new blocks of public toilets which generate adequate revenue from fees. For IFSM, the ULB will have to meet the costs of a septage treatment facility as no private contractor is likely to take this up on a PPP basis. A PPP strategy will need to be backed by appropriate risk management, including escrow accounts for payment by ULBs. ULBs will also need to develop capacity and set up good monitoring systems.

Grants from state and national governments: The third strategy is to explore use of grants for some activities where it is not possible to meet the full costs through local contributions or to develop a business model for a PPP approach. This will also require that there are some programmes or schemes which would provide grants. While ULB will meet some share of these costs, grants from either state or national government will need to be explored for this. A new source of grant funding that the cities can start to explore is grants or contributions from the corporate sectors and local benefactors who want to contribute to the development of their cities. Corporate Social Responsibility (CSR) funds are likely to be available due to the new provision in the Companies Act that mandates large companies to spend 2 per cent of their profits towards CSR.[26] As sanitation is included in the CSR rules, this could be a potential source.

[26] Section 135 of the 2013 Act, seeks to provide that every company having a net worth of INR 500 crore or more, or a turnover of INR 1,000 crore or more, or a net profit of INR 5 crore or more would be required to spend at least 2 per cent of the average net profits of the immediately preceding three years on CSR activities.

Table 40: Potential sources of funds for various CSP projects

Sr no	Project	Potential sources for Capital finance
	Access to toilets	
1	Household toilets with partial subsidy as incentive	a) GoI's new **Swachh Bharat Mission** which provides subsidy to incentivise households; b) **special funding** from the state; c) **MP and MLA** under local area development scheme; and d) **CSR** funding. e) Households can use **own savings** or **borrow** from financing institutions.
2	Community toilets: New blocks and refurbishment of existing ones	a) ULB **own funds;** b) **CSR funds;** c)**Swachh Bharat Mission**
3	Public toilets: New blocks and refurbishment of existing ones	a)**PPP arrangements** for new public facilities or refurbishment; b)**CSR funding** for construction and hand over O&M by private player with user charges; c) explore VGF under **Swachh Bharat Mission**
	Wastewater and stormwater management	
4	Wastewater conveyance (settled sewer network) and treatment	a) GoM's **Maharashtra Sujal Nirmal Abhiyan**; and b) **Maharashtra Nagarotthan Yojana**. In such state schemes, ULB has to **contribute** a part ranging from **10% to 20%** of the project cost; c) As this project makes an impact on a wider area, funds available **with District Planning Committee** (DPC) could also be accessed
5	Desilting and rehabilitation of natural water bodies (phase 1)	
	Integrated faecal sludge management	
6	Provide regular IFSM service with sludge treatment	For suction emptier trucks: a) **private player**; b) **GoM** grant under Maharashtra Sujal Nirmal Abhiyan/Nagarotthan; c) **CSR** funds; and d) ULB **own funds** to meet a part of the cost For treatment plant: a) GoM's **Nagarotthan** Yojana; b) GoM **Vaishtyapurna Kaama** Yojana; c) **CSR** funds; d) **borrowing**. For septic tank access refurbishment: **Households** to bear these costs themselves
	Integrated solid waste management	
7	Tipper trucks, replacement of concrete bins, extension of waste collection contract	a) GOM's grants for **purchase of equipment;** b) **CSR** funds
	Awareness generation	
8	Awareness generation and IEC campaigns	a) **Swachh Bharat Mission** funds for IEC campaigns; b) **CSR** funds

Grants from Corporate Social Responsibility (CSR) and other donors: Grant funds are also likely to be available through other sources such as from local benefactors, other corporate sector donors through the requirements of CSR as per the Companies Act provisions, etc. The SMC, with possible support from civil society organisations and academic institutions, will need to proactively identify such possibilities. Projects such as the ones for provision of toilets through incentive subsidy, construction and management of community and public toilets, as well as for procurement of vehicles for solid waste collection and septage or awareness campaigns, may receive funding from such sources.

SMC own funds: Besides exploring other external funds, the SMC should also explore the possibility of using its own funds to meet a part of the capital costs; it can directly use its own revenue surplus for this purpose. It can also leverage additional funds through borrowing from local commercial banks and other financial institutions, if this appears financially viable. The assessment of the SMC's finances discussed earlier suggests that the SMC will be able to meet funding requirements for some of the CSP projects. In addition, however, the SMC will need to explore external funds. **Table** 40 provides potential sources of funds to meet capital costs for projects. While many options seem possible, considerable efforts will be needed to explore and mobilise these for timely implementation of these projects identified in the CSP.

Table 41: Phasing of projects

Sr no	Project	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
	Access to toilets										
1	Household toilets with partial subsidy as incentive										
2	Community toilets: New blocks and refurbishment of existing ones										
3	Public toilets: New blocks and refurbishment of existing ones										
	Wastewater and stormwater management										
4	Wastewater conveyance (rehabilitate existing drains + settled sewer network) and treatment										
5	Desilting and rehabilitation of natural water bodies (phase 1)										
	Integrated faecal sludge management										
6	Provide regular IFSM service with sludge treatment										
	Integrated solid waste management										
7	Tipper trucks, replacement of concrete bins, extension of waste collection contract										
	Awareness generation										
8	Awareness generation and IEC campaigns										

7.1.1 Priorities, Phasing and Project Development

Based on local priorities and capacity for implementation, a phasing plan has been developed to implement the CSP proposals over a 10-year period. The proposed phasing takes into consideration local priorities, urgency of the project, availability of financial and human resources and logical sequence of actions. For example, projects those can be funded through ULBs own resources or from household contributions are phased early while those which need grants are taken up later. However, as most projects require some grant funding, as a strategy the SMC will need to treat this as a rolling plan that can be adapted to match their efforts at mobilisation of capital funding. The SMC also plans to initiate pilot projects with its own funds to test project modalities as well as demonstrate implementation capacity to mobilise more innovative funding such as from CSR funding. While a number of local corporate sector firms have shown interest, they will need evidence that can be provided through implementation of schemes through demonstration pilots.

Financial Assessment

The proposed phasing will result in a total requirement of Rs 97.9 crore for the full CSP to be implemented over a 10-year plan period. Based on an assessment of financing sources in Table 40 , Table 42 presents sources of financing all the CSP projects identified above. The SMC will have to mobilise 75 per cent of the total costs as grants through central and state schemes, or from CSR sources. It will have to contribute Rs 9.7crore as its own share. This can be met through its internal surplus or by borrowing from a commercial bank.

Table 42: Capital finance of CSP projects

Sr. no	Project	Project cost	Grants	Private/PPP	Beneficiary	ULB
	Access to toilets					
1	Household toilets with partial subsidy as incentive	1,680	252 (15%)		1,344 (80%)	84 (5%)
2	Community toilets: New blocks and refurbishment of existing ones	39				39 (100%)
3	Public toilets: New blocks and refurbishment of existing ones	13		13 (100%)		
	Wastewater and stormwater management					
4	Wastewater conveyance (rehabilitate existing drains + settled sewer network) and treatment	7,758	6,982 (90%)			776 (10%)
5	Desilting and rehabilitation of natural water bodies (phase 1)	68	61 (90%)			7 (10%)
	Integrated faecal sludge management					
6	Provide regular IFSM service with sludge treatment	132	88 (67%)	33 (25%)		11 (8%)
	Integrated solid waste management					
7	Tipper trucks, replacement of concrete bins, extension of waste collection contract	65	31 (48%)			34 (52%)

	Awareness generation					
8	Awareness generation and IEC campaigns	35	18 (50%)			18 (50%)
	Total	**9,788**	**7,431 (75%)**	**47 (1%)**	**1,344 (14%)**	**966 (10%)**

Besides capital financing, new projects will also entail considerable additional O&M expenditure. Thus, to meet both capital and O&M expenditure requirements, the SMC will need to consider improvements in three areas: a) it will need to improve efficiency in collection of taxes to about 90 per cent (as discussed earlier); b) increase or at least maintain transfer of internal surplus to WSS sectors; and c) introduce sanitation and SWM taxes and consider some increase in tax levels (property tax as well as special taxes for water, sanitation and SWM). The SMC will need to introduce new taxes for sanitation (Rs 300/annum) and SWM (Rs 180/annum) in 2015.

Table 43: Percentage increase in average tariff/tax levels required in year 10 - to implement the full CSP

		Transfer of internal surplus to WSS account	
		No increase (60%)	Increased
Collection efficiency	No increase (51%)	113%	42% (86% transfers over 10 years, max 100%)
	Improved to (90%)	62% (54% transfers over 10 years, max 60%)	17% (68% transfers over 10 years, max 100%)

8. Institutional Strengthening and Awareness Generation

8.1 Overall Institutional Issues

The CSP has identified broader issues in discussion with the ULB team and reviewed the current institutional framework. The city currently suffers from alack of provision of sanitation-related infrastructure such as adequate toilets, safe sewerage system and proper solid waste management practises (including collection, disposal and treatment of waste). Accordingly, the strategies proposed deal with these issues and also tackle the workload issue due to a staff crunch.

Intervention at state level (DMA office) is needed to fill cadre-related posts that are currently vacant. This will help reduce workloads and ensure smooth functioning of each department. It will also help strengthen the monitoring of the department. Since the current staffing pattern cannot be changed or new recruitments (besides sanctioned posts) cannot be made, increasing staff at ULB level is not possible. In addition, posts will become defunct once employees in provisional positions retire, leading to further staff crunches. Therefore, outsourcing of sanitation services on a contract basis, (as well as the option of engaging private parties, existing CBOs/SHGs, and certain other groups like informal rag pickers) should be explored. It is suggested that these services be operated on a user fee basis so as to cover O&M costs and payments to the contractor, etc.

8.2 Strategies for Institutional Strengthening

The institutional strategy is designed to foster effective and efficient use of existing human resources. The proposed framework aims at helping the ULB achieve: a capable and motivated workforce, responsible and accountable elected representatives, and stronger financial management. CSP interventions are envisaged to guarantee sustained services and ensure effective management of assets created under the project. CSP interactions clearly highlight the following issues:

- Lack of provision of sanitation-related infrastructure (such as adequate toilets, which prevents the city from becoming open defecation free), scientific sewerage system leading to cleaner environment, and proper solid waste management practices (including collection, disposal and treatment of waste).
- Lack of provision of sanitation services as per norms, especially O&M of basic services such as toilet cleaning and waste management.

The strategies proposed deal with the above two issues and also aim to tackle the issue of increased workloads due to a staff crunch.

Intervention at state level (DMA office) is needed to fill cadre-related posts – for instance, Sanitary Inspector, Junior Water Supply Engineer, Internal Auditor, Administrative Officer, etc – which are currently vacant. This will reduce the work pressure on existing staff and ensure smooth functioning of each department. It will also help strengthen monitoring the work of the department.

Existing staff management practices and monitoring tasks can be strengthened to improve sanitation services in the city. Since the current staffing pattern cannot be changed or new recruitments (besides sanctioned posts) cannot be made, increasing the staff at ULB level is not possible. Further, once employees in provisional positions retire, the posts will be defunct, leading to a further staff crunch. Hence outsourcing of sanitation services on contract basis should be further explored. Option of engaging private party and also existing CBOs/SHGs and certain other groups like informal rag pickers should be explored. But these services should be operated on user fee basis so as to cover the O&M costs and payments to the contractor, etc. In this case, the public health department of the ULB, which looks at the sanitation aspects for effective monitoring of implementation and O&M, should be strengthened. The ULB will function more as a facilitator and provider of infrastructure and monitoring. The monitoring of the contract work, and also that of existing sanitary workers, can be achieved by filling up the post of Sanitary Inspector (sanctioned but currently vacant).

Table 44: Strategy for outsourcing O&M activities in Sinnar

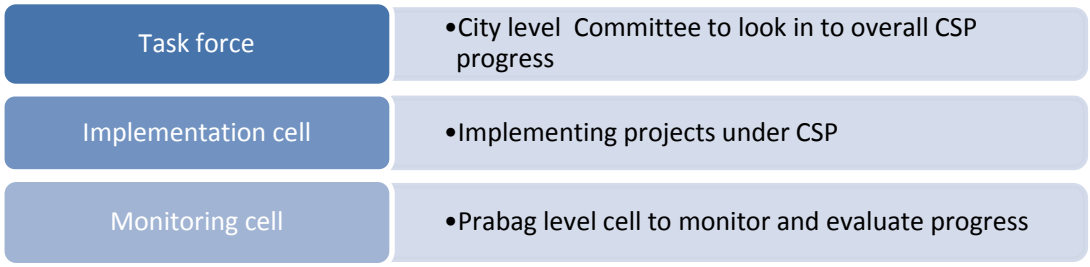
Key issues	Strategy	Stakeholder role	Implication for ULB
O&M of community toilets: Community-managed toilet (CMT) model for CT augmentation pilot area			
Lack of ownership by community, vandalism, lack of regular cleaning	• Community-managed toilet (CMT) • User fee model	**NGO role:** • Identify and form groups of interested stakeholders • Train and build capacity Manage day-to-day finances Act as bridge between CMT group and ULB • Clean toilets daily **CMT group role:** • Guard the toilet complex • Ensure fee collection and account management	• Refurbish existing CTs • Provide water and electricity • Facilitate formation of CMT groups and their training • Put well-defined contracts in place • Undertake monitoring and trouble shooting
O&M of public toilets (PTs)			
Lack of O&M of PTs	Contracting to private parties	• Clean toilets daily • Guard the toilet complex • Undertake repairs and maintenance in case of theft/breakages • Monitoring: maintain a daily log of cleaning schedules followed by the caretaker	• No additional staff needed. • Monitoring by existing staff (SI and Sanitary Supervisors) • Financial burden (Rs 5000 per block) • Solution: operate on user fee basis
Solid waste management			

Key issues	Strategy	Stakeholder role	Implication for ULB
Less staff	Hire additional staff on contract for D2D collection, street sweeping, etc	• Provide labour as per ULB requirement • Do reporting as per MIS system of ULB	• Financial burden • Need a well-defined contract • Daily monitoring of tasks performed against set timetables

8.3 Strategies for Effective Implementation

For effective implementation of the CSP, it is necessary that though the ULB plays the role of the principal implementer, it partners with other important stakeholders as well. A three-tier system is suggested.

Figure 41: Three-tier system of stakeholder participation



The Task Force: This will be a multi-stakeholder, city-level committee consisting of representatives from: agencies directly responsible for sanitation; eminent persons and practitioners in civic affairs, health and urban poverty; representatives from shops and establishments; NGOs working on water and sanitation, urban development and slums, health and environment; representatives of unions of safai karamcharis; sewerage sanitary workers; recycling agents, and so on. It will be responsible for:

- Coordinating with the relevant central and state government departments.
- Influencing policy-level decision-making at state/central government level.
- Appointing City Sanitation Implementation Cell.
- Providing overall guidance to the Implementation Agency.
- Assigning institutional responsibilities.
- Undertaking field visits from time to time to supervise progress.
- Undertaking quarterly review meetings.
- Take decisions on updating and extending CSP implementation as per future needs.

Table 45: Proposed structure of CSP Task Force

Head	President of Municipal Council
Deputy Head	Deputy President of Municipal Council
Executive Head	Chief Officer
Member	Chairman, Standing Committee

Member	Leader of House
Member	Leader of Opposition
Member	Political leaders
Member	NGO representatives working in urban management, sanitation, environment, etc.
Member	Representatives of commercial establishments/hotel associations

Implementation Cell: The responsibility of implementing projects under the CSP will be the primary responsibility of the SMC and will be carried out in coordination with Prabhag-level ULB staff and contractors, CBOs/SHGs and NGOs as facilitators, etc.

Figure 42: Implementation Cell structure

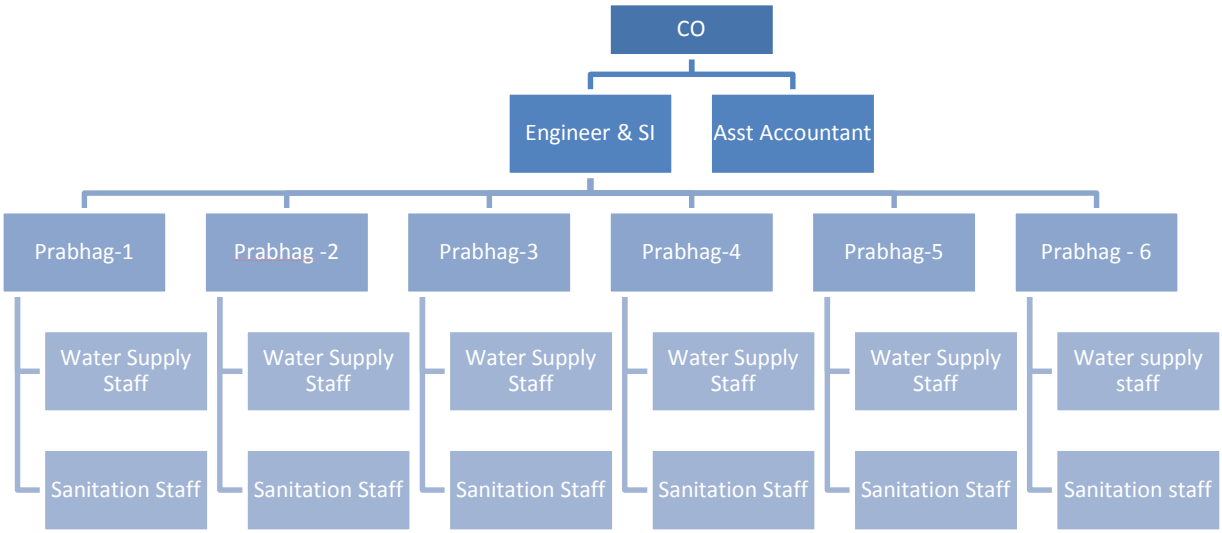


Table 46: Roles and responsibilities of Implementation Cell for CSP projects

Stakeholder	Role
CO	• Administrative/decision-making authority
Engineer/SI	• Providing support in preparation and implementation of CSP • Supervising tasks carried out by Prabhag-level ULB staff, O&M tasks carried out by private operators/SHGs • Implementing IEC at Prabhag-level and guiding the field staff and other stakeholders in the process • Implementing e-governance programmes • Overseeing and coordinating capacity building programmes for staff • Reporting progress made • Holding bi-monthly review meetings with field level staff
Asst Accountant	• Ensuring reforms are on track • Achieving targeted billing and recovery; targeted collection efficiency • Ensuring timely payments to ensure continuation of tasks envisaged
Water supply and sanitary staff	• Carrying out field level works in delineated Prabhags • Doing detailed city survey on socio-economic parameters and sanitation status • Identifying OD spots, water leakages, water logging spots, faulty septic tanks, etc. • Doing daily road sweeping, D2D collection, O&M of toilets, etc • Ensuring timely implementation of projects as envisaged in the CSP

Stakeholder	Role
	• Identifying and motivating CBOs to partner with, and undertake, O&M, waste collection, etc • Carrying out IEC programmes with identified stakeholders • Following MIS and reporting schedules • Communicating citizens' feedback to relevant authority

Monitoring Cell: It is often observed that one of the hindrances in effective implementing of projects and its sustainability is lack of monitoring. The proposed structure of the CSP Monitoring Cell includes a mix of councillors, head clerks, engineers and mukadams, as well as mohalla committee members and representatives of CBOs/SHGs.

Table 47: Roles and responsibilities of Monitoring Cell for CSP projects

Stakeholder	Role
Councillors	• Enabling tariff and institutional reforms • Interfacing between public, mohalla samitis, ward committees and ULB • Facilitating CSP implementation at ward level • Leading IEC activities at ward level
Administrators/supervisors at ULB level	• Holding monthly meetings with Implementation Cell and troubleshooting • Reporting to Task Force • Being the bridge between Task Force and Implementation Cell
Mohalla committees	• Taking on a 'watchdog' role in monitoring CSP implementation • Doing IEC activities and citizen interaction and involvement • Undertaking third party assessment and evaluation
NGOs/CBOs	• Community mobilisation, demand promotion • Carrying out IEC activities • Do training and capacity building • Do surveys, evaluations, etc

It is envisaged that outsourcing sanitation services related O&M will not only help solve the issue of staffing but reduce burden on finance arrangements as well. Institutional strengthening can also take place by clearly assigning roles and responsibilities, resources and capacities and institutional incentives in relation to setting standards, planning and financing, implementation, knowledge development, capacity building and training, monitoring and evaluation, and regulatory arrangements. Involving various stakeholders in the implementation and monitoring/evaluation process will help improve the ownership of the sanitation situation, leading to a cleaner town.

A state-level sanitation policy – specifying institutional strengthening and capacity-building measures at ULB level, including awards, rewards and incentive framework – needs to be developed. Discussion with ULB staff members revealed that there is a need to provide capacity-building training programmes. The ULB has to function not merely as a 'provider' but as a 'facilitator'. These switches in roles have to be accompanied by scaling up for community management, cost recovery and use of participatory management tools. Some of the capacity building programmes (from discussions with the staff) include technical training for handling O&M, financial management,

stakeholder involvement, project management, contracting, citizen interface and grievance redressed etc.

The ULB can tie up with training institutes and arrange exposure visits, workshops for discussion and experience-sharing by subject experts. Skill transfer can be achieved through on-the-job training and deputation of municipal staff (for short- to medium-term durations), to state-level departments, etc, to build skills in project planning, appraisal and management. Similarly, staff from smaller municipalities in the region may work on deputation with other municipal corporations.

Monitoring and evaluation of projects should be undertaken both internally and externally through a participatory approach. The beneficiaries may be involved in measuring, recording, collecting, processing and communicating information in this approach. . Issues such as interfacing with citizens, MIS, work overload, etc, can be managed effectively through automations and e-governance.[27]

8.4 Awareness Generation and IEC Measures

The previous Sections have thrown light on the key issues in sanitation in Sinnar. The lack of awareness and importance placed on sanitation and hygiene is an emerging issue – be it use of toilets, knowledge about safe disposal of wastewater, or even disposal of household waste, its treatment and reuse. FGDs were conducted in slum and non-slum areas, commercial/market places and educational institutes to understand the level of awareness related to sanitation. (The FGD results are summarised in Appendix 6.)

It can be concluded that levels of awareness vary considerably amongst different categories of people. In addition, some practices – such as dumping of household waste in the open, littering and improper septic tanks – are not changed mostly due to inadequate facilities and lack of knowledge.

IEC can play an important role in bringing about attitudinal, and hence behavioural, change. Awareness generation using simple communication strategies play an important role in achieving 100 per cent access to sanitation. Complete sanitation can be ensured by bringing about change in existing mindsets through an integrative process of behavioural change. This goal can be met not only by implementing a comprehensive IEC plan, but also by targeting and involving stakeholders at various levels in the town.

The identification of sectoral issues and awareness levels amongst different target groups form the basis of the IEC strategy to be used in Sinnar. The ultimate aim of IEC is to bring about behaviour change in the target group.

[27]As per State GR vide (Computer/2005/ Let no. 05/ UD-29) issued by Urban Development Department, GoM, urban local bodies have to replicate Kalyan-Dombivali Municipal Corporation's (KDMC) e-governance project by 2012. The Department has also specified the financial model for all Municipal Councils, as per which Wai can avail a total amount of Rs 29.12 lakh from the state government for computerisation. The Municipal Council will have to contribute Rs 2 lakh.

Depending upon understanding, education levels and environment, different channels are suggested so that there is effective communication among different stakeholders. They are broadly divided into channels for:

- Information dissemination and awareness generation.
- Participatory approach and capacity building.
- Mass promotions.
- Awards and recognitions.

The details of activities for slum/non-slum areas, institutional stakeholders, ULB staff and elected representatives are elaborated in Appendix 7. Though IEC should be an ongoing activity, it is important to match it with the timeframe set by the ULB to achieve certain sanitation practises (such as, pilots for waste segregation, waste collection system in commercial areas, promotion of individual toilets, etc). IEC will be an important tool for promoting sanitation in the first three years of CSP implementation, and from there on as per the programmes targeted.

Table 48: IEC costs

Sr no	Component	Description	Cost (Rs in lakh)
			Short term (3 years)
1	Designing and planning of IEC campaign (designing IEC material, drawing up a plan of action, etc)	NGO and consultant involvement	5
2	Implementation (street plays, campaigns, competitions, etc)		15
3	Publicity materials	Printing handouts, posters, banners, etc	10
4	**Total**		**30**

The short term (that is, three year) cost of achieving IEC objectives per year would be Rs 10 lakh. Strategies would have to be tailored for different stakeholders for effectively bringing about change in sanitation related attitude and behaviour. There is a need to shift from imposition on pre-planned ideas and programmes to people's participation in the whole process – be it planning, implementation or monitoring. Hence the need to adopt different strategies and programmes for varied stakeholder groups. The IEC component should be kept short, though continuous, for approximately three years to bring about change.

9. Options for Early Implementation of Projects

The CSP team has started identification of potential projects that could be implemented immediately by the SMC, without waiting for larger grants or new investments. In this context, two potential projects have been identified.

9.1 Demand-led Scheme for Group Toilets' Construction

One of the key goals of the Sinnar CSP is to make the city open defecation free (ODF) and, therefore, have universal access to sanitation. Sinnar can pursue individual toilets or look at 'group toilets' to ensure all households have access to toilets.

Based on surveys conducted in Sinnar, as well as the 2011 Census, it is estimated that about 4,869 households in the city do not have their own toilets. The key reasons: lack of space and/or lack of adequate funds to construct toilets. During the survey it was observed that households prefer their own toilets and are ready to share a toilet with known neighbours to address the space and funding issues. Discussions revealed that households are willing to consider the option of group toilets if some financial assistance is provided in the form of subsidies from the SMC.

After the completion of CSP field work, the SMC has contracted out operation and maintenance of community toilets within the municipal limits (year 2013–14) for an annual cost of Rs 7.8 lakh per year (around Rs 2,100per seat per year). The contractor is responsible for cleaning all community toilets twice a day. The material required for cleaning is procured by the contractor; he/she reports

A survey to assess group toilet possibilities in Sinnar.

to the SMC regarding complaints about community toilets and the SMC incurs the necessary expenditure and repairs. Electricity and water required for community toilets is supplied by the SMC, which also empties the septic tanks on a periodic basis. SMC staff is involved in monitoring the services of the contractor.

'Group toilets' essentially mean that the construction of a toilet is shared by two to four households residing in close proximity, depending on the availability of common space. This will decrease the investment required from each household, in addition to creating joint ownership and providing

access to safe sanitation. The group toilet is maintained by these households who also undertake their repair and maintenance, as in the case of individual toilets.

The CSP team has compiled the results of the group toilets assessment –11 cases (one for each slum) have been identified for the potential implementation of group toilets– and has shared this with the SMC. Assistance is also being provided to the SMC to draft a scheme to announce subsidies for eligible households for construction of group toilets, thus promoting their use among households that do not have toilets. This will help provide access to safe sanitation to all households. Eventually, as all households gain access to such individual or group toilets, it will be possible to remove community toilets in the city. The successful implementation of such a scheme can help save ongoing expenditure on community toilets, as well as free up land used for housing community toilets in the city in the future.

For the scheme design, it is assumed that subsidies will be granted by the SMC for constructing toilets with septic tanks (as per specifications/guidelines given). A fixed amount of subsidy will be granted per household. This means that the amount of subsidy per toilet will increase with increased number of households that are ready to share a toilet.

For the implementation of this scheme, support is being provided to the SMC to invite applications from households willing to construct group toilets. The process to review and shortlist applications with due verification processes on ground is being jointly designed. The process of assessment and verification of applications by the SMC will include on-ground assessment of availability of land for construction of toilets, assessment of submitted documents for granting permissions for construction of toilets and the possibility of granting subsidies to applicants. The CSP team is developing detailed specifications and guidelines for toilets' construction, in coordination with the SMC, to ensure quality construction and standardisation of materials used for construction. Additionally, based on field surveys, the CSP team has also identified potential cases for group toilets and interacted with the households interested in availing the benefits of the scheme. Detailed documentation of such cases, with architectural designs, are being prepared to build cases for group toilets in Sinnar with the help of the CSP team.

9.2 Septage Management Plan

The CSP has recommended the preparation of a Septage Management Plan to tackle faecal sludge and periodically clean existing septic tanks. In Sinnar, septic tanks are largely oversized and do not confirm to standards prescribed in IS codes and CPHEEO manuals. In old town areas the majority of the toilets are connected to septic tanks, and the effluent from the tanks is disposed off into roadside drains. In new town areas, the majority of the toilets are connected to septic tanks, and the effluent from the tank is disposed off into soak pits, or at some places effluent is disposed off into the drains. In addition, the irregular emptying cycle of septic tanks (around five to seven years) leads to high levels of BOD in effluent and wastewater flowing in the drains. The MoUD advisory on septage management requires the cities to desludge septic tanks every three years.

The Septage Management Plan, or faecal sludge management plan, for Sinnar will include activities related to asset creation in terms of building/retrofitting septic tanks, creating septage treatment facilities and procurement of vehicles to ensure regular cleaning. Additionally, it will also plan for soft support items such as formulating regulations for on-site sanitation, creating database on on-site sanitation arrangements in the city through surveys and exploring possibilities for private sector involvement in septage management. To maintain the recommended cycle of three years, city officials need to ensure that 2,800 septic tanks are emptied every year and the sludge is subjected to proper treatment.

This will not only help in the effective treatment of sludge but also lead to overall reduction in pollution levels (since earlier there was indiscriminate discharge into the river). The advisory suggests periodic desludging of septic tanks, adequate and safe transportation of septage and its proper treatment. All the three aspects are being captured in the Septage Management Plan for the SMC. As part of the Plan, specific recommendations are being prepared for septic tank improvements, emptying cycles and procedures and possibilities for private sector participation. The Septage Plan also delineates methods for treating septage and designing a treatment plan. It also includes recommendations for levying cleaning charges to ensure sustainability.

Appendixes

Appendix 1: Required Staff Qualification in Water Supply and Sanitation Department

Post	Grade	Qualification required
Assistant Office Inspector/ Assistant Tax Inspector	3	Degree in any discipline and Post Graduate Social Service/Public Admin/Town and Country Planning/Law/Business Admin/Engineering MS-CIT
Senior Clerk	3	HSC (12th)& MS-CIT Typing speed for Marathi &English: 30 WPM & 40 WPM, respectively
Typist Clerk	3	HSC & MS-CIT Typing speed for Marathi &English: 30 WPM & 40 WPM, respectively Certificate in 'Data Entry Operator'
Driver	3	10th Pass with Heavy Vehicle Driving License
Peon	4	9th Pass
Assistant Accountant/ Assistant Account Supervisor	3	B.Com and ICWA or CA MS-CIT
Sanitary Inspector	3	Degree in any discipline or Diploma in Sanitary Inspector/Public Health MS-CIT
Mukadam	4	Selected from Labour Class 7th Pass 12 years' experience
Labourer	4	7th Pass
Junior Building Supervisor/Sub Overseer	3	BE Civil/Diploma in Civil MS-CIT
Junior Town Planner	3	BE Arch or ME (Town and Country Planning) or Diploma in Arch/T&CP MS-CIT
Junior Electric Supervisor	3	BE Elect or Diploma in Elect MS-CIT
Wiremen	3	10th Pass ITI Electrical MS-CIT
Assistant Fire brigade Station Supervisor	3	Degree in any discipline and certificate from College of National Fire brigade Service MS-CIT
Leading Fireman	3	10th Pass Government recognised Leading Fireman Training Heavy Driving License 7 years' experience in Fireman Post
Fireman	4	10th Pass Government recognised Fireman Training Heavy Driving License
Driver-cum-Operator	3	10th Pass Government recognised Fireman Training Heavy Driving License
Junior Water Supply/Sanitation Eng.	3	BE/DE Mechanical/Environment or Degree/Diploma in Environmental Science MS-CIT

Post	Grade	Qualification required
Lab Assistant/Operator	3	BSc Chemistry MS-CIT
Pump Operator/Electrician/Plumber	3	10th Pass ITI Electrical/Plumbing MS-CIT
Valve Operator	4	7th Pass
Garden Supervisor	3	Degree from Agriculture College in Horticulture MS-CIT

Appendix 2: Case Studies: Conditional Assessment of Household Sanitation

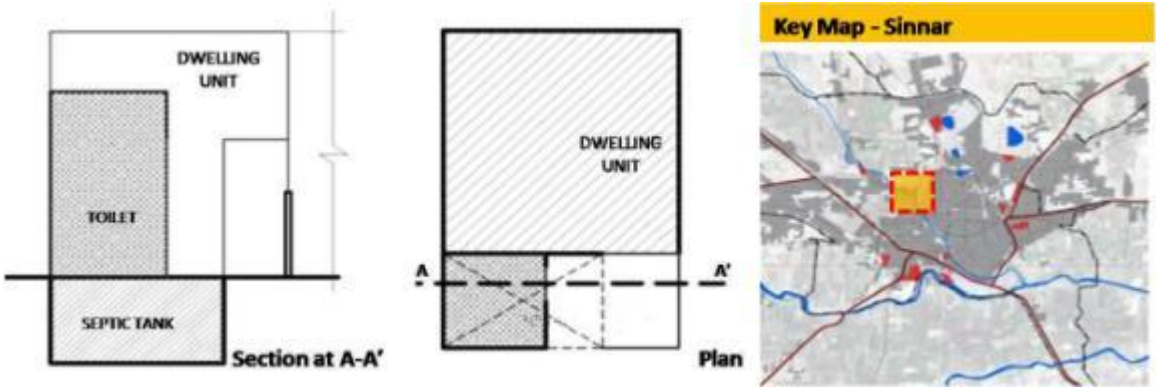
Case Study 1

Location: Old town, Prabhag 4

It is located in northern part of the old city. The dwelling unit is one-storied height with semi-attached toilet of size 4' x 4', facing the road. The septic tank of size 4' x 7' is constructed off-centred of superstructure.

Sanitation service chain

Pour flush toilet is connected to septic tank which serves as primary treatment of wastewater. The effluent is discharged into closed drain along the roadside. Without any secondary treatment the wastewater is discharged into the river. Septic tank has not been cleaned within the last five years.



Observations:

- No provision of soak pits.
- Irregular cleaning of septic tank reduces efficiency

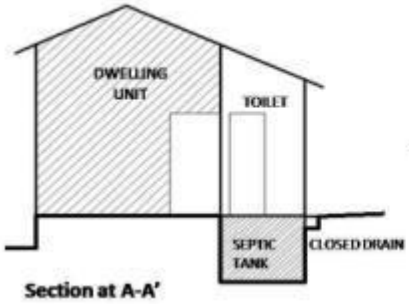
Case Study 2

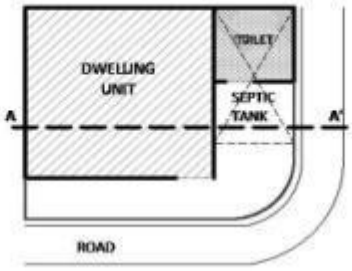
Location: Prabhag 3

The house is located near Waav Wes area. This area is a part of the old town; it has bungalows of higher middle income group. The dwelling unit is located at the junction of two roads and toilet block is attached to the house facing the road. The size of the toilet is 4' x 3'. Septic tank of size approximately 4' x 7' is constructed partly below superstructure.

Sanitation service chain

At user interface level, a case comprises of pour flush toilet. Septic tank is constructed partly below superstructure as collection of waste. Effluent from septic tank is discharged to roadside closed drains. Roadside drains collect and carry wastewater from households, and later wastewater is discharged into natural drains and rivers.





Observations:

- No provision of soak pit.
- Inadequate size of septic tank may affect its function.

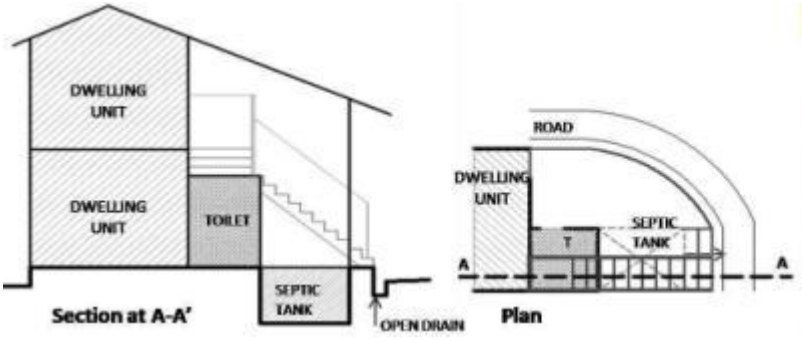
Case Study 3

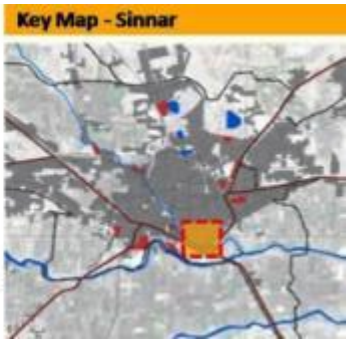
Location: Prabhag 5

The house is located near the by-pass road, bordering old town. It is a bungalow with two storeys. The toilet is constructed in the front yard of the house. Septic tank is constructed in front yard adjacent to the toilet. Septic tank is of adequate size, 8'x 5' with baffle walls.

Sanitation service chain

A pour flush toilet is connected to septic tank. The effluent from septic tank is discharged into open drains along roadside. The drain in front of the house is closed with stone slabs. Drains carry wastewater and discharge into natural drains or rivers.





Observations:

- No provision of soak pit.
- Adequate size septic tank is constructed with baffle walls.

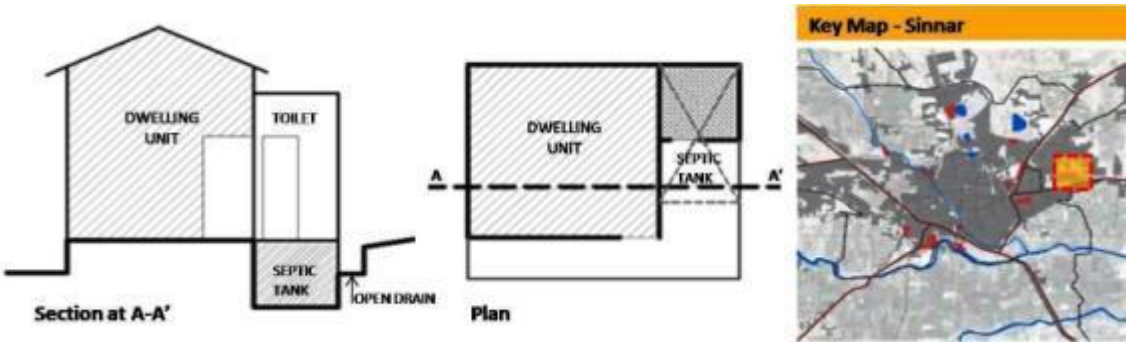
Case Study 4

Location: New developments, Prabhag 1

The dwelling unit is located in new developments in Prabhag 1. The unit is situated in the area of plotted development in which toilet of size 4' x 4' is located adjacent to the house. The septic tank of size 8' x 4' is constructed off-centring the toilet block.

Sanitation service chain

There is a pour flush toilet. The septic tank is constructed for the purpose of collection and primary treatment of waste. The effluent from septic tank is discharged into roadside open drains. Through open drain wastewater is conveyed into natural drains.



Observations:

- No provision of soak pit.
- Adequate size septic tank is constructed with baffle walls.

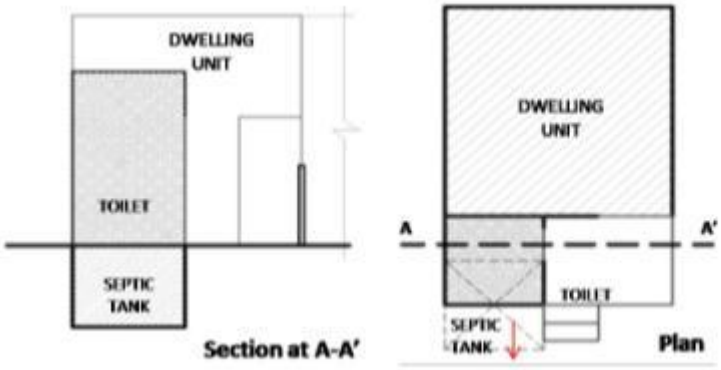
Case Study 5

Location: Near Pune-Nashik highway

The dwelling unit is located near Pune-Nashik Highway. It is a one-storied house with individual toilet. The toilet of size 4' x 3'6" is constructed on the front side of the house. Septic tank of size 4' x 3'9" is constructed partly below superstructure and partly in setback area.

Sanitation service chain

Septic tank is constructed for the purpose of collection of waste from pour flush toilet. The effluent from septic tank is discharged into roadside drains. The plot owners have covered the wastewater drains in front of their houses. Hence the drain is almost covered with stone slabs.



Observations:

- No provision of soak pit.
- Inadequate size of the septic tank affects its function of primary treatment.

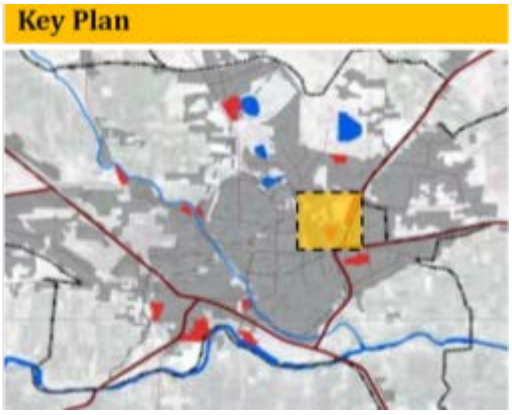
Appendix 3: Case Studies: Conditional assessment of Community-level Sanitation

Case Study 1

Location: Indira Nagar slum, Prabhag 5

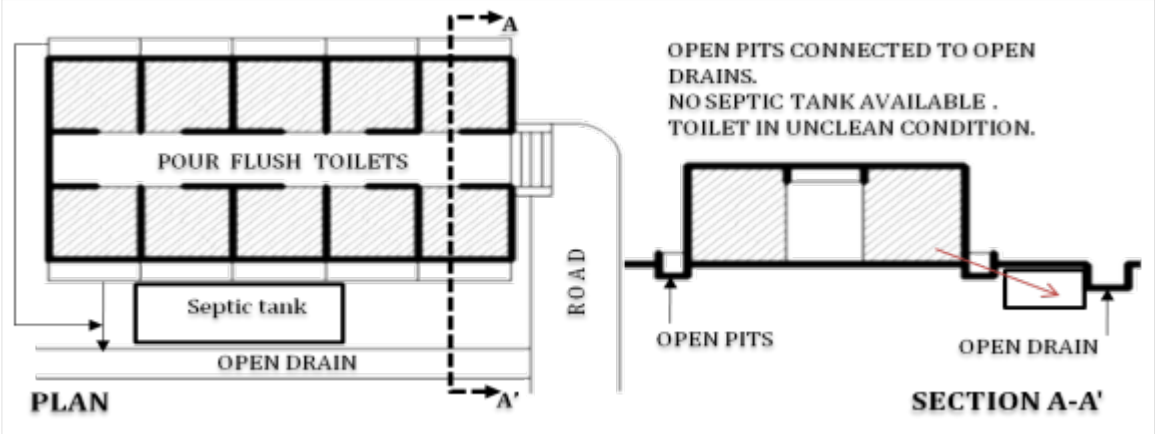
The community toilet in Indira Nagar is of 30 seats (20 for men and 10 for women). The toilet is in working condition but is not cleaned every day by SMC. Every day there are about 850–900 users but no availability of water and electricity. The toilet is in very bad condition. The picture below shows the pits are open and not cleaned regularly.

Seats	20(men);10(women)
Approximate users	850 (+50 floating users per day)
Doors	In good condition
Water	Unavailable
Electricity	Not available
Hygiene level	Very unclean and unhygienic condition; O&M by SNP
User perception	10 (men) and 20 (women)



Sanitation service chain

Pour flush toilets are connected to septic tank. Effluent from septic tank is discharged into open drains. The sketch shows the typical structure of this community toilet.

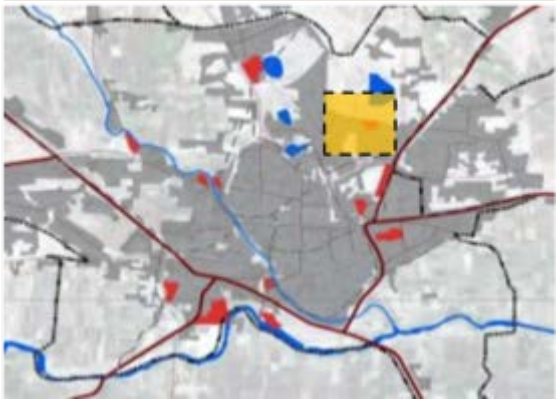


Case Study 2

Location: Waiduwadi slum, Prabhag 1
The community toilet in Waiduwadi slum is of 18 seats (eight for men and 10 for women). The toilet is not in a usable condition; it is not cleaned regularly which leads to higher open defecation practises in this area. This toilet is managed by the SMC. The toilet lacks infrastructure, water, electricity, etc.

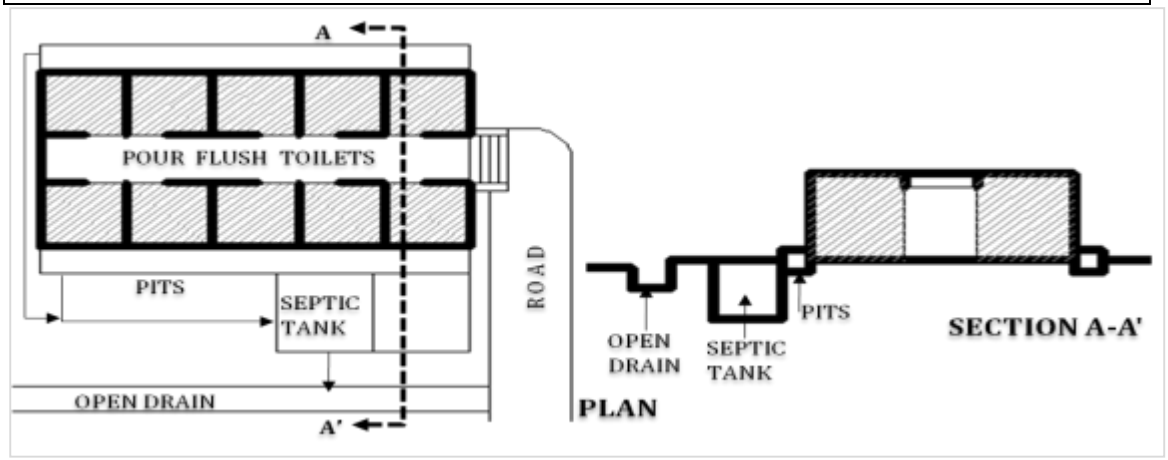
Seats	8(men);10(women)
Approximate users	1,405 users/day
Doors	Not in working condition
Water	Not available
Electricity	Not available
Hygiene level	Unclean & unhygienic condition, bad odour; O&M by SNP
User perception	Very bad condition

Key Plan



Sanitation service chain

Pour flush toilets are connected to pits, which are connected to the septic tanks. The overflow of septic tanks is let out into the open and eventually into open drains.

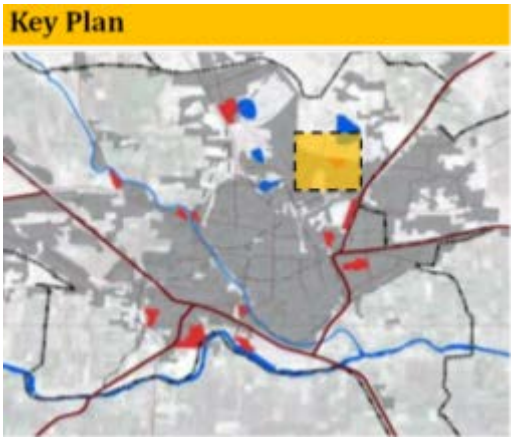


Case Study 3

Location: Makadwadi and Joshiwadi slum, Prabhag 1

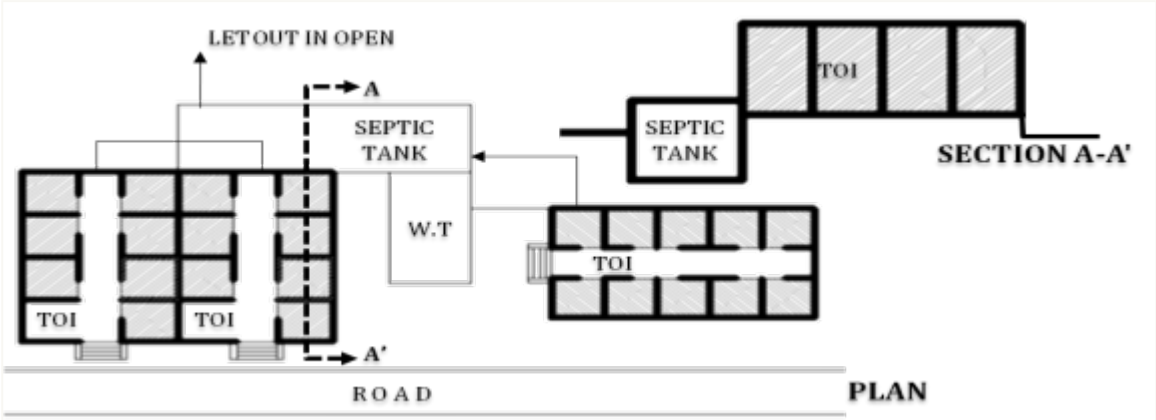
There are 24 seats (eight for men and 16 for women); 13 seats are in working condition. Infrastructure facility is lacking; doors are available but not maintained well. The O&M responsibility of this toilet is with the SMC.

Seats	8(men);16(women)
Approximate users	1,405 users/day
Doors	In broken condition
Water	Not available
Electricity	Not available
Hygiene level	Unclean & unhygienic condition with no facilities. O&M by SMC
User perception	Very bad condition



Sanitation service chain

Three toilet blocks are connected to one septic tank and effluent from the septic tank is let out into the open. The sketch below shows the typical structure of this community toilet.



Case Study 4

Location: Tambeshwar Nagar slum, Prabhag 6

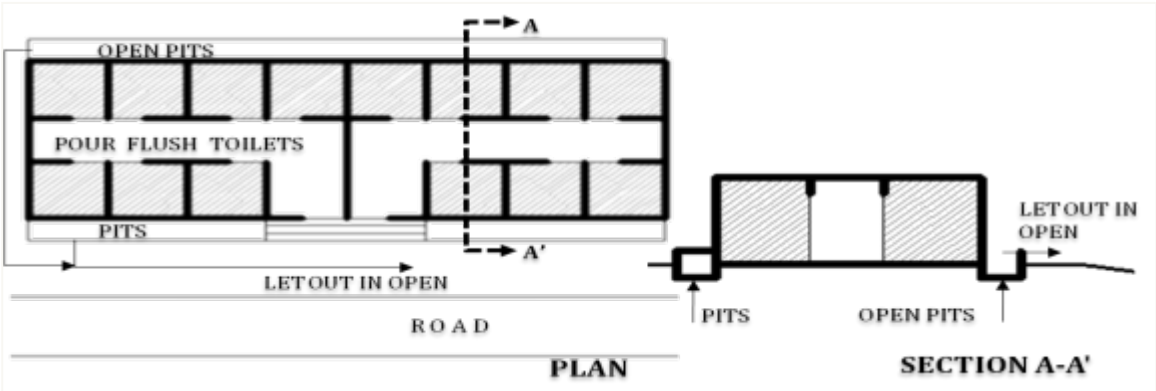
There are 15 seats (eight for men and seven for women); approximate users: 395. Infrastructure facility is lacking; doors available but not maintained well. The O&M responsibility of this toilet is with the SMC.

Seats	8(men);7 (women)
Approximate users	395 users/day
Doors	In broken condition
Water	Not available
Electricity	Not available
Hygiene level	Unhygienic condition, septic tank not cleaned regularly; O&M by SMC
User perception	Very bad condition

Key Plan

Sanitation service chain

Three toilet blocks are connected to pits; effluent from the pits is let out into the open. The sketch below shows the typical structure of this community toilet.



Appendix 4: Comparative Analysis of Wastewater Treatment Systems

Component	1	2	3	4	5	6
	Activated Sludge Process (Conventional) ASP	Aerated lagoon (AL)	Extended Aeration System (EA)	UASB & Polishing Pond(PP)	Waste Stabilisation Pond (WSP)	Advanced Integrated WPS (AIWPS)
Hydraulic detention time	**3–8 hrs**	**i) Facultative type (FT: 3–5 days) ii) Aerobic type (AT) (Generally 5 days)**	**12–24 hrs**	**8–10 hrs for anaerobic reactor & 1day for PP**	**10–12 days (Anaerobic + Facultative +Maturation)**	**12–6days (Advanced Facultative pond, High Maturation Pond)**
Flow Regime	**Plug Flow**	**i) FT: Partial Mix ii) AT: Complete Mix**	**Complete Mix**		**Complete Mix**	**Complete Mix**
Forced Oxygen requirement (kg/kg BOD5 removed)	**0.6–0.65**	**0.6–0.7 (FT) 1.2–1.4 (AT)**	**0.8–0.85**	**Nil**	**Not required**	**Not required**
Recirculation Ratio	**0.5–0.75**	**Generally not provided**	**0.75–1.00**	**Not required**	**Not Required**	**0.25**
Mixed liquid/ suspended solids (MLSS, mg/lit)	**1500 –4000**	**–**	**4000–5000**	**Not important**	**Not Important**	**Not Important**
Stability against shock load	**Susceptible during excessive variation**	**Stable**	**Stable**	**Stable**	**Stable**	**Stable**
Process Power requirement (KWH/Capita/Year)	**12–17**	**i) FT: 12–15 ii) AT: 12–14**	**16–20**	**nil**	**nil**	**nil**
Operating Cost/capita (Rs)	**76**	**44**	**60**	**52**	**22**	**26**
Operating Cost comparison	**Moderate**	**Moderate**	**High**	**moderate**	**low**	**low**

Component	1	2	3	4	5	6
Installation Cost/capita (Rs)	**610**	**300**	**440**	**350**	**300**	**320**
Installation Cost comparison	**Substantially high**	**Low**	**Moderate**	**Moderate**	**low**	**low**
Simplicity of Construction	**Complicated**	**Simple**	**Simple**	**complicated**	**Simple**	**Simple**
Simple O&M	**Skilled O&M**	**Simple O&M**	**Simple O&M**	**skilled but simple**	**Simple O&M**	**Simple O&M**
BOD5 removed efficiency (%)	**85–92**	**i) FT: 0–90 ii) AT: 50–65**	**95–98**	**80–90**	**75–80**	**90–95**
Suspended solids removal efficiency (%)	**85–95**	**–**	**85–95**	**85–90**	**80–90**	**90–95**
Digestion Sludge	**Required inviting considerable skill**	**i) FT: Not required, manual desludging once in 5–10 years ii) AT: required**	**Not required**	**SDB/mechanical device**	**Manual desludging once in 5–10 yrs**	**Manual desludging once in 30yrs**
Operational Problem	**Substantial**	**Moderate**	**Low**	**Substantial**	**Least**	**Least**
Odour problem	**Slight**	**Minimum**	**Minimum**	**No Odour**	**Odour problem in anaerobic pond but can be minimised by due care in maintenance**	**No odour**
Cost/Mld (Rs in Lakh)	**45**	**34**	**40**	**38**	**16**	**18**
Land/Mld (Ha)	**0.3**	**0.65**	**0.2**	**0.35**	**1–1.5**	**1**
Simplicity of Construction	**Complicated**	**Simple**	**Simple**	**complicated**	**Simple**	**Simple**
Simple O&M	**Skilled O&M**	**Simple O&M**	**Simple O&M**	**skilled but simple**	**Simple O&M**	**Simple O&M**

Appendix 5: Details of Estimated Costs of Wastewater Conveyance Systems

COST ESTIMATION FOR REHABILITATION OF DRAINS IN OLDTOWN				
	Rate in Rs per unit length	**Length considered for subsequent activities (in %)**	**Length considered for subsequent activities (in km)**	**Cost in INR**
Cleaning/removal of clogging	50	80%	41.208	2,060,400
Lining of drain channels with proper gradient	850	70%	36.057	30,648,450
Closing of drains with cement concrete grating with intervals of 3m	700	50%	25.755	18,028,500
Total length of drain in old town	51.51 km			
Cost (A)				50,737,350
Miscellaneous cost (B)	5% of cost (A)			2,536,868
Total cost (A+B) in Rs				53,274,218
Total cost (A+B) in Rs crore				**5.32**

COST ESTIMATE FOR CITY-WIDE CONVENTIONAL SEWERAGE NETWORK										
Description	**Quantity**					**Final quantity**		**Amount**		
	No	**Length (m)**	**Breadth (m)**	**Depth (m)**	**Assumptions**	**Quantity**	**Unit**	**Rate**	**Unit**	**Total Amount (Rs)**
Length of roads	1	126,510				126,510	Metre			
Sewer line to be provided	1.5	126,510				189,765	Metre			
UPVC 75 mm dia secondary sewer	1	189,765			1.00	142,324	Metre			
RCC NP2 Trunk sewer (avg dia 500 mm)	1	47,441			0.75	47,441	Metre			
Excavation costs										
UPVC 75 mm dia secondary sewer	1	142,324	0.6	1.0		85,394	m^3	130	Rs/ m^3	11,101,253
RCC NP2 Trunk sewer (avg. dia 500 mm)	1	47,441	1.2	2.0		113,859	m^3	130	Rs/ m^3	14,801,670
Pipe installation costs										
UPVC 75 mm dia secondary sewer	1	142,324				142,324	Metre	261.3	Rs/Metre	37,189,196
RCC NP2 Trunk sewer (avg dia 500 mm)	1	47,441				47,441	Metre	5,603	Rs/Metre	265,813,324
Miscellaneous item costs										
Junction boxes	4,866						No.	7,000	Rs/No	34,060,385
Pumping stations							No.	0	Rs/No	
Rising Mains DI K-7							Metre	0	Rs/Metre	
Add 25% for road restoration & crossings, implementation charges								25%		90,741,457
Total cost (Rs)										**453,707,283**
Total cost (Rs crore)										**45.4**

Desilting of drains/nallas								
Length of natural drains	Length (m)	Depth (m)	Width (m)	m^3	Brass	Rs/brass	Desilting	Transportation
Within Municipal limits	3,160	0.75	2.4	5,688	2,010	80	128,633	75,371
Outside Municipal limits	11,840	0.75	2.1	18,648	6,589	80	421,722	2,471,024
							550,355	**3,224,735**

Channelising works						
Item	Length (m)	Width (m)	Depth (m)	m^3	Rs/Cm	Total cost (Rs)
Reinforced side walls up to 100 mm and bottom with PCC bed up to 200 mm	2,390	4.2	0.1	1003.8	2,000	2,007,600

Note: Width refers to the sum of retaining walls on both the sides up to 0.9m and average width of drain is taken as 2.4m (0.9+0.9+2.4= 4.2m). Depth is the thickness of RCC retaining wall and is taken as 0.1m.

Desilting of lake										
	Area (sq m)	Depth (m)	Volume (m^3)	Volume desilting per day	Required days	Per day rate of desilting (Rs)	Per m^3 rate of transportation (Rs)	Desilting cost (Rs)	Transportation cost (Rs)	Total cost (Rs)
Lake 3	10,000	0.9	9,000	2,000	4.5	8,000	25	40,000	225,000	265,000
Lake 4	9,120	0.9	8,208	2,000	4.104	8,000	25	32,000	205,200	237,200
Total cost (Rs)										**502,200**

Appendix 6: Outputs of Focus Group Discussions

Areas	Indicators	
	Toilet &wastewater management	**Solid waste management**
Slum	• Gross lack in knowledge about sewerage management systems/treatment and reuse • Well aware of illness due to OD and unhygienic conditions of toilets • Hand washing practised after defecation/before meals by around 50% respondents; inconsistent among children; practise of cleaning hands with mud observed	• Dumping waste on roadsides and open areas very common, outside community bins • Well aware of health issues due to the practise, but lack of ownership to correct the behaviour • Little awareness about recycling and reuse practises of waste, except amongst those engaging in rag picking activities
Non-slum	• 65% respondents had knowledge about septic tanks and pits for on-site waste disposal • Almost 90% respondents were aware of the need to channelise HH wastewater through proper conveyance • 60% respondents did not have knowledge about sewage treatment and reuse	• D2D and community bins prevalent. • Waste dumping on roads common in newly developed areas but well aware of inconvenience caused and health hazards posed by this practice • 60% aware about recycle and reuse of waste(mostly paper, bottles)
Market places	• Lack of proper usage of toilets in market place; irresponsible behaviour of throwing waste in seats, leading to clogging • User fee model only at bus stand, and hence clean. • Almost 75% respondents agreed to the concept of charging Rs1–2 for usage at market place, if cleanliness is ensured	• Lack of ownership of keeping the market area clean; waste dumped in nallas, open spaces, roads • 40% shopkeepers, roadside vendors agreed to pay Rs 30–50 a month for cleanliness of the area
Educational institutes	• Adequate seats and regular cleaning • Children and staff ensured use of water after toilet use	• Premises well-kept and cleaned regularly • Collection disposed in community bins • Awareness on waste recycle, reuse was low

Appendix 7: Channels of Communication

Theme	Channels of communication		
	Slum areas	**Residential/non-residential (schools, commercial, etc)**	**Administrators and Ward Councillors**
• Promotion of HH level toilets • Promotion of community-managed toilets and waste collection • On-site and off-site disposal of wastewater • Processing and reuse of wastewater and solid waste	**Information dissemination** • Display of banners promoting HH level toilets, schemes available, information on on-site waste management • Banners promoting waste segregation, disposal means, recycle and reuse • Street plays • Audio visuals, for example, movies **Participatory approach &capacity building** • Training programmes on CMT, waste handling, skill upgradation – given to SHGs • Experience sharing and showcasing best practises through site visits • Participation through mainstreaming of rag pickers and other interested SHG members by registering a cooperative (initiation of pilot in commercial area waste management) • Training of the cooperative members in waste handling and disposal, finance management **Incentives** • Clean slum competitions • Prizes and awards to community for following waste disposal systems through competitions held • Prize for best contractor	**Information dissemination** • Distribution of pamphlets, display of banners/posters • Door to door canvassing • Street plays **Participatory approach** • Rallies • Discussion forums • Motivating citizens to participate in mohalla committees • Promotion of, and participation by, shopkeepers' associations/doctors' associations • Formation of school sanitation committees • Clean school drives &competitions • Drawing/essay competitions • Cleanliness drives in schools, neighbourhoods, market places, temple precincts, etc **Mass promotions/awards and recognitions** • Mass media (cable TV, Radio Mirchi, etc) • Clean Mohalla competitions • Concessions in the form of tax rebates for implementing environment friendly initiatives, such as use of solar energy, composing pits, rainwater harvesting, etc • Tax rebates for paying existing taxes (property tax) before time • Reward points (grace marks for	**Capacity building** • Subject expert interactions • Skill development workshops/trainings • Add-on courses • Discussion forums • Soft skills training and people management • Exposure visits **Participatory approach** • Clean Ward/Prabhag competition **Incentives** • Individual awards for promoting environment-friendly sanitation activities in respective wards/Prabhags • Best employee/councillor awards • Financial incentives for improved performance/special inputs in sanitation campaign

Theme	Channels of communication		
		participating in sanitation campaign)	

The Performance Assessment System (PAS) Project

The 'Performance Assessment System – PAS' is a five-year action research project, initiated by the CEPT University, Ahmedabad, with funding from the Bill and Melinda Gates Foundation. It supports development of appropriate tools and methods to measure, monitor and improve delivery of urban water and sanitation services in the states of Gujarat and Maharashtra. The PAS Project comprises three components of performance measurement, monitoring and improvement.

The PAS Project is supporting the development of City Sanitation Plans (CSP) to achieve open defecation free status for four small cities in Maharashtra, which are Wai, Hingoli, Ambajogai and Sinnar. These cities were selected by the Water Supply and Sanitation Department, Government of Maharashtra, and Maharashtra Jeevan Pradhikaran (MJP). A framework for city-wide assessment using the full value chain for urban sanitation has been developed, which is being used in developing these CSPs. Initial workshops were organised by the MJP with officials of these cities to discuss the CSP approach. Draft plans for these cities are ready and will be discussed with city officials.

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