City Sanitation Plan

Wai Municipal Council

January 2015

pas performance assessment system

CEPT UNIVERSITY

वाई नगरपरिषद, वाई

कार्यालय : (०२१६७) २२००२२, अध्यक्ष. २२००९३

जा. क्र. दिनांक - / / २०

Foreword

Sanitation has received increased attention in recent years in India. It is also high on Government of India's agenda as evident through the launch of Swachh Bharat Mission.ForWai Municipal Council, keeping the city clean has been an avowed goal, towards which both the elected members and the officers of the council work hard.

Wai Municipal Council was introduced to Service Level Benchmarks (SLB) by All India Institute of Local Self Governments (AILSG) and CEPT University through Performance Assessment System (PAS) project. We have since keeping a close eye on our service levels and striving to maintain and improve services.

Wai was fortunate to be among the four cities selected by MJP and WSSD for the City Sanitation Plan exercise. It has provided us with an opportunity to learn from other cities and the teams of experts who have worked with us in preparation of this plan. We . thank members from CEPT, AILSG and Micro Cloud Computing (MCC) for their support. I am particularly thankful to CEPT and AIILSG, for supporting us in implementing our plans to make Wai as open defecation free cities. I am proud to say tha Wai has become a role model for other small towns in Maharashtra becuase of our efforts in designing a demand based scheme for own toilets and integrated faecal sludge management plan. We hope that within the next three years, we are able to achieve this goal.

Mrs. Asha Raut
Chief Officer
Wai Municipal Council

January 2015

CHIEF OFFICER
Wai Municipal Council, Wai

WAI MUNICIPAL COUNCIL WAI WAI

Acknowledgements

The City Sanitation Plan (CSP) for Wai was prepared by the PAS team as a part of its support to the Government of Maharashtra (GoM) on sanitation related activities. The focus of the CSP was on 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).

On the outset 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 Wai Municipal Council (WMC) 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 WMC, Mrs Asha Rout. Support from other officials of the WMC, particularly Mr Gaikwad, City Engineer, and Mr Gosavi, 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 (AIILSG) worked further on the analysis of information. The team worked closely with WMC 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
LSGs	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
MJP	Maharashtra Jeevan Pradhikaran
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
WMC	Wai Municipal Council
WNP	Wai 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 to the preparation of a City Sanitation Plan (CSP) for Wai Municipal Council. It describes the approach and methodology used in preparing this Plan, highlighting the ongoing nature of the CSP process. Finally, it gives an outline of the overall report.

The Wai 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 Water Supply and Sanitation Department (WSSD), Government of Maharashtra (GoM), Maharashtra Jeevan Pradhikaran (MJP) and Wai Municipal Council (WMC).

1.1 Background

To address the sanitation situation in small and medium towns and in the context of 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 City Sanitation Plan for the WMC 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 similar service levels with a less capital intensive option.

The city-wide sanitation assessment builds on new thinking in urban sanitation that goes beyond 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 Wai 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 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 WMC has selected key priority areas for implementation. CEPT University is supporting the Council to: ensure universal access to own toilets and preparation of an Integrated Faecal Sludge Management (IFSM) Plans 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 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).

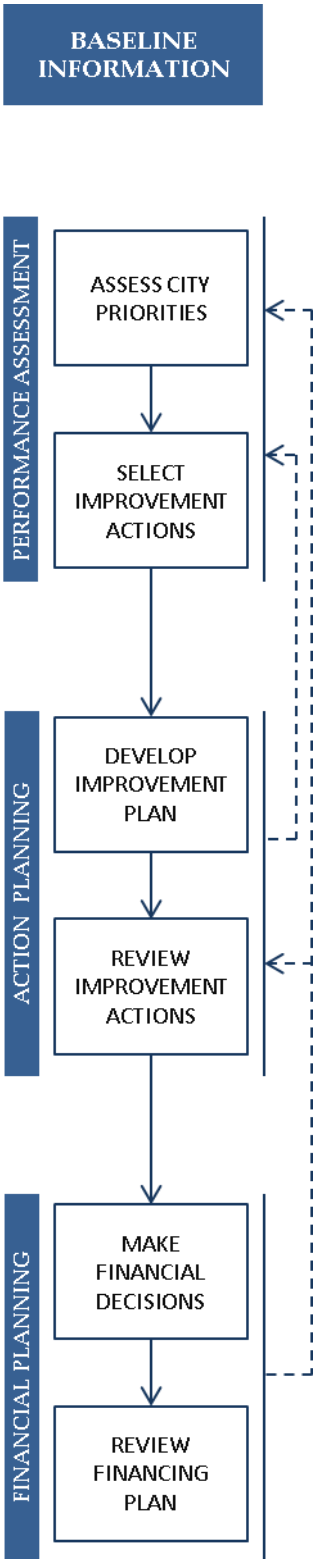
1.2 Approach and Methodology

The approach to 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 onsite 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 local body 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:** Analysis of SLB indicators along with additional indicators for on-site system and equity pointed out the gaps in current services. In addition, 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 Wai. 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 so phased so that universal coverage of toilets and 100 per cent safe management are achieved at the earliest. Based on urgency of the project, logical sequencing and availability of resources

- **Stakeholder consultation:** Analysis of the existing situation as well as proposals were discussed and debated with all the stakeholders including the city officials, elected representatives and officers of the 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 partnership (PPP), beneficiary contribution and urban local body's (ULB's) 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 WMC. These four chapters cover the performance assessment and 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 process 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 Wai 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

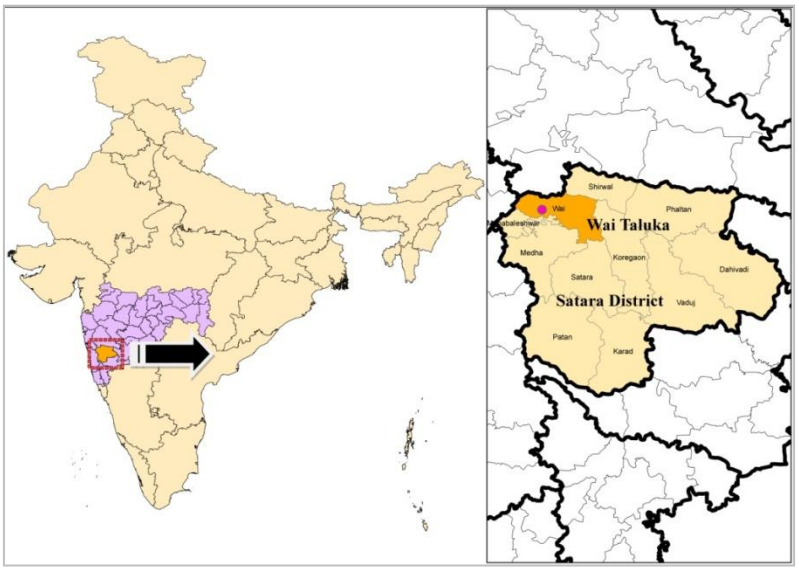
The following chapter describes the town profile, and highlights its geographical location and regional settings. It also elaborates demographic profile of the town and estimations of its population growth in future, anticipating various factors affecting the town and the past trends of decadal population growth. Overall development pattern, urban sprawl, ecological factors like climate, rainfall, soil structure, topography and natural drainage are also discussed.

2.1 Location and Regional Settings

Wai is a town in Satara District in Maharashtra, India. Wai has the epithetic name Dakshin Kashi. The town is known for its ghats on the banks of river Krishna and is known to have around 250 temples. Wai is also a well known film shooting destination. The town extends on both sides of the river; the older part of the town is more than 350 years old.

Wai is located at 17°56'N and 73°53'E, south of the city of Pune. The town is 35 km from Satara, 95 km from Pune and 250 km from Mumbai. Situated on the Mahad-Pandharpur State Highway, it is a major city on the way to the hill stations of Mahabaleshwar and Panchgani. Wai is surrounded by the mountainous region of the Sahyadris with an average elevation of 718 meters (2,355 feet).

Figure 1: Location and regional settings of Wai



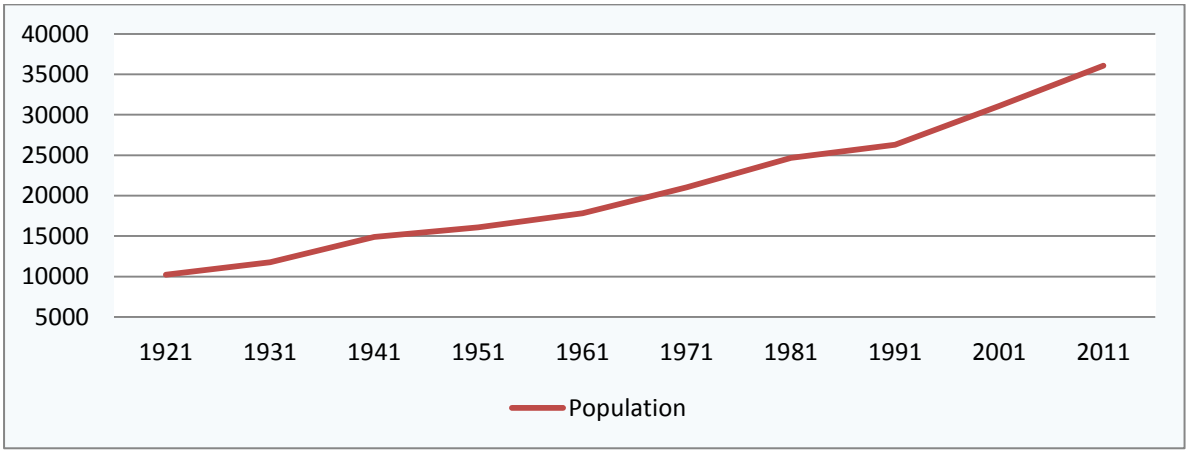
2.2 Demography

Population trends and forecast

According to Census 2011, Wai has a total population of 36,025. In 2001, Wai had a population of 31,090. (Males constituted 51 per cent of the population; females, 49 per cent.) Literacy in Wai was

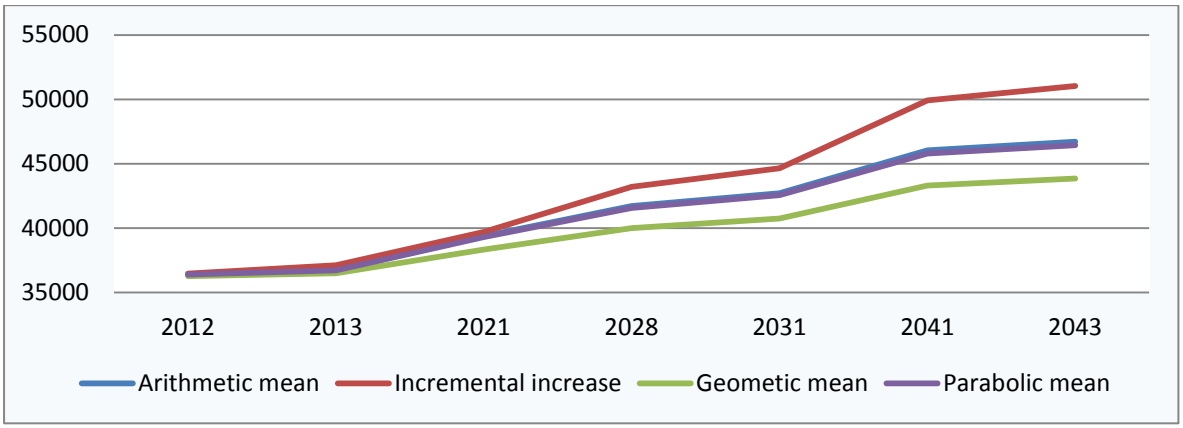
77 per cent – male and female literacy being 81 per cent and 73 per cent, respectively – which is higher than the national average of 59.5 per cent.

Figure 2: Population growth over the years



Wai has grown moderately in the last century. The decadal growth rates have varied between 26.6 per cent in 1931–41 to 6.6 per cent in 1981–91. In the last two decades, Wai's population has grown at an annual rate of 1.7 per cent and 1.5 per cent, respectively.

Figure 3 : Population projections using various methods



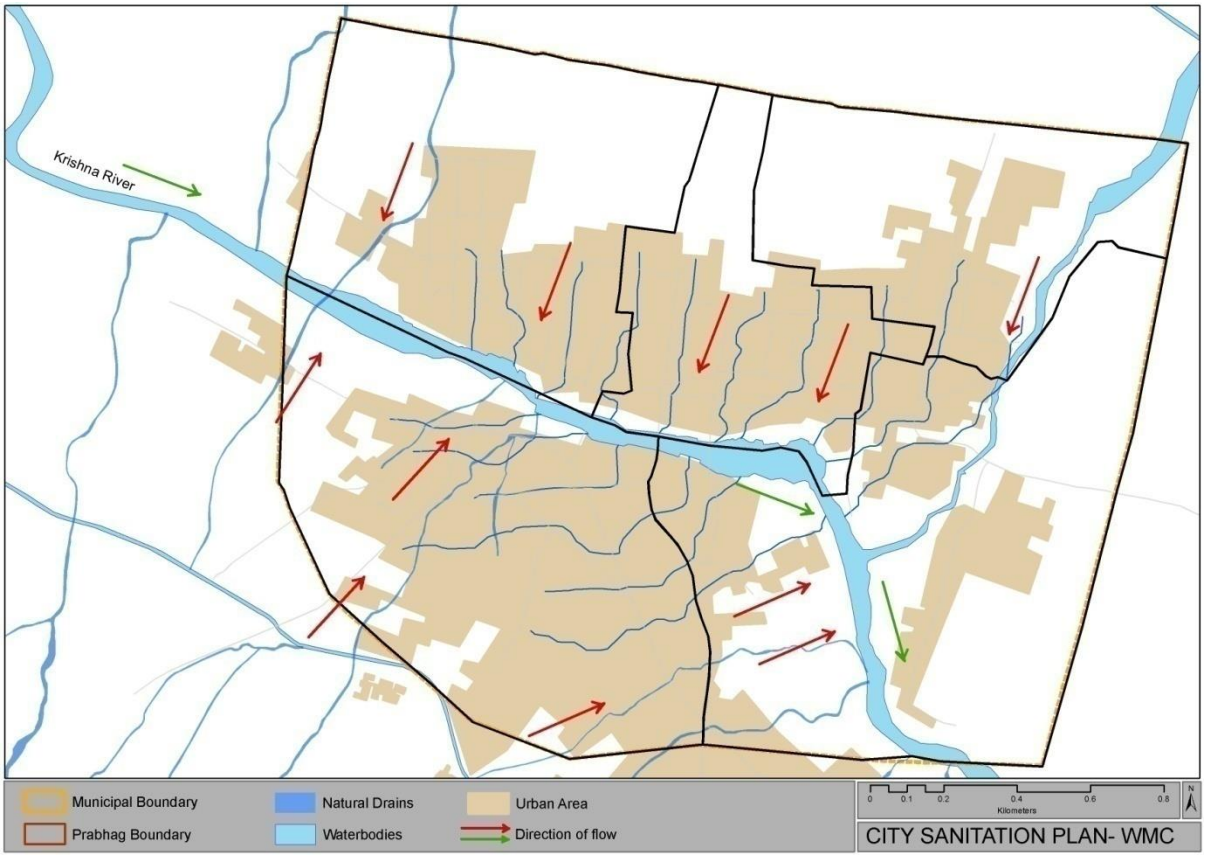
2.3 City Ecology

Climate and rainfall

The climate is moderate with temperatures during the summers (March to mid-June) reaching a maximum of 34°C, and in the winters (November to March) dropping to 10°C.The monsoon starts in June with maximum precipitation in July and August. Total rainfall is 3,104 mm although there are large differences in the amount of precipitation over various parts of Satara district.

Such heavy rainfall along with the undulating topography puts stress on stormwater management. The frequent flooding of river Krishna and release of water from upstream Dhom dam only increases the severity of the problem faced by the city.

Figure 4: Natural drains and their flow



Terrain and topography

The older part of the city, on the north of the river, consists of Prabhags 1, 2 and 3. The new developments have used land on the southern side of the river, now consisting of Prabhags 4 and 5. The terrain is favoured by a uniform gradient converging towards the river, which complements the natural drainage system and stormwater management. The city experiences considerable variations in altitudes, the lowest being 677 m and the highest being 1,092 m.

Soil structure

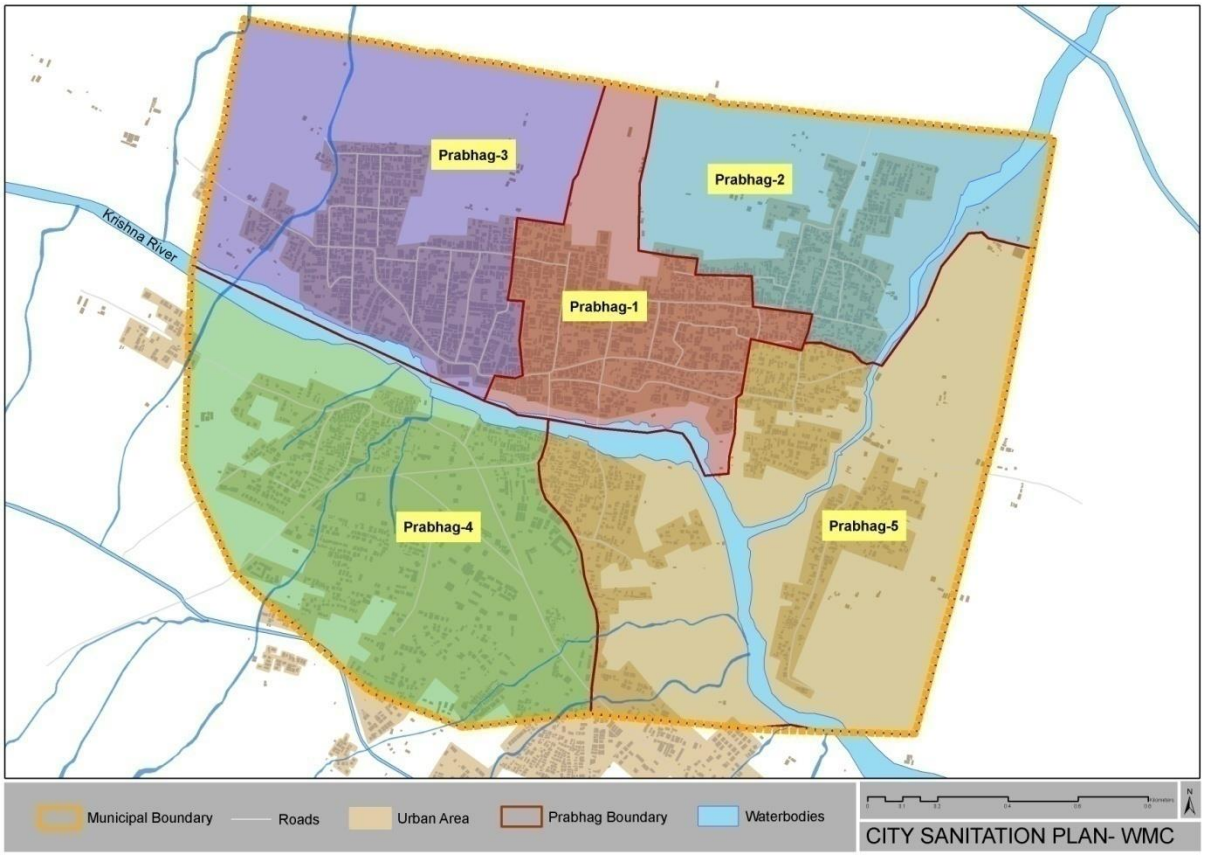
The soil stratum in Wai Taluka is black cotton soil, medium deep. Being very fertile and having good water holding capacity, black soil is good for agricultural activities. Hence the town is predominantly agro based. At certain places mixed soil conditions of the black soils with laterite or red soils are observed. This region experiences heavy rainfall and thus these soils are subjected to a high degree of erosion. The good water holding capacity of black cotton soil is helpful in enhancing the groundwater.

Spatial patterns of development

In old city areas, most of the houses are single- or double-storied with a common wall between adjacent houses. In the new town, plotted development such as bungalows and apartments are

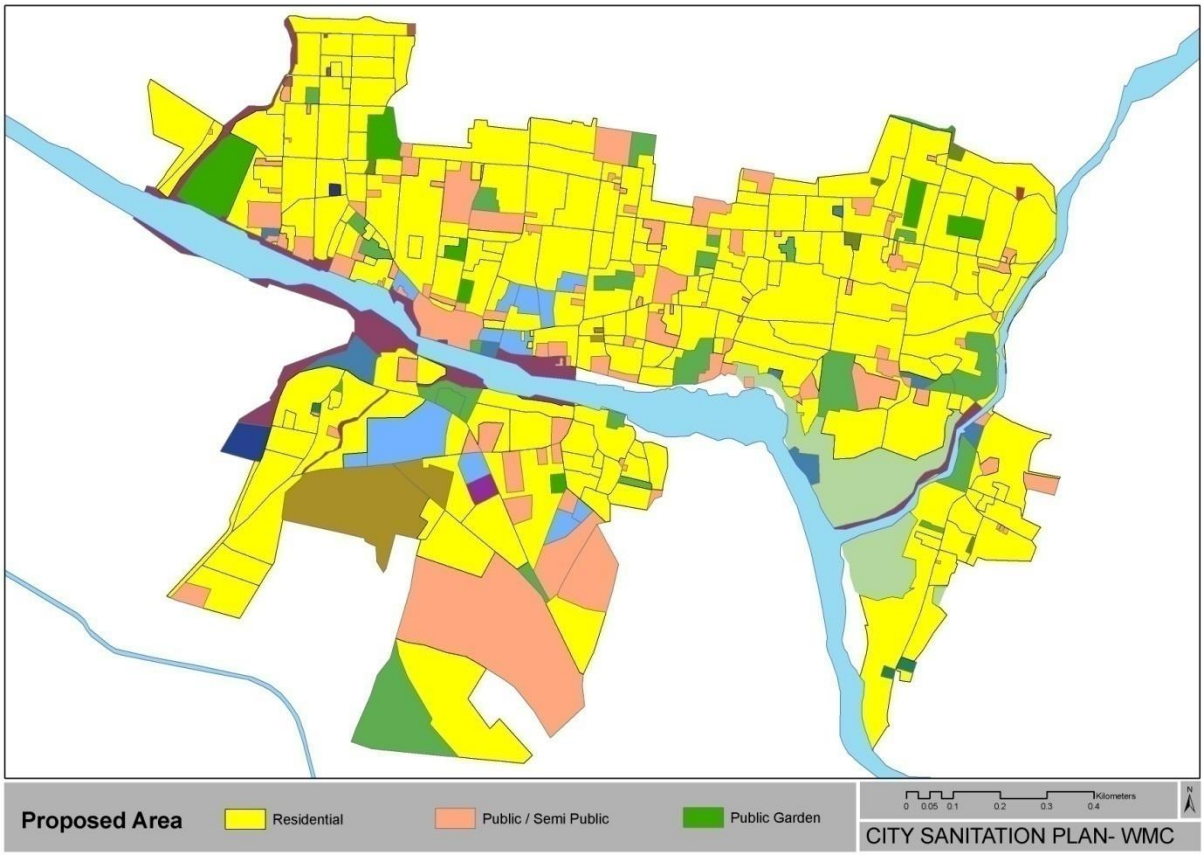
more evident. The old town area is typically characterised with narrow street widths and linear plots similar to old Wada housing typology in Maharashtra.

Figure 5: Administrative divisions



The development plan for Wai has proposed for future residential zones in Prabhags 1, 2 and 5 in the northern and south-east parts of the town. At present, most of these areas are predominantly agricultural land with sparse plotted development.

Figure 6: Development plan



2.4 Water Supply in Wai

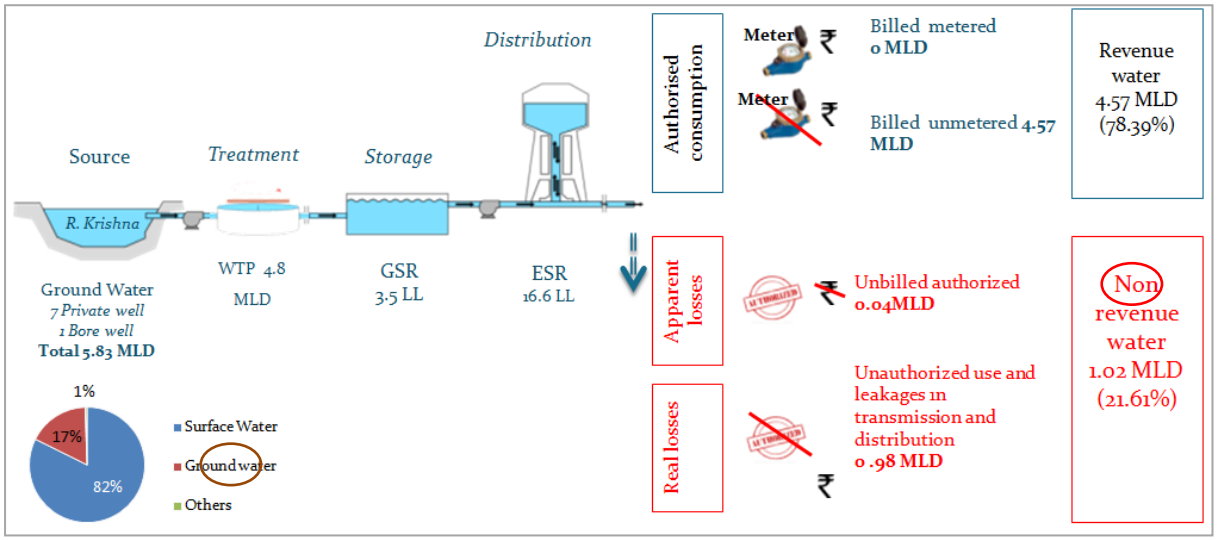
Wai is dependent on river Krishna for its water supply. There are seven private wells in the peripheral areas of the town and one bore well near Siddhanath Wadi temple, both used for domestic purposes. Eighty-two per cent of water requirement is tapped by surface water sources and 17 per cent through groundwater. Other sources constitute only 1 per cent of the total water supply in Wai. At present, the per capita water supplied in the town is reported to be 127 litres per capita per day (lpcd).[1] Figure 7 explains the process of water supply and quantities at various levels. As seen, Wai has non-revenue water (NRW) levels at 21.6 per cent, a large part of which can be attributed to the real losses caused by leaks in transmission and distribution lines.

Water storage

In Wai, out of a total 5.83 MLD water supplied, only 4.8 MLD is treated at the treatment plant. Three ESRs (elevated storage reservoirs) and two GSRs (ground storage reservoirs) are filled thrice daily.

[1] Source: Performance Assessment Systems (PAS) data, 2011–12.

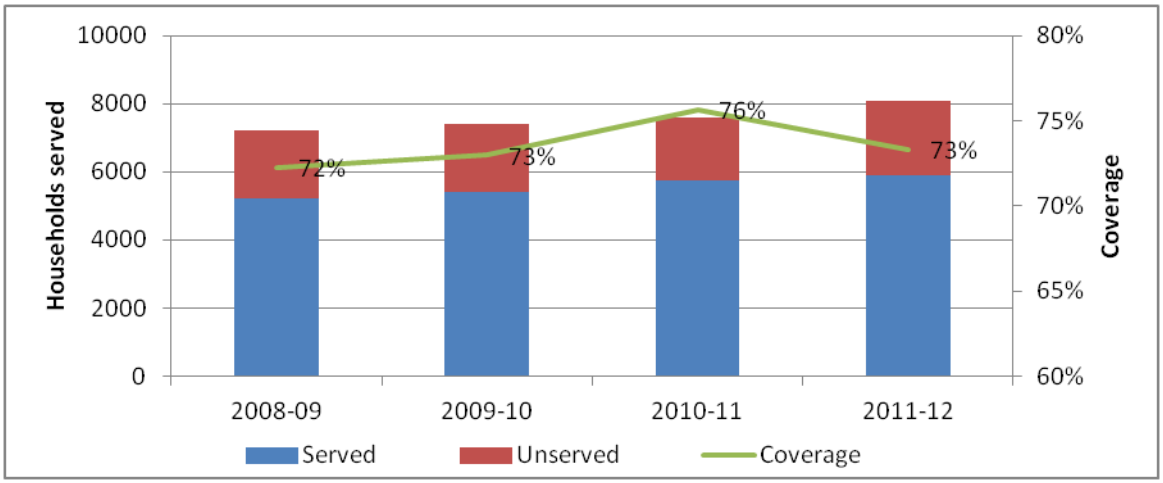
Figure 7: Water supply process



Water distribution and supply

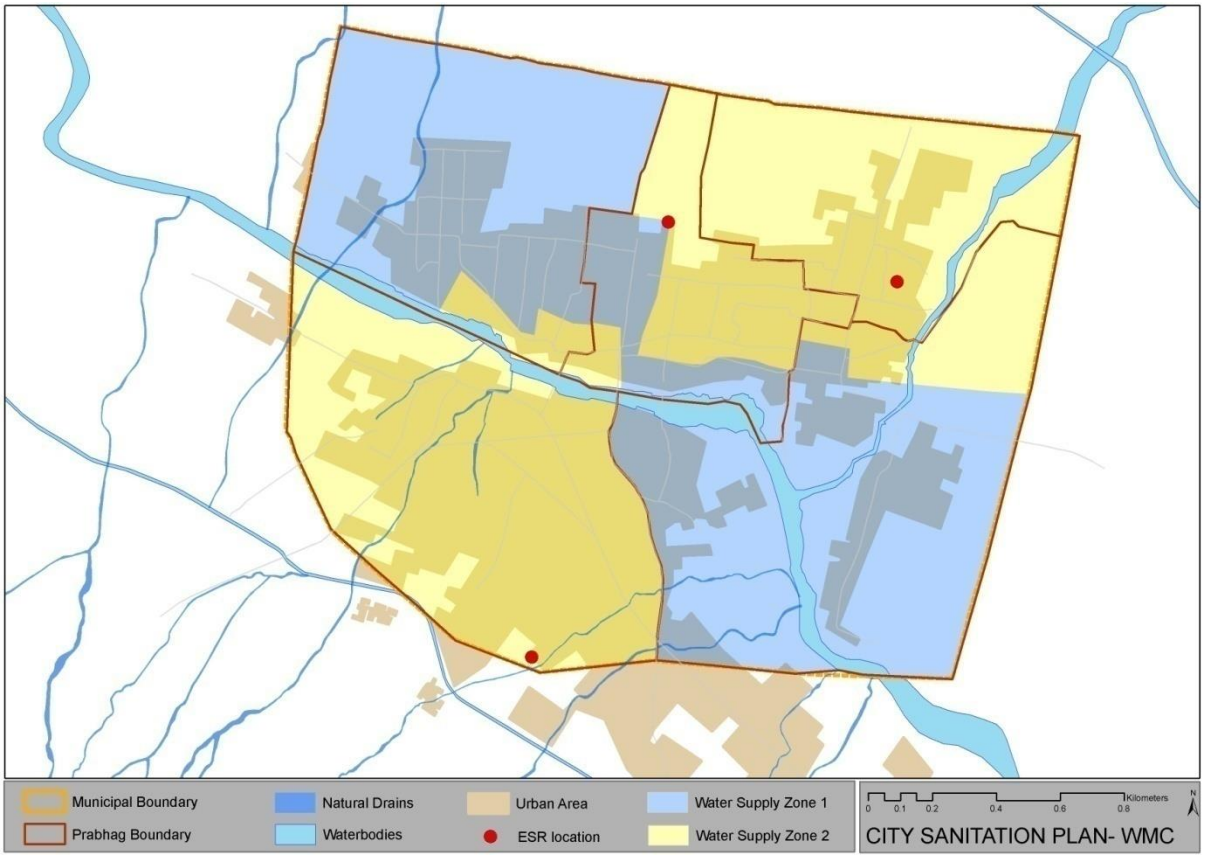
The coverage of piped water supply connections is about 73 per cent – 5,915 out of 8,066 households are served by the connections. Figure 8 shows trends in number of households served with water supply for the last four years. It has been noticed that the percentage of households served by water supply has increased slightly from 72 per cent to 73 per cent from 2008–09 to 2011–12. However, considering an SLB of 100 per cent coverage, the town still experiences a gap of 26 per cent. Water supply network is yet to be extended to the newly developed areas (in southern side, that is, Prabhags 4 and 5) in the periphery of the town. The city does not have individual connections in slums and is devoid of any metering at household level.

Figure 8: Water supply coverage over the years



Wai town is divided into two zones and water is supplied to both zones for 45 min/day. In addition, water is supplied in the evening for 45 minutes on alternate evenings. The water supply timing for Zone 1 is daily from 4:30 am–5:15 am and 7 pm–7:45 pm on alternate evenings. Timing for Zone 2 is daily from 9 am–9:45 am and 9 pm–9:45 pm on alternate evenings.

Figure 9: Water supply zones and location of ESRs



In slum areas there is no provision of individual piped water supply connections. The distribution system is absent and almost all the slum dwellers rely on the community (public) taps nearby. There are 40 public taps in the town. As observed during the surveys, about five to six households in the Kashikapadi slum have opted for piped connection and they facilitate water to neighbours with minimal charges like Rs 10–20 for water usage. However, slum households will get individual connections once they shift to houses constructed for them through the Integrated Housing and Slum Development Programme (IHSDP) which is likely to be complete by 2014.

3. Access to Sanitation

This chapter presents the existing situation in the city with respect to availability of toilets to household in their premises or at community levels as well as at public places. 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.

As per Census 2011, 68 per cent of households in Wai have access to individual toilets. A considerable number of households (30 per cent) depend on community toilets.

Table 1: Toilet coverage in Wai

Component	No.
Total households	7,580
Households with individual toilets	5,145
Households relying on community toilets (CT)	2,300
Households practising open defecation (OD)	135

Source: Census 2011.

The old town on the northern side of river Krishna (comprising Prabhags 1, 2 and 3) is marked by dense residential areas where dwelling units (mostly wadas) are closely packed leaving no space for sanitation services within the premises. The newly developing colonies on the southern side of the river (including Prabhags 4 and 5) largely have access to individual toilets and are less dependent on community toilets compared with old town area.

3.1 Household-level Toilets

On-site waste and septage management in household toilets

The CSP survey reveals that, mostly, all existing individual toilets are pour flush latrines are connected to septic tanks. However, in most cases, these septic tanks, usually constructed below the toilet superstructure, vary in sizes and dimensions. The predominant reasons for this are cited as space constraints and limited knowledge about functioning of septic tanks.

Table 2: Details of existing on-site sanitation treatment

Component	No.
Households with individual toilets	5,145
Toilets with septic tanks	4,429
Toilets with non-functional septic tanks (about 20%)	886
Toilets with other facility	716

Source: Census 2011.

Due to space constraints, most households construct a toilet outside the house abutting the main street. In such cases the effluent of the pit/septic tank is discharged into the roadside open or closed drain. The newly developed residential areas (including bungalows, group housing schemes) in the

city seem to have properly designed septic tanks as the primary treatment for blackwater. However, the septic tanks do not always connect to soak pits. The effluent from the septic tanks is discharged in the open drains along the road.

Household-level toilets.

Field interactions confirm that most residents lack knowledge about functioning and maintenance of on-site facilities. The toilet seats/pans for individual toilets are regularly cleaned; however, periodic cleaning of the pits or septic tanks is not carried out. While effluent is discharged into the nearby open drain along the street, the faecal part remains in the pit or tank and is not flushed out for several years. The responses during personal interviews and group discussions revealed that the toilet pits were cleaned only once in three to seven years.

A survey of 100 individual toilets was conducted during CSP preparation to assess availability and status of on-site treatment and disposal of blackwater from individual toilets. Locations of toilets were marked and information on typology of on-site treatment facility, construction techniques, cost incurred for construction and cleaning and maintenance practices followed by households was recorded. The assessment revealed the following insights:

Table 3: Observations about on-site sanitation facilities

Location of toilets	Usually located on the external face of premise/front yard closer to access road; detached or semi-detached from residential unit
Location of pits/septic tanks	Constructed mostly below superstructure (toilet block) in old town area, or in front yard and beneath the ground level off centred from the superstructure
Construction and design norms	• No design norms followed: Irregular sizes of septic tanks varying from 3’ x 3’ to 4’ x 8’ and depth varying from 4’ to 6’ • Construction in brick walls plastered from inside • Effluent discharged into abutting open/closed drain along road
Cleaning practices	• No periodical cleaning of pits and septic tanks • About 80% HH (that have individual toilets since last 6 to 7 years) responded not having cleaned the tanks in last 4 to 6 years • Effluent, in all cases, is discharged into drains

Source: Primary survey.

3.2 Community-level Sanitation Facilities

Due to the absence of individual household level latrines, about 2,300 households rely on community-level sanitation facilities. At present there are 45 community toilet blocks in the city with 283 seats, of which 264 are functional. Of these 45 community toilet blocks, 30 are older toilet blocks and the remaining are newly constructed. Recently three non-functional community toilet blocks were also demolished. Table 4 shows Prabhag-wise availability of community toilets.

Table 4: Prabhag wise availability of community toilets

Community toilet details	Prabhag 1	Prabhag 2	Prabhag 3	Prabhag 4	Prabhag 5
No. of toilet blocks	3	6	8	13	15
No. of seats	29	51	34	79	90
No. of functional seats	29	51	33	67	84
Remark	Usable and cleaned every 2 days	Usable and clean	Dampness and decay in the walls	Foul smell	Neat and clean condition
Managed by	ULB				
User charges	None				
Type of on-site treatment	Septic tank				

Source: Wai Municipality; Primary survey.

Figure 10: Location of community toilets

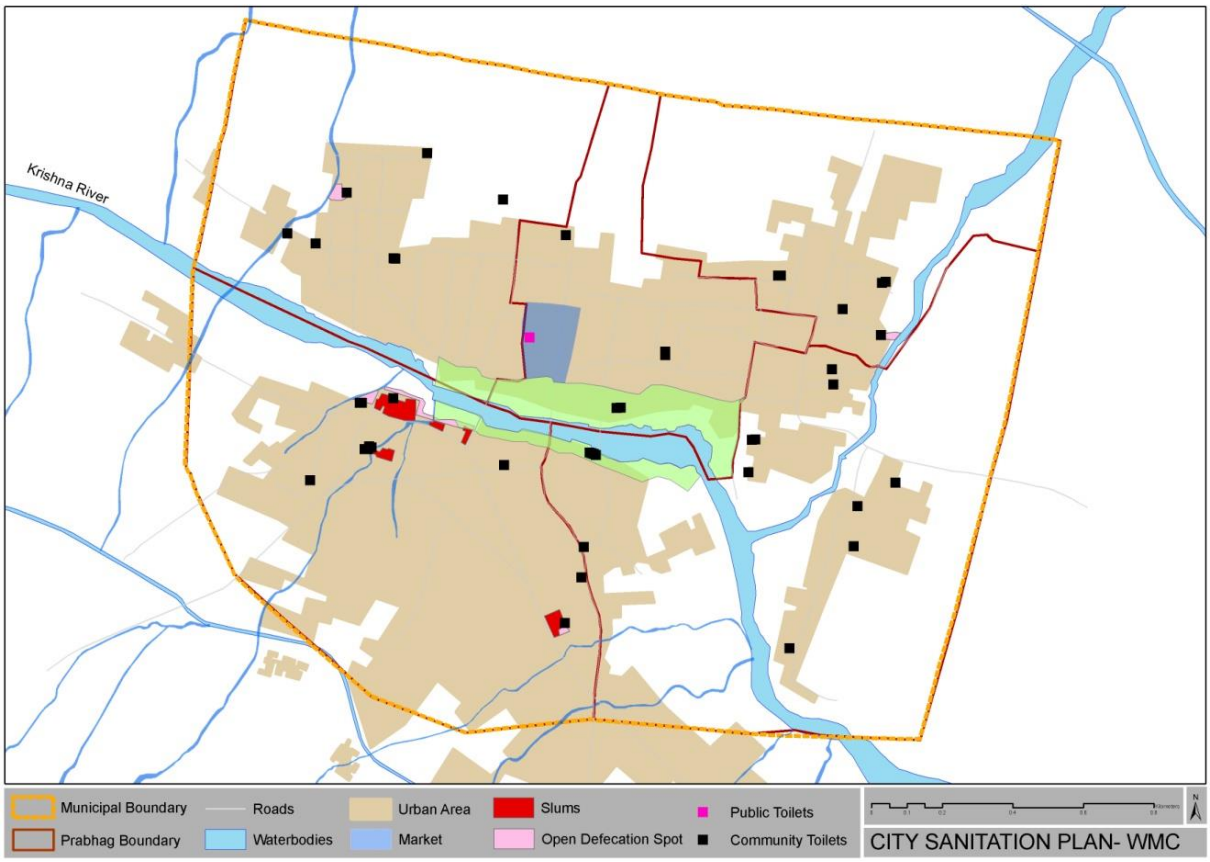
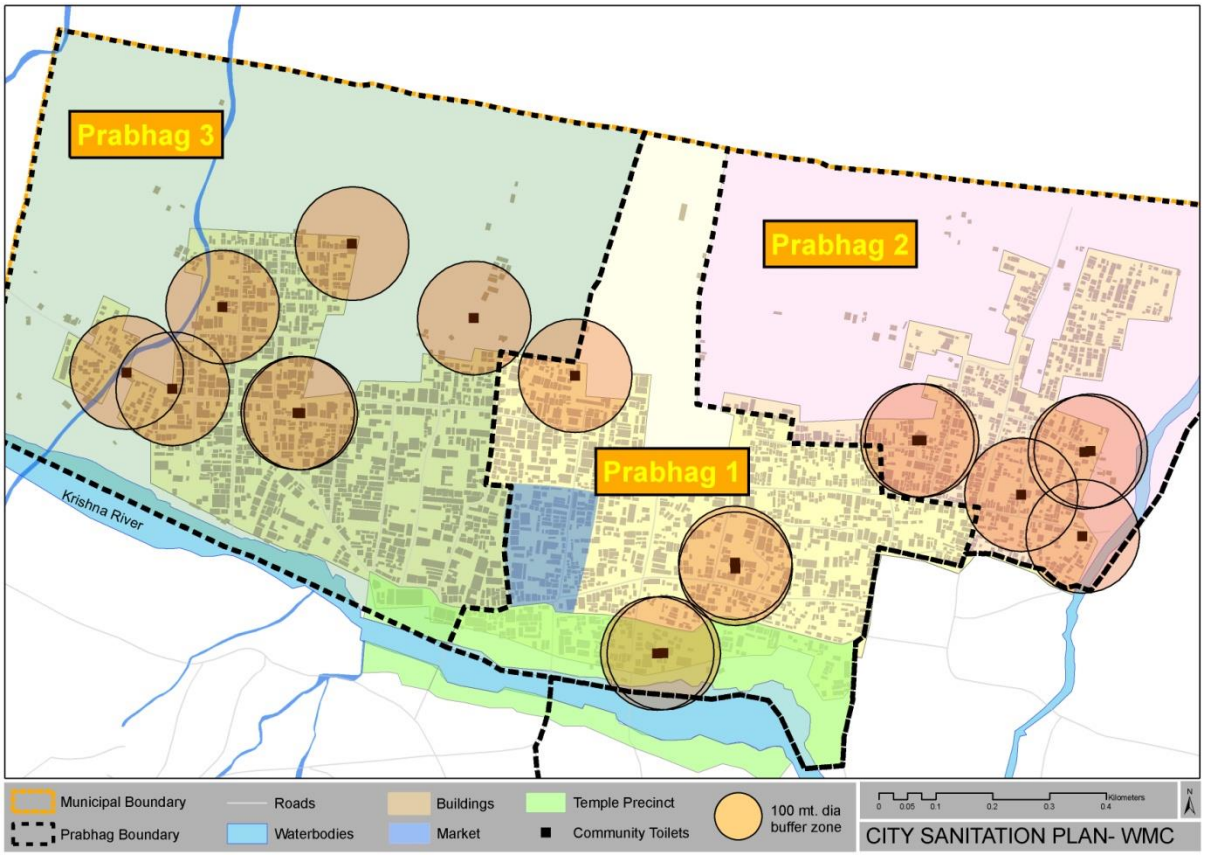


Figure 10 shows the location of existing community toilet blocks in the city. At present, all the community toilet blocks are maintained by a private contractor and no user fee is charged. However,

the primary surveys and interactions with the users revealed certain issues regarding the existing status of community toilets.

Each toilet block is provided with a water storage tank and availability of water does not seem to be an issue. However, in some blocks (water storage tank of toilet block in Kashikapadi slum in Prabhag 4) it was observed that improper construction of the tanks makes it unusable. These tanks are open and are easily accessible and this, in many cases, leads to misuse of water. Almost all the older toilet blocks lack electricity and lighting facility which affects the usage during nights. Doors are in working condition; however, incidents of taps having been stolen have been reported in a few cases.

Figure 11: Location of community toilets in Prabhags 1, 2 and 3

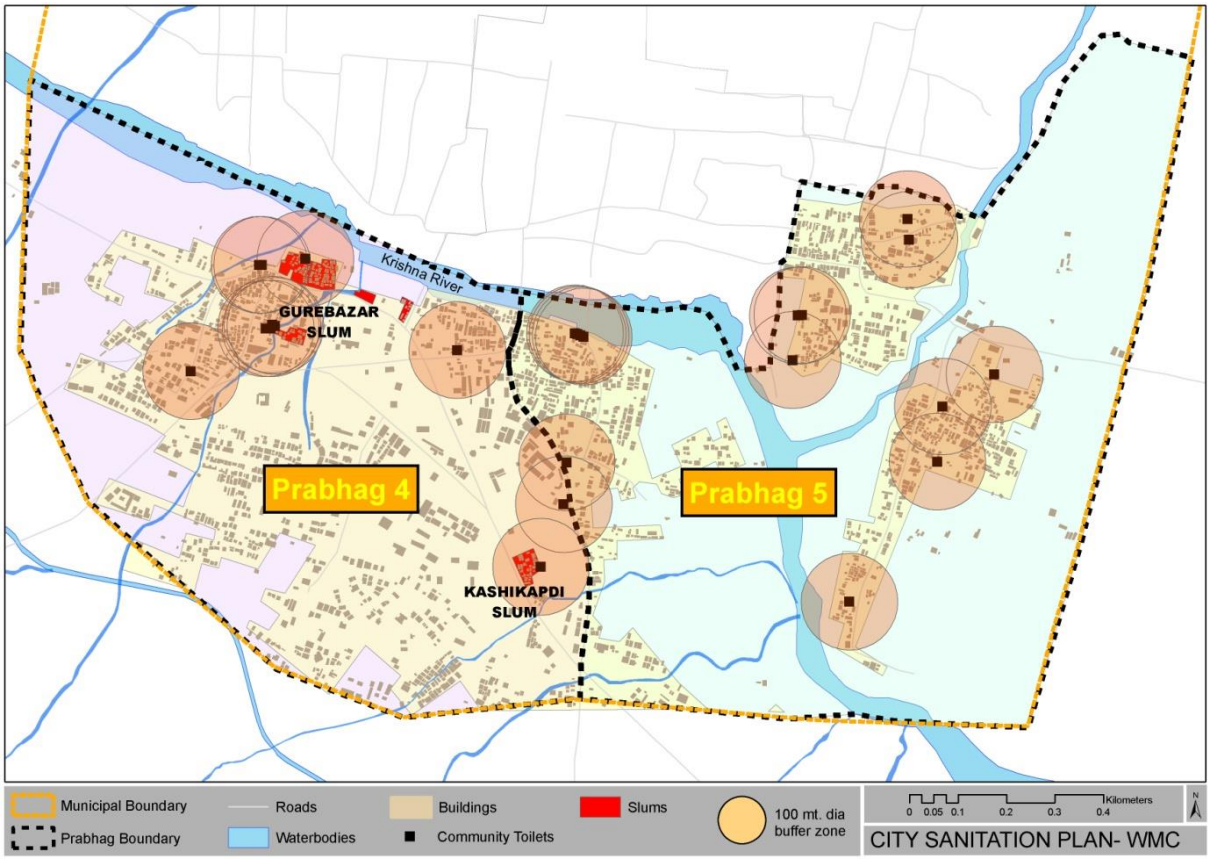


Source: Primary survey (map not to scale).

The newly constructed toilet blocks are different in design as compared with the old ones – they are provided with urinals, water traps, electricity and entrance lobbies, as well as and a counter for one maintenance person. In Kalwaat Aali (Prabhag 3), insufficient toilet seats and irregular maintenance of the block leads to open defecation behind the toilet block itself. For the community toilet block on Parakandi road and in Gangapuri (Prabhags 2 and 3, respectively), it was observed that people commute about 100 to 150 metres daily to use the facility.

Community toilet blocks in Wai.

Figure 12: Community toilets in Prabhags 4 and 5



Source: Primary survey (map not to scale).

On-site waste collection and treatment in community toilets

The community toilet blocks have pour flush latrines connected to septic tanks. Having no provision of soak pits, the effluent from the tank is discharged into nearby open or closed drains along the road. The septic tanks in the older community blocks do not function due to improper construction and sizes. The primary survey assessment revealed that septic tanks/pits are left uncovered, hampering their functioning and allowing rainwater and solid waste to enter the tanks. The sludge from these tanks was observed to be overflowing as they were not periodically cleaned.

Septic tanks in community toilet blocks.

The older blocks have water storage tanks. In some cases, however, they are closer to the ground and are thus polluted. The older blocks are in a dilapidated condition and damp. Some of the older blocks also lack individual water and electricity connections. Their design is, however, simple and easy to maintain and thus they are comparatively cleaner than the newly constructed toilet blocks.

Operation and maintenance of community toilets

Primarily, in any municipal council, the local authority performs the operation and maintenance of community toilet blocks. The WMC has limited human resources for the maintenance of toilets and so has preferred to outsource all community toilet blocks to a private contractor/service provider. Community toilets are operational for 24 hrs and no user fee is levied from users. The contract is for one year and expenses incurred are Rs 135,400 per month for maintenance of all blocks. The toilet blocks are well maintained and regularly monitored by the ULB.

3.3 Public-level Sanitation Facilities

Status of public facilities

The central core area on the northern side of the river houses key commercial areas such as the vegetable mandi, informal market place, commercial areas, banks, hotels and other such establishments. Most institutional building campuses are located in the southern part of the town that is, Prabhag 4. These include a court building, hospital campus, Forest Department office, PWD campus, bus terminus and the Tehsil office, as well as a few private and municipal schools. Figure 13 shows the locations of key commercial and institutional areas in Wai.

The central market area.

The Forest Department and PWD offices are located on the main road and provide access to the toilet facilities for the outsiders. With this additional load of users and in the absence of any kind of maintenance, the toilet block is inadequately maintained and has become unsuitable for usage. The community block opposite the Tehsil office campus is meant for use only by the residential areas around it. However, it is also used by the visitors and serves as a public latrine, which results in issues with its maintenance. The toilet block in the premises of the bus stand has non-functional and broken taps. The toilet block has enough urinals and seats and is maintained by the local workers of state transport. There is a parking lot near the temple but without any toilet facility for the visitors to the temples, and thus leads to increased open defecation in the area. Similarly, municipal schools have insufficient seats and water facility, are not cleaned regularly and are poorly maintained.

Toilet blocks near Tehsildar's office, Forest Department campus and in the market area.

Figure 13: Institutional and commercial areas in Wai

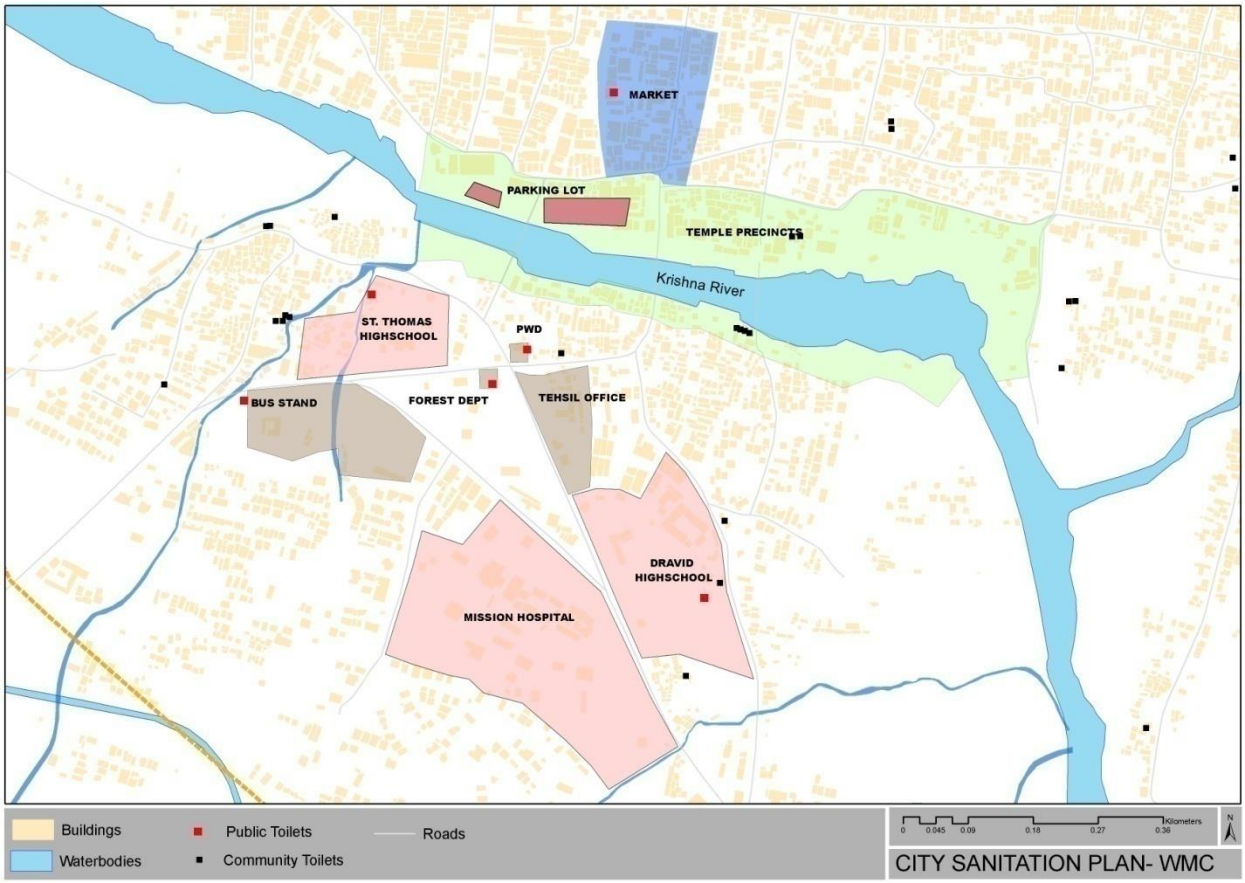


Table 5: Status of public sanitation facilities

Toilet	Condition	No. of users	Demand gap[2]
Market area (10 seats + 5 urinals available)	This toilet is inadequate to serve or cater to the load for the market area. However, it is well maintained by private operator	Approx 600–800/day	6 seats & 3 urinals required
Bus stand (7 seats + 10 urinals available)	The toilet has sufficient seats and urinals and is maintained by the local workers of state transport. Due to continuous usage the toilet is left unclean. Water supply is an issue	Approx 500/day	3 seats required. Urinals are adequate as per norm
Forest department (2 seats available)	The toilet block has one seat for men and women, which are insufficient. The toilet block is accessed by outsiders as the campus is located on the main road	Approx 50–75/day	1 urinal required
PWD (3 seats – 2 functional available)	The toilet block has two seats for men and one seat for women, which are insufficient. The seat for women is not functional. The toilet block is accessed by outsiders as the campus is located on the main road	Approx 300/day	3 seat & 3 urinals required Suggested to repair non-functional seat with necessary infrastructure[3]
Tehsil office	A community toilet for the residential area is located opposite the Tehsil office and is accessed by outsiders and proves to be inadequate due to additional load	Approx 300/day	6 seats & 3 urinals required
Parking lot near Dholya Ganpati mandir	The parking lot in front of the temple precincts does not have provision of a toilet block. The people visiting the temples defecate in the open along the ghats due to unavailability of the facility	Approx 300/day; no toilet facility	6 seats & 3 urinals required
Temple precincts	The temple precincts and ghats are not provided with toilet blocks and thus open defecation by the floating population is observed	Approx 400/day; no toilet facility	8 seats & 4 urinals required

Source: Primary survey.

[2]As per guidelines published by Ministry of Urban Affairs and Employment, for market places and other public utility buildings, one urinal per 100 users and one seat per 50 users should be provided.

[3]Assessment is required to identify the repair works for non-functional seats along with availability of water taps, door, electricity, etc, and needs to be repaired accordingly.

Table 6 : Existing sanitation status in schools

School	Seats	Users/day	Water availability	Electricity availability	Remarks
Dravid High School	Men: 1 seat, 10 urinals Women: 2 seats, 10 urinals	1,350	Individual connections	Available	Neat and clean toilet blocks O&M by private person appointed by school
St Thomas	Men: 1 seat, 6 urinals Women: 1 seat, 6 urinals	150	Individual connections	Available	Dilapidated condition of toilet block O&M by private persons appointed by the school authorities
Govt School No 10	Men: 2 seats, 12 urinals Women: 2 seats, 12 urinals	235	Not available	Not available	Clean toilet block O&M by private persons appointed by school
Govt School No 5	Men: 1 seat, 12 urinals Women: 1 seat, 12 urinals 1 block for teachers	450	Not available	Not available	Blocks are dilapidated Poorly maintained by the WMC

Source: Wai Municipality, Primary survey.

3.4 Sanitation in Slums

Wai has 6 per cent of slum population residing in two major pockets, Kashikapadi and Gure Bazaar, both located in Prabhag 4. The total number of slum households is 342. The coverage of individual toilets in slums is 65 per cent, which is less than average overall city coverage of 68 per cent. The open defecation percentage in slums is higher than the city average at 5 per cent. Thus, increasingly, both slums and non-slum households in Wai use community toilets which are maintained by the municipality.

Table 7: Slum details

Parameter	Gure Bazaar	Kashikapadi
Slum households	271	71
Slum population	1328	812
Status	Notified	Notified
Land status	State Government	State Government
Area	2281 sq m	3844 sq m
Age of slum	30 yrs	50 yrs

Source: Wai Municipality, Primary survey.

Table 8 shows slum-wise existing community blocks, seats available and their status.

Table 8: Community toilets in slums

Slum area	Gure Bazaar	Kashikapadi
Population	1,328	812
Seats available	4	8
Maintained by	ULB	ULB
Demand gap	50 seats required	6 seats required

Source: Wai Municipality, Primary survey.

Kashikapadi is a 30-year old slum; the residents are involved mainly in trading of metal goods, utensils and scrap collected from surrounding villages. The housing typology in the slum is mainly semi pucca (30 houses) and temporary kutchha shelters (41 houses) constructed of brick walls and corrugated metal sheet roofing.

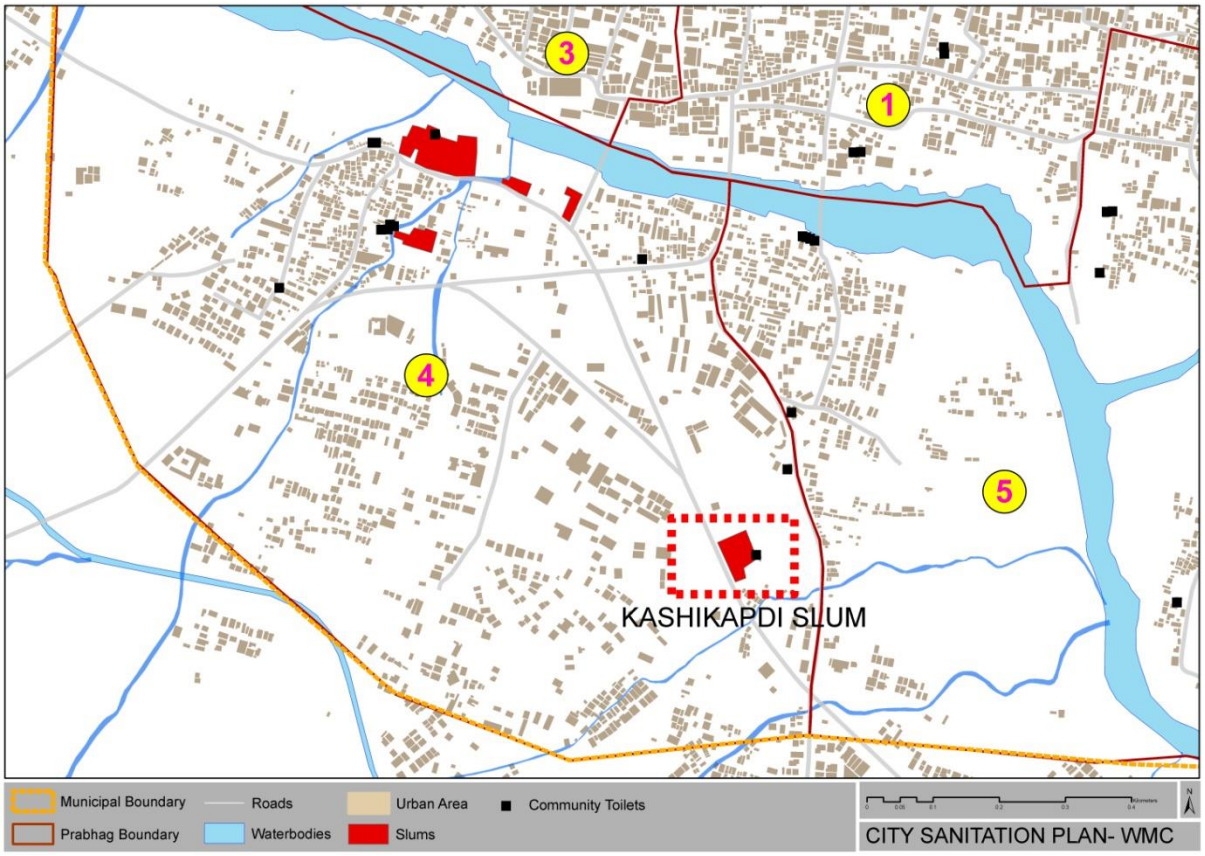
As is evident in Table 8, there are inadequate number of seats in community toilets in the slums. The children and men therefore practice open defecation. Women continue to rely mostly on the community blocks. The slum lacks basic amenities like adequate water supply, toilets and drains for wastewater. From the primary survey conducted by the team for the preparation of the CSP, it has been noticed that for water supply 83 per cent HHs rely on community water taps while 17 per cent have individual tap connections. Since the reliance on community taps is high, many HHs resort to purchasing water from neighbours or private suppliers.

The existing community toilets are cleaned only two or three times a week by the urban local body (ULB) appointed staff. The toilets are connected to septic tanks with no facility for wastewater

disposal and the greywater from houses is left to stagnate in open. Solid waste is dumped in the open because there is no door-to-door coverage service in slums.

Kashikapadi slum.

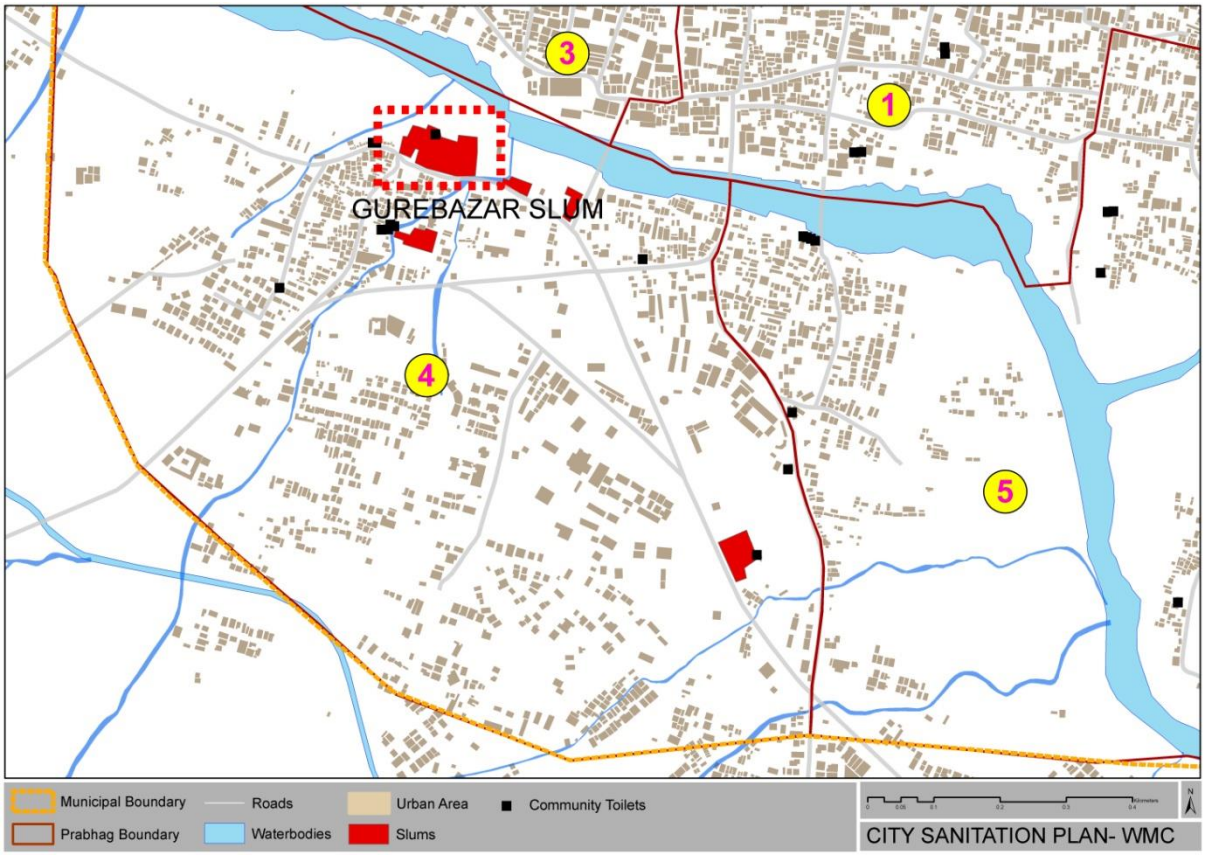
Figure 14: Location of Kashikapadi slum



Gure Bazaar slum is located along the banks of river Krishna. The slum is characterised by densely packed low-rise temporary structures. Most of the residents rely on fishery or daily wage works on construction sites for their livelihood. Currently, one community toilet block has been provided for the slum dwellers. For bathing, some dwellers have developed the wash area in their premises. However, most of them go to the river for bathing and washing clothes. The percentage of open defecation is considerably high in the slums, especially by children and men, because toilet seats are insufficient. The toilet user group comprises mostly women. There is no conveyance system for wastewater, due to which it is left in the open, leading to stagnation and unhygienic conditions.

Gure Bazaar slum.

Figure 15: Location of Gure Bazaar slum



The ULB is implementing the IHSDP scheme for in-situ rehabilitation of the slum dwellers through which individual slum dwellers will be provided with 270 sq ft dwelling unit including toilet and bath. Considering both the slums in the town, about 342 households are earmarked as scheme beneficiaries. The completion of the scheme is expected in the next one or two years, after which the slum dwellers will be shifted to the newly developed houses.

3.5 Suggested Strategies for Toilets

This section summarises the proposals for toilets as part of 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]

Around 32 per cent of the total city population depends on community toilets, even in non-slum areas. A survey was conducted to capture the perceptions of the non-slum households regarding preference of toilet facility. Around 10 per cent of those relying on community toilets (sample size of 220 households) were interviewed and two FGDs conducted in each Prabhag across the city. The survey reflected that 60 per cent of the respondents preferred household-level toilets, provided that 50 per cent of the capital cost is borne by the ULB. The remaining 40 per cent preferred to continue using community toilets, out of which 80 per cent were willing to pay Rs 50–100 per month towards O&M costs. The discussion reflected the fact that the respondents also preferred the option of group/shared toilets where space and finance was a constraint.

Table 9: Willingness to pay for the facility

No	Indicator	No.	%			
1	Households relying on community toilets	2,196[5]	32%			
2	Sample size	220	10% of (1)			
3	Preferred choices of sanitation facility in future			Upto Rs 50	Rs 50–100	Rs 100–150
5	Community-level toilet facility	88	40%	20%	80%	--
6	Household level toilet facility	132	60%	Capital cost up to 50% can be borne by the users. Ready to pay sanitation tax after having the toilets constructed		

Source: Primary survey and FGD.

Table 10: Prabhag-wise scenario of preferred choices

Prabhag no[6]	Sample size (HH)	Preferred choices (%)		Remark
		HH	CT	
2	55	38% (21)	62% (34)	Densely located houses with space constraints at household level
3	55	80% (44)	20% (7)	Gangapuri (baudhwasti) area has no households without toilets No space available for HH level toilets
4	55	90% (49)	10% (6)	Most of the existing dwelling units are reconstructed with HH level toilets facility
5	55	30% (16)	70% (39)	Topographical constraints and unavailability of

[4]To understand people's perception, awareness and willingness to pay for improved sanitation services, a survey and FGDs were conducted targeting slums and non-slum residents. A total of 10per cent slum households and 10% non-slum households were interviewed. Two FGDs were carried out in each Prabhag across the city (total: 10 FGDs). Both slums in Wai are proposed to be rehabilitated under scheme of IHSDP, which will include provision of toilets and septic tanks; hence surveys in slums were not used for provision of improved sanitation facility queries.

[5]The household are from non-slum areas. Slum households relying on community toilet facility are deducted from the total number of households relying on community-level sanitation facility.

[6]Prabhag 1 was not included in the survey for providing household level or community level sanitation, as it consists largely of commercial areas with very few households.

Prabhag	Sample size	Preferred choices (%)		Remark
				space is a prime issue

Source: Primary survey and FGD.

Strategy for universalising access to toilets in Wai

CSP survey results reveal that temporary arrangements for improved sanitation – O&M of community toilets, seat augmentation and initiating solid waste collection in slums – will take care of the issues faced till the IHSDP scheme is completed and slum dwellers are rehabilitated in new improved dwellings. Till then, the slum dwellers can afford to pay a small fee – they have also expressed willingness to pay for improved sanitation services when surveyed.

In non-slum residential areas, promotion of household-level toilets should be undertaken, especially in areas where people have expressed their desire for individual toilets (Prabhags 3 and 4). But in areas where there is lack of space at household level, as an immediate solution, efforts should be oriented towards building consensus on group/shared toilets (shared by two to three households) as an immediate strategy. Households should be made to use the community toilet facilities only in cases where group toilets are not possible. This can be supplemented by introducing user charges for use of community sanitation facilities. Even in these areas, promotion of individual or group toilets should be undertaken through appropriate information, education and communication (IEC) activities.

Table 11 : Prabhags and toilet availability

	Prabhag	Type of toilets
1	Prabhag 1	Consists of main commercial area with very few HHs. The existing HHs, mostly old Wadas, are being reconstructed with toilet facilities at home. Hence survey for preferred choices was not performed in Prabhag 1. There are three community toilet blocks in the Prabhag that can be used as public toilets on user fee basis to cater to the needs of floating population. Currently there is only one public toilet in the area. There is also an urgent need to repair the community toilets to make it usable
2	Prabhag 3	80% of the respondents in Prabhag 3 were willing to have individual or group toilet facilities. This Prabhag can be taken for pilot demonstration for promoting individual and group toilets
3	Prabhag 4	Most of the existing houses are being reconstructed by owners, with independent toilet facilities.
4	Prabhags 2 and 5	People prefer continuing the use of community toilets. Prabhag 2 being located in the heart of the city, there is lack of space at HH level for toilet construction. In Prabhag 5, the houses are situated on hill slopes and topographic constraints may cause hindrance in providing HH level toilets. Hence pilot can be initiated in Prabhag 2 to improve O&M services and operation on user fee basis.

Source: Primary survey and FGD.

Table 12: Highlights of pilots suggested

Prabhag	Pilot details	Options	Remark

Prabhag	Pilot details	Options	Remark
1	Promotion of individual toilets	• Explore an option of facilitating access to credit for household toilets through SHGs/credit cooperative societies/MFIs • ILCS scheme to be promoted amongst EWS through IEC	• 100% HHs in the Prabhag to be covered under Socio economic and sanitation survey to understand the actual situation. • Promotion of HH level toilets, and guidance to people on schemes available through IEC.
2	Promotion of group/shared toilets	ULB level schemes with partial subsidies to be announced to facilitate promotion of group toilets for households that face space and finance constraint for individual toilets	The ULB can announce a demand led scheme for group toilets inviting applications from households to construct shared toilets between 2-4 HHs. A partial subsidy can be provided to selected applications
3	Existing old 30 CTs to be repaired, provision of basic facilities like water and electricity	Proper monitoring of private contractor appointed by ULB for O&M of toilets	• ULB has currently appointed private contractor for maintenance of all CTs; but no user fee is charged. • In this Prabhag there is a community which is involved in cleaning of toilets. This group can be tapped to operate CTs on CMT basis.
4	CTs to be repaired and converted to PTs on user fee basis	All 3 CTs in Prabhag 1 to be renovated	The renovated toilets to be used by floating population in the main commercial area.

Action plan

As an immediate intervention, it is suggested that the existing infrastructure of old community blocks be upgraded through providing water and electricity facilities, tackling issues of waste management and enhancing the hygiene levels to reduce open defecation. It is necessary to assess the condition and functioning of all the septic tanks, especially for the on-site management system and – if required – refurbish or reconstruct them with proper technical design. At present, toilets are working as pans, are fit for use and water is available. However, absence of electricity in toilets makes them unfit for usage during nights. In addition, other necessary infrastructure such as doors, water, taps, etc, should put in place wherever required.

The existing pit latrines need to be replaced with ones connected to septic tanks to ensure on-site primary treatment of the blackwater. Households which rely on community toilets shall also be provided with individual or group toilets with septic tanks. However, to achieve 100 per cent dependency on individual toilet facility, there is a need to initiate IEC campaigns and develop pilot models which can eventually be upscaled.

Table 13: Strategies for universal access to toilets

Sector	Type of intervention	Achievement
Specifications for short term interventions		
Household sanitation	Promote household sanitation (individual and group toilets) along with IEC campaigns	To reduce dependency on CTs and improve sanitation level in the long run

Sector	Type of intervention	Achievement
Community-level sanitation	Upgrade and rehabilitate 30 community blocks from for improved on-site collection–treatment–disposal system and regular cleaning of septic tanks	Improved functioning and hygiene level of existing toilets blocks
	It is assumed that in the next five years, households will have individual/group toilets; hence dependency on CTs is reduced or closed down	
Public sanitation	Augmenting new toilet blocks in commercial areas and public spaces & Provision of mobile toilet in temple precinct area in a PPP mode	Improved functioning and hygiene level of existing public toilets blocks and school sanitation
	Continue with existing model of involving private service provider for O&M of blocks	
	Provision of improved and adequate sanitation facility in schools with CSR funding	
	Improved toilet facilities and their management in municipal schools	

Suggested costs for individual and community toilet improvements

Replacing pit latrines with ones connected to septic tanks: As per Census 2011, about 14 per cent of individual toilets have pits as primary collection and treatment systems. However, pits fail to carry primary treatment which is possible through septic tanks. It is suggested to conduct a primary survey to assess and identify the pit latrines at individual household level and upgrade to septic tanks with proper technical design.

Table 14: Details of existing on-site treatment facilities

Component	No.
Households with individual toilets	5,145
Toilets with septic tanks	4,429
Toilets with non-functional septic tanks (about 20 per cent)	886
Toilets with other facility	226
No of toilets that need an improved on-site system through replacement/refurbishment	**1,112**

Table 15 : Indicative unit cost for household level toilet

Component	Specifications[7]	Size	Cost (INR)
Super structure	6" brick wall masonry plastered from both side, Sheet roofing of standard make, Indian style pan and ½ " pipe line with Brass water tap	1.2 m x 1.2 m	20,000
Septic tank	Considering 5 persons per household	3 m x 1.5 m x 1.5 m	10,000
Total			**30,000**

Note: Costs are based on the local prevailing rates and standards.

[7] Sanitary fittings of standard make are available locally and construction specifications are considered based on local construction practices.

While refurbishing/replacing existing pits or non-functional septic tanks to properly designed septic tanks, it is assumed – for costing purposes – that the structure of the individual toilet will need to be dismantled since in most cases septic tanks and pits are well beneath the superstructure.

Table 16: Cost for replacing existing pits and non-functional septic tanks

Component	Cost
Upgradation of existing 1,112 toilets blocks with pits and non-functional septic tanks to toilets with septic tanks	1.67 cr[8]

Rehabilitation of existing community toilet blocks: It is proposed to improve the existing on-site treatment and disposal system of the community toilets which are currently not adhering to design standards. Most toilets blocks are more than 15 or 20 years old and the structures have not been periodically maintained.

Table 17: Indicative cost estimate for community toilets

Capital cost expenditure for community-level facilities				
Strategy	**No. of CT blocks**	**Total cost**	**Share of ULB**	**Through loans/Subsidy**
Upgrading old community blocks for improved on-site collection–treatment–disposal system (regular cleaning of septic tanks)	30	0.03 Cr[9]	0.03 Cr[10] (100%)	--
Refurbishing existing 30 community toilets	30	0.90 Cr.[11]	0.45 Cr. (50%)	0.45 Cr. (50%)

Cost of construction of individual toilets in non-slum areas: As per the Census data about 30 per cent households do not have individual toilet facility. As revealed during the survey, about 28 per cent of the residents are residing in non-slum areas.

Table 18: Details of individual toilets

Component	No.
Total households	7,580
Households with on-premise toilets	5,145
Households in slums that will be provided a dwelling unit with on-premise toilet under IHSDP	342
Remaining households that need to be provided with an on-premise toilets	2,093

[8] The cost of upgrading on-site primary treatment will be private cost. Only technical support can be provided through involvement of NGOs working in the field of sanitation.

[9] The cost of upgrading on-site treatment and disposal system for one community toilet block is considered as Rs 10,000 based on prevailing rates in Wai.

[10] From own source income of the ULB.

[11] For constructing the septic tanks, repairing works of water taps, pans, doors, lighting, etc (as required) is included in refurbishing of community toilet blocks. The assumed cost of Rs 3 lakh per block these works are considered is based on prevailing construction techniques and rates.

Source: Census 2011, Wai Municipality.

Considering prevailing practices and construction technologies, the cost of a toilet for one household works out to be in the range of Rs 25,000–30,000. The total cost of providing nearly 2,100 households with an on-premise toilet will be Rs 6.28 crore.

Role of ULB in promotion of individual toilet facilities: The ULB will take a leading role in promotion of household-level toilets in Wai through IEC campaigns. The various activities could include distribution of pamphlets, use of audio-visual advertisements, street plays as well as subsidy to incentivise households.

Identifying technologies on low-cost toilets: There are some low cost models of sanitation facilities developed and promoted by non-governmental organizations (NGOs) like Gramalaya and Sulabh International. Such models can be researched and replicated in the town of Wai where low cost toilets with less space requirements can be implemented. The ULB can be instrumental in providing handholding support in collaboration with such NGOs for skilled development of local masons. Schemes and grants like Integrated Low Cost Sanitation (ILCS) Programme,[12] which consider economically weaker section (EWS) groups, can be promoted for individual toilets.

Suggested costs for public toilets

The town experiences tourist influx and visitors mainly because of old temples like Kashi Vishweshwar and Dholya Ganpati, as well as market place in the central area. Currently, there is no sanitation facility for visitors in the area. It is proposed to provide one public toilet block near the temple precincts. The southern side of the town, near existing bus terminus, has commercial establishments. The area is severely lacking in toilet facility and people rely on a toilet block near Siddhnath Wadi slum, which is inconvenient. It is proposed to provide one public toilet block for the area near bus stand which would cater to the floating population in the campus as well as nearby commercial establishments. The southern side of the town houses campuses like PWD offices, Tehsil office, Forest Department and other government institutes; this experiences visitors from the surrounding region of Wai throughout the day.

There is one community toilet block near the PWD office campus along the main road. However, it is used by residents from nearby residential areas as well as visitors which, in absence of maintenance, affects hygiene level of the block. It is proposed to provide more seats near the existing community toilet block which would cater to the floating population in the area.

Table 19: Estimated costs for improving public facilities

Toilet	Demand gap	Proposal	Cost in Rs[13]
Market area (10 seats + 5 urinals available)	6 seats & 3 urinals required	1 block with6 seats and 3 urinals[14]	Rs 5 lakh

[12]ILCS – Central subsidy 75 per cent, state subsidy 15 per cent and beneficiary share 10 per cent (as per ILCS guidelines, 2008).
[13]Costs are given by the ULB officials.
[14]Having considered location attributes.

Toilet	Demand gap	Proposal	Cost in Rs[13]
Bus stand (7 seats + 10 urinals available)	3 seats required. Urinals are adequate as per norm	1 block with 3 seats	Rs 1.5 lakh
Forest department (2 seats available)	1 urinal required	Since these campuses are closely placed, they can be provided with a common toilet block in either one of the premises or on the road: 8 seats (4 for men + 4 for women) and 6 urinals can be proposed	Rs 4 lakh
PWD (3 seats: 2 functional available)	3 seat & 3 urinals required		
Tehsil office	6 seats & 3 urinals required		
Parking lot near Dholya Ganpati mandir	6 seats & 2 urinals required	1 block with: • 14 seats (7 for men + 7 for women) and 6 urinals • (Mobile toilet)[15]	Rs 6 lakh
Temple precincts	8 seats & 4 urinals required		

At present, the public toilet in the market area is managed by a private contractor and user fee is levied for 'per use' basis. Compared with other toilet blocks, this block has a good level of maintenance and cleanliness. It is proposed to charge user fees subsequently for the proposed public toilet blocks near the bus stand and temple precincts which would provide for the operation and maintenance of the block.

[15]Considering existing constrains of space and development regulations along the riverfront, it is suggested to provide mobile toilet block. The same has already been considered by the WMC.

3.6 Summary of Strategies

Table 20: Summary of strategies, achievements and indicative estimation of households, community and public level sanitation

Goal	Current status	Interventions	Cost (Rs crore)	Timeframe
Eliminate open defecation and reduce dependence on community toilets in the long run	2% HHs practice open defecation; more than 30% depend on community toilets	**Promote HH level toilets** Encourage HHs to construct their own toilets either at HH level or shared with neighbours	6.28	2015–19
Ensure all the community toilets are functional till all HHs have their own toilets	Some community toilet seats are not functional while many don't have electricity and water taps	**Rehabilitate community toilets** Make seats functional 24x7 through provision of electricity, water, doors where needed, etc	0.93	2015–17
Provide public facilities for floating population	Existing facilities are inadequate and not well maintained. Some areas that experience floating population have no public facilities	**Construction of public toilets** One each in/near market area, bus stand and PWD/Forest Department office	0.11	2015–17
		Provide a mobile toilet in temple precincts	0.06	2015–17
		Outsource Involve private sector in O&M and promote adoption of public toilets through CSR, etc	Policy	2015–19

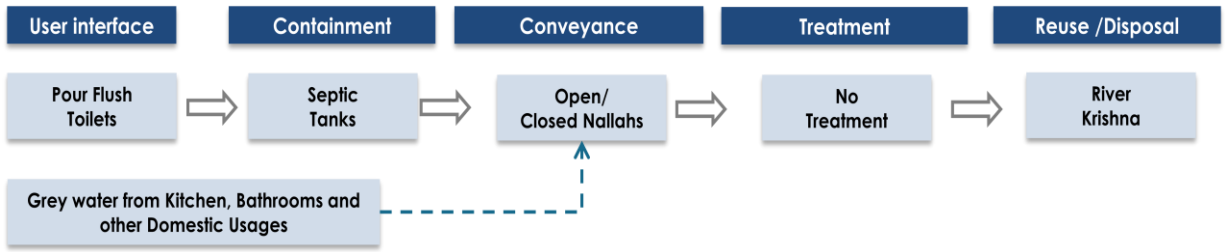
4. Wastewater, Septage and Stormwater Drainage

This chapter discusses existing wastewater, septage and stormwater management practices in Wai. It highlights various stages of the service chain including conveyance treatment and disposal system in the town.

4.1 Generation of Wastewater by Sanitation Zones

At the domestic level, wastewater is generated mainly through individual toilets, bathrooms, kitchen and wash areas (known as 'mori' – a place for washing and cleaning of clothes, etc). It is estimated that the current water supply in the town is augmented to 135 lpcd. With an existing population of 36,025 – and considering 80 per cent of wastewater generation – the total amount of wastewater generated is about 3.90 MLD. A schematic flow of domestic wastewater management practices across the town is presented here.

Figure 16: Schematic flow diagram of existing wastewater management



Discharge of blackwater/effluent from septic tanks into the drain channels.

Discharge of greywater from kitchens and bathrooms into the drain channels.

An approach to develop sanitation zones or clusters has been adopted in the CSP to analyse liquid waste managementspatially. Delineation of these clusters is attempted with reference to

topography, natural drainage pattern, homogeneity of urban development, roads and flow direction of the water, etc.Figure 17 shows the three clusters formed in Wai. Table 21 details the characteristics of each cluster in terms of population and quantum of wastewater generated.

Figure 17: Sanitation clusters based on topography

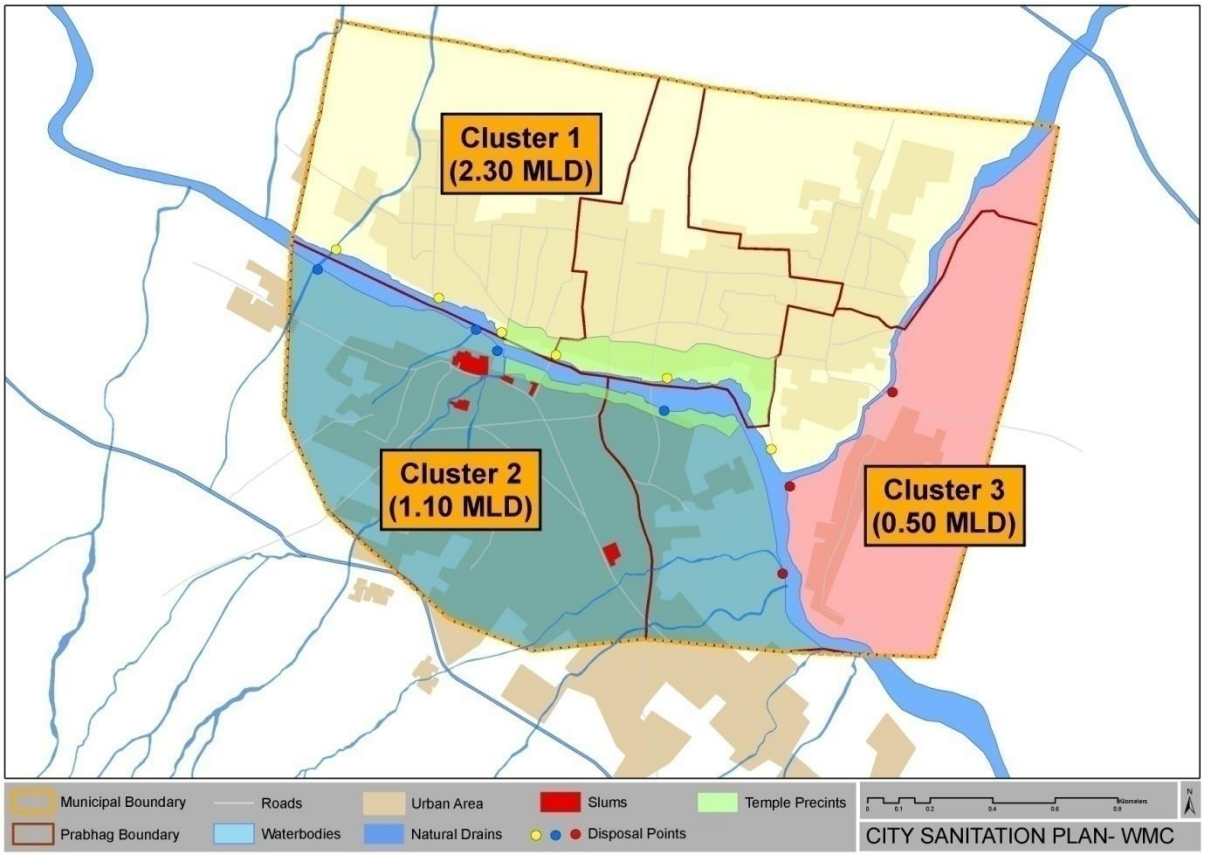


Table 21 : Cluster-wise generation of wastewater in Wai

Cluster	Prabhag	Population	Wastewater generated (MLD)
Cluster 1	1	6,607	0.71
	2	6,916	0.75
	3	7,805	0.84
	Total	**21,328**	**2.30**
Cluster 2	4	8,023	0.9
	Ward 17 of Prabhag 5	2,443	0.3
	Total	**10,466**	**1.1**
Cluster 3	Ward 18 of Prabhag 5	2,491	0.3
	Ward 5 of Prabhag 5	1,768	0.2
	Total	**4,259**	**0.5**

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4.2 Existing Conveyance System

The town lacks an underground sewerage system. Effluent from septic tanks/pits of all toilets is directly discharged into open or closed drains along the streets. Greywater from kitchen and other

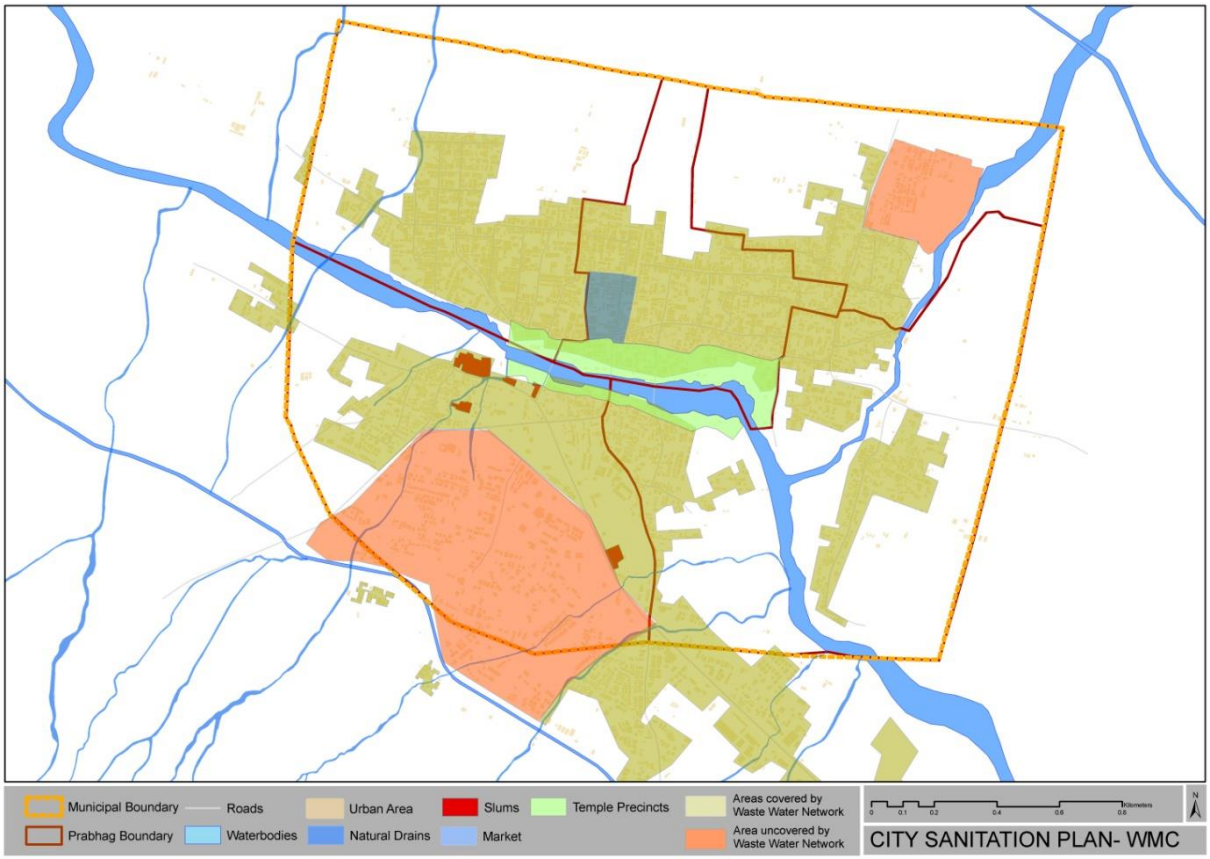
wash areas is also directly discharged into the drains. Figure 18 shows the coverage of existing conveyance system in the town. The old town area in Prabhags 1, 2 and 3 has open drains along roadsides while newly developing areas on the southern side of the town lack any kind of network of conveyance system. Though drain channels are present in some newly developing colonies, they lack last mile connection leading to collection of wastewater at lowest points in the area. At the city level, only 35 per cent households are connected to covered drains. The central market and commercial area in old town also have access to covered drainage.

Table 22 : Details of household drain connections

No. of households	Waste outlet connected to closed drains	Waste outlet connected to open drains	Waste outlet connected to no drains
7,580	2,644	4,312	624

Source: Census 2011.

Figure 18: Coverage of conveyance system



Conveyance system in old area (Prabhags 1, 2 and 3).

Cleaning and maintenance of the drain channels

The municipality is responsible for periodical cleaning (nalla safai) and maintenance of open drains. Discussions with ULB officials revealed that the drains are cleaned every alternate days and the waste is carried to the existing dumping ground. However, field visits revealed otherwise: the drains are not cleaned; clogging of drains due to improper maintenance is commonly observed in the southern part of the town that is gently sloping.

Open drains need to be periodically cleaned to remove any solid waste dumped in them.

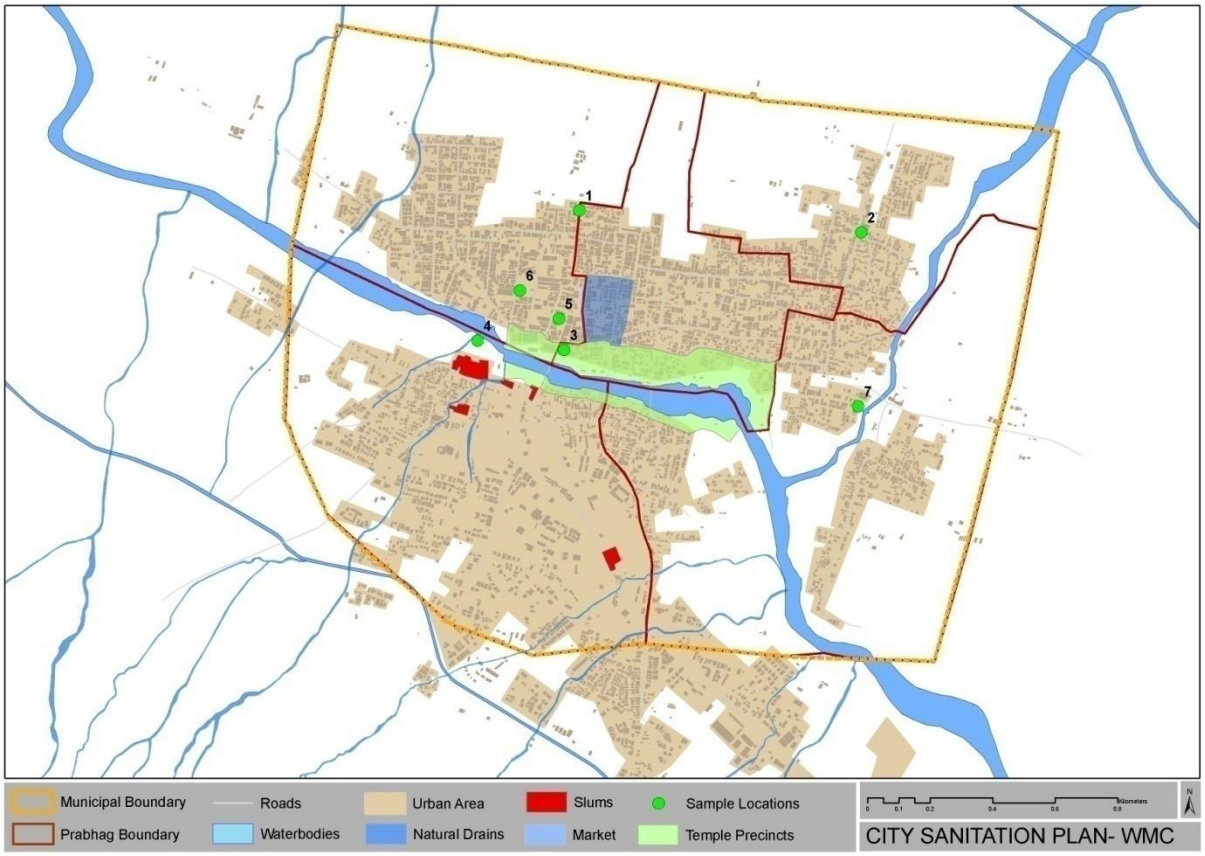
Treatment and disposal system

Currently, there is no provision to treat domestic wastewater generated in the town. Septic tanks is the only means of primary treatment (that too, not in all the households).In many cases, blackwater is directly discharged into open drains and, from there, is subsequently discharged in to the river Krishna.

To assess the characteristics and pollution level of the wastewater, samples were collected and tested in laboratory. The parameters studied were: BOD, COD, TSS and pH value. The samples were collected at various locations in the town and at various stages along the existing wastewater management system (for example, effluent of septic tank, blackwater in open drain along a road, natural open drain in which roadside drains carrying wastewater converge, and the sample in river Krishna where natural drains converge).

The samples collected from the river are found to be within the effluent standards. The effluents get diluted because of the water in the river. It was observed that the BOD content in the river was considerably low (9.3 mg/l for the sample in Krishna river near Ganpati Mandir and 4.2 mg/l near Vishwakosh Ghat) – the main reason being dilution of the effluent after getting discharged into a large stream of river water which automatically reduces the concentration of the wastewater.

Figure 19: Sampling locations for wastewater quality tests



The following table presents presents results of laboratory tests. of wastewater sample

Table 23: Analysis of sampling results

Sample location	BOD, mg/l	COD, mg/l	TSS, mg/l	pH
Desired standards	**30**	**250**	**600**	**6.5-8.5**
Ganpat Aali, near Nagar parishad	96	150	92	7.5
Kalwaat Aali	147	230	119	7.6
Old Bridge	201	380	332	6
Siddhanthwadi	36	59	51.6	7.4
River Krishna, Ganpati Mandir	9.3	28	17.6	7.3
Vishwakosh Ghat	4.2	13	7.8	7.5
Madhali Aali	153	260	201	5.7
	Samples beyond Central Pollution Control Board (CPCB) effluent standards			

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

Ganpat Aali is marked by comparatively newly developed housing layouts (bungalows, individual and group housing schemes) and has properly constructed septic tanks. In spite of the septic tanks, the result of the wastewater sample taken in the open drain in Ganpat Aali is 96 mg/l beyond the effluent standards. A natural drain in Siddhanathwadi carries domestic wastewater in the area as well as stormwater coming from various tributaries from the hillock located in the south west area. The existing open drains carry the untreated greywater (from kitchens, bathrooms and other domestic usage) and blackwater from the septic tanks and pit latrines. In the absence of proper technical designs for septic tanks, there is a lack of on-site primary treatment of the effluent, resulting in high BOD values of the samples. (Samples taken in Kalwaat Aali, near Old Bridge and Madhaliaali show BOD values of 147, 201 and 153 mg/l, respectively.)

Septage management

Wai relies on on-site sanitation system along with a system of open/closed drains along the main roads. The effluent from septic tanks/pits of individual as well as community toilets is directly discharged 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; secondly, in most other cases, the top of septic tanks are sealed, making access for emptying difficult. It has also been found during the surveys that septic tanks in cities are oversized and do not prescribe to the norms suggested in IS codes and CPHEEO manuals. Interestingly, there is no major difference in septic tank sizes for a bungalow and an apartment building. As a result, there are long intervals in septic tank cleaning of bungalows, whereas septic tanks for apartments are cleaned more frequently than required. 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, septage solidifies in the tank and the treatment efficiency of septic tanks is reduced due to reduction in retention time of wastewater in the tanks. Due to this, wastewater from septic tanks enters drains without primary treatment. Personal interviews revealed that, in many cases, septic tanks were cleaned once in three to seven years; some, in fact, were never cleaned.

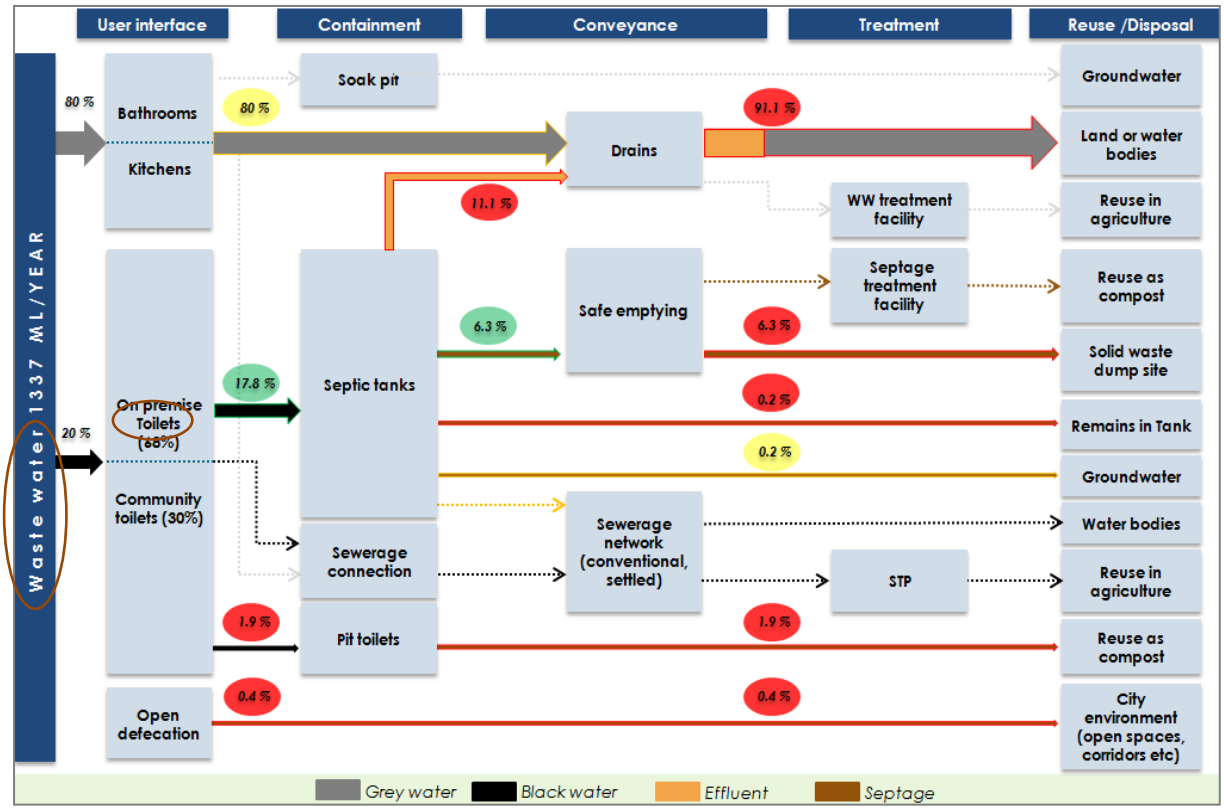
The local authority owns one suction machine for cleaning of septic tanks at household level. The charge of cleaning of one septic tank is Rs 1,000 per trip .Approximately only 2 per cent of septic tanks are cleaned annually. However, septic tanks for community toilet blocks are emptied too frequently (once a week). Improper cleaning frequency impacts the functionality of septic tanks and results in inadequate primary treatment. It has been observed from surveys that the cleaning frequency for toilet septic tanks is also three to seven years. The faecal part remains in the pit or tank and is not cleaned for many years. The waste is disposed off in dumping grounds[16]about 3 km from the town.

[16]This is the same dumping ground for solid waste disposal and the waste from cleaned septic tanks.

Key issues in wastewater management

From field investigations, it is evident that wastewater is discharged into natural drains and river Krishna without any treatment. The town grossly lacks in conveyance system and relies on open drain channels along the streets which are lacking in any consideration of technical designs. Common practices of dumping of solid waste into open drains, especially in market areas, have affected the functionality of the drains and result in overflow of wastewater. The natural slope towards the river results in the open drains emptying wastewater in the river.

Figure 20: Existing wastewater flow in Wai



As illustrated in the wastewater flow diagram for Wai, a large part of greywater currently flows through drains and is discharged into land/water bodies without any treatment; 91 per cent of volume of greywater gets discharged without any treatment. The soak pit route is also not used for greywater discharge and it ends ups untreated. For the blackwater volumes, the septic tanks in case of household toilets are able to primarily treat 18 per cent of volume but this entire volume does not get safely emptied. Less than 7 per cent of blackwater volume is safely emptied, but even this does not go through the proper treatment procedures. Thus, a very negligible volume of blackwater gets partially handled across the service chain.

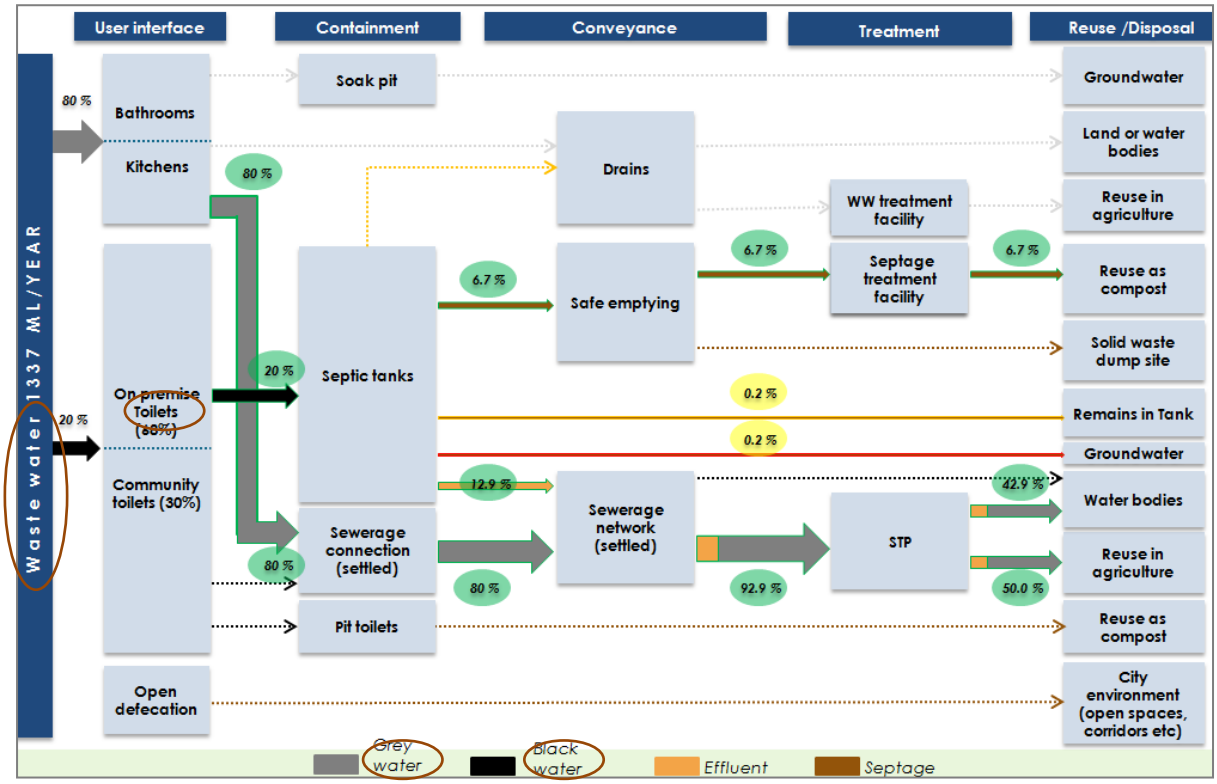
Building bye-laws state that it is necessary to develop an on-site treatment facility of a septic tank followed by a soak pit. However, very few buildings (especially newly developing ones) follow the system. There is, thus, a lack in implementation and enforcement of bye-laws. Surprisingly, the newly developing areas lack in conveyance network. The town is favoured by natural topography and drainage pattern which can be considered for designing of any gravity-based conveyance and treatment facility. The northern and southern parts of the town have a slope towards the river Krishna which is a favourable condition for designing a conveyance system.

Figure 21: 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 Krishna river without treatment

In the improved scenarios, it is assumed that both blackwater and greywater will be appropriately treated and then disposed off or reused for other purposes. As Figure 21 shows, a sustainable wastewater management plan for Wai will essentially involve handling of the entire wastewater volumes and their proper treatment across the service chain; none of the volumes will be highlighted through red or yellow traffic lights. Green lights illustrate that the entire wastewater volumes are treated through septic tanks, STPs or appropriately reused in the service chain. The respective volumes for effluent and blackwater and methods for treatment are also shown in Figure 22.

Figure 22: Targetted wastewater flow after CSP interventions



4.3 Existing Stormwater Management

Topographically, Wai slopes towards the river. The town has a hillock on the southwest side, which adds to considerable amount of rainwater discharge. The river divides the town area in two catchment zones and natural drains form a system which carries stormwater into the river.

Figure 23: Location of stormwater converging points

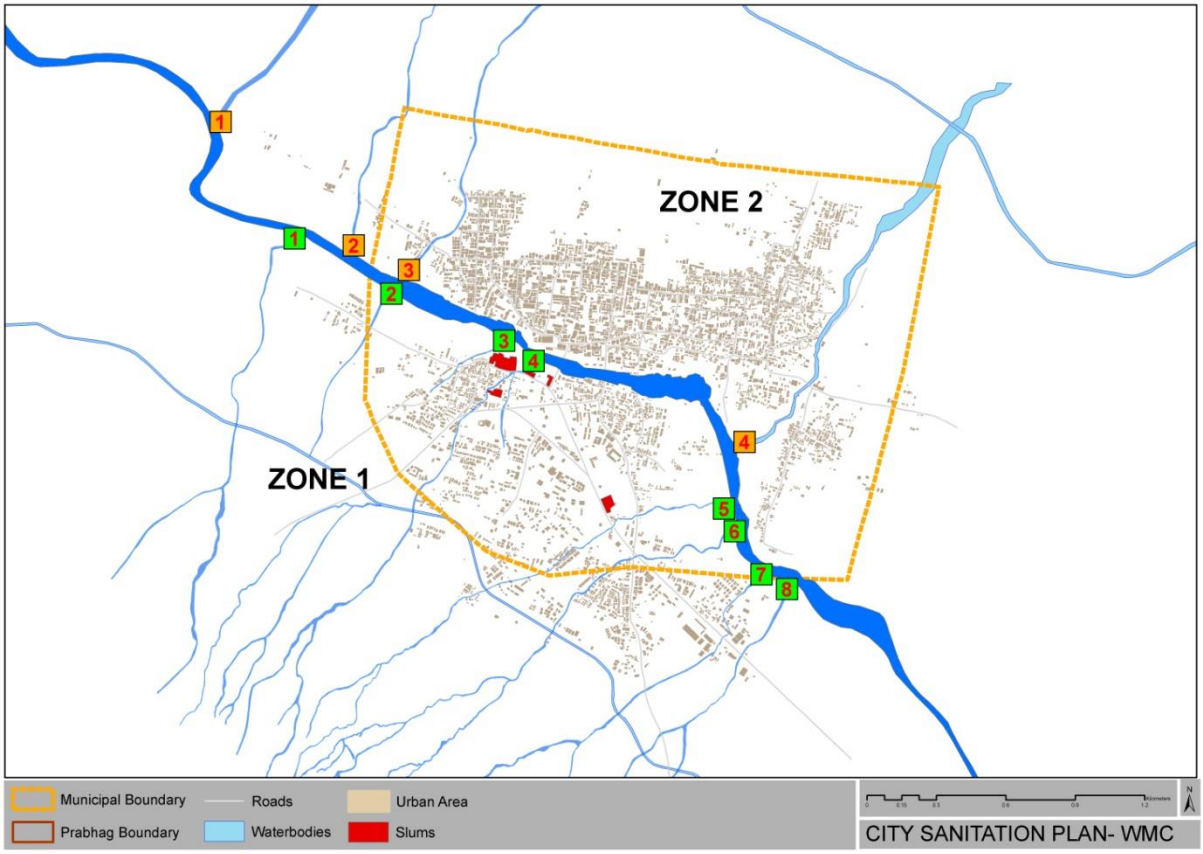
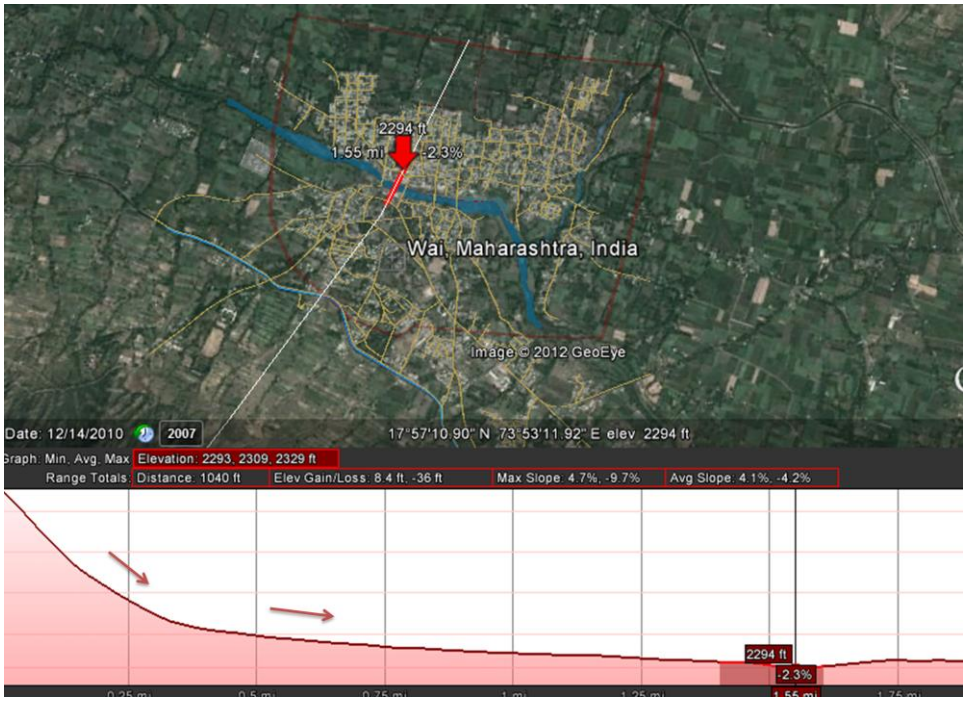


Figure 24: Satellite image and section through the city



The following table shows the estimated quantity of surface water run-off and domestic wastewater in the town which is also discharged in the river through these natural drains.

Table 24: Details of wastewater zones in Wai

Parameters	Zone 1	Zone 2
Population	28,795 (Prabhags 4 and 5)	7,655 (Prabhags 1, 2 and 3)
Area	688 Ha	750 Ha
Length of nalla	2,5603 m	6,700 m
Quantity (Q)	87.14 cu.m sec	95 cu.m sec
Run-off	87,140 lps	95,000 lps
Total (run off + sewage)	87,175.99 lps	95,012.03 lps

Some natural drains in Wai.

Natural drains within the city.

There is no dedicated stormwater management system designed for the town to carry and dispose off surface rainwater. Largely the open and closed drains along the roads are used for carrying both kinds of water in the town. In Prabhags 4 and 5, there are slum areas located on the banks of natural drains. In some cases, there are slum encroachments on existing natural drains. Also, commonly observed practices of dumping garbage and solid waste in these drains creates problems during the

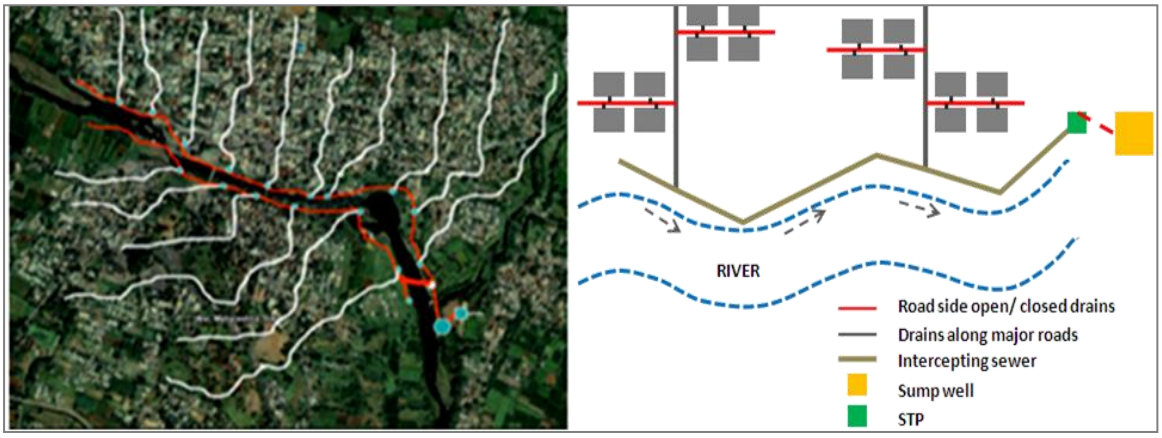
rains when heavy amount of discharges are conveyed to the river, especially in the southern side of the town.

The natural topography and gravity is favourable for conveying and discharging stormwater into the river, due to which the city is able to discharge wastewater through natural streams. However, mismanagement of garbage affects efficiency of natural drains. The southern side of the town is developing along the drains which need to be prioritised with some immediate interventions.

4.4 Proposed Action Plan for Wastewater Management under NRAP

The MJP has proposed a scheme for wastewater treatment and disposal under National River Action Plan Programme (NRAP) for Wai. The scheme focuses on pollution abatement of Krishna river by tackling domestic wastewater (including grey and black) and preventing it from mixing directly into the river. It proposes interceptor sewers to be constructed on both the banks of river to collect the discharges of wastewater from open drains along streets. About 19 points have been identified where wastewater drains directly converge into the river. The wastewater so collected will be pumped to a proposed STP of 5.00 MLD capacity through Rising Main of 500 mtr. Sludge from septic tanks collected by the ULB is will be also treated in the proposed STP – which consists of a pre-treatment unit followed by Moving Media Bio Reactor (MMBR) Technology. The treated sewage is proposed to be disposed off for irrigation purposes. The estimated cost for intercepting sewer is around Rs 400 lakh and the total cost of the NRAP project – that is, initiating intercepting sewers along the banks of river Krishna and treatment plant located in south-western Wai – is about Rs 1,600 lakh.

Figure 25: Schematic sketch of the proposed NRAP scheme



The scheme intercepts the existing open drain points that converge into river. It does not ensure or consider collection and conveyance of wastewater generated at household level. In addition to this, the treatment technology proposed in the scheme is of conventional type which needs considerable amount of energy consumption and human resource to operate. It does not consider stormwater loads, which are considerable in case of Wai due to prevailing topography. While the technical

approval for this project was given a few years ago, the WMC has still not received an approval for funding from the ministry of water Resources under the NRAP.

4.5 Suggested Improvements in Wastewater Management

Possible waste management options for sanitation improvements

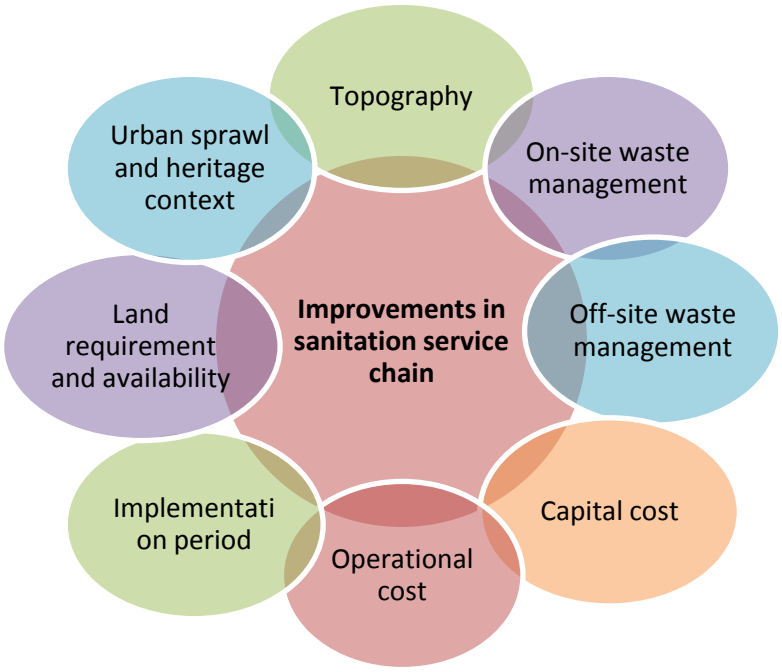
In light of existing waste management practices, various technological options to carry and treat the domestic wastewater are assessed in the city's context. To arrive at suitable options for collection and conveyance systems, the following parameters and technologies have been considered.

Table 25: Wastewater conveyance technologies for Wai

No.	Conveyance systems	Capital cost	O&M cost	Efficiency	City context	Remark
1	Rehabilitation of drains	Low	High	Not recommend able in long run	Good coverage of open drains available in old town; New developments lacking any kind of network	Suggested in old town area as immediate intervention
2	Small bore Settled sewer	Low	Moderate	Efficient when topography favourable	Having septic tanks available at individual household level, the solid free sewer is easily achieved avoiding intercepting tanks	Suggested as a city-wide solution in phases Preferable to initiate from the new areas without network
3	Simplified sewer	High	High	High	Not feasible in old congested areas	--
4	Septic tank emptier to convey faecal sludge from septic tanks	Low	Low	High	Can be done for the entire city as all HHs have their toilets connected to septic tanks	City-wide intervention
5	Conventional sewer	High	High	High	Not feasible for the old town area as it is congested and has narrow road width	-

A review of possible service chain improvements has been considered for various options for collection, conveyance and treatment functions. Appendixes 4 and 5 have possible options. Appendix 4 has details of alternatives of wastewater treatment. Having reviewed various possibilities of improvements in wastewater management with reference to the sanitation service chain, the following approach was adapted to formulate area specific strategies.

Figure 26: Selection of appropriate improvements in sanitation service chain



There are various combinations of wastewater conveyance and treatment. Considering the topography of the town, population and growth trend 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, specific strategies and proposals have been proposed for three distinct areas of city including:

Old town area, characterised by densely developed residential area with narrow streets. It comprises open and closed drains along the roads and natural drains which carry domestic wastewater from individual houses and to river Krishna.

Newly developing area, marked by newly developing colonies and group housing schemes which have septic tanks as primary treatment facilities. The areas, however, lack in conveyance network as well as treatment. At some places, wastewater is carried through kutchha nallas.

Future development areas, which in reference to the development plan, are designated and earmarked for future development. They are currently lying vacant. Considering future growth trends, the wastewater conveyance and treatment alternatives for these areas are compared.

Table 26: Comparative analysis of wastewater conveyance and treatment alternatives

Location	Existing		Proposed		Cost (Rs in cr)[17]	Remarks		
	Conveyance	Treatment	Conveyance	Treatment		Area required for conveyance	Cost effectiveness	Ease of implementation
Old town	Open/closed drains	-	Rehabilitation of drains (closing of drains with PCC lining) (Rs 1.65 cr)[18]	NRAP[19] (Rs 16 cr)	18.47	Lesser area required for treatment	Cost effective alternative	Easily implemented as immediate intervention
				DEWATS (Rs 10.35 cr)	12.82	Due to heritage precinct, difficulty in acquiring land[20]	Cost effective alternative	Easy implementation
			Initiate settled sewer (Rs 2.80 cr)	NRAP (Rs 16 cr)	18.80	Area requirement lesser than DEWATs and can be located outside town	Cost effective provided primary treatment is put in place; High operational cost	Lesser time required than conventional UGD
				DEWATS (Rs 10.35 cr)	13.15	Difficulty in land acquisition	Cost effective alternative for conveyance system	May be time-consuming due to issues in land acquisition
			Simplified sewer (Rs 3.73 cr)	NRAP (Rs 16 cr)	19.73	Area requirement lesser than DEWATs and can be located outside town	Lesser cost than conventional sewer	Easy implementation at short-term level
				DEWATs (Rs 10.35 cr)	14.08	Due to heritage precinct, difficulty in acquiring land	Lesser cost than convention sewer; Lesser cost than conventional	Easy implementation

[17] Detail calculations of block costs are given in Appendix 7.

[18] The rates assumed are based on prevailing rates of items as suggested by officials, Wai Nagar Parishad.

[19] Estimated cost for treatment plant proposed under NRAP is Rs. 16 cr considering future growth. It includes intercepting sewers along both banks of the river and treatment plant.

[20] The slope of the whole town is towards river Krishna. Heritage precincts and monuments are located along banks of the river. Hence, DEWATs near banks of river require permissions from higher authorities at state and national level. Dense settlement pockets along banks of the river also restrict treatment through DEWATs technology.

ca tio	Existing		Proposed		Cost (Rs in cr)[17]	Remarks		
							treatment	
New development[21]	-	-	Initiate settled sewer (Rs 1.81 cr)	NRAP (Rs 16 cr)	17.81	Considerably lesser area than DEWATs and can be located in a single piece of land outside the city	Cost effective provided primary treatment is put in place; High operational cost	Lesser time needed
				DEWATS (Rs 7.14 cr)	8.95	Difficulty in land acquisition along banks of river Krishna	As area lack in conveyance system, cost effective only if primary treatment is ensured	Time effective than UGD network
			Simplified sewer (Rs 2.39 cr)	NRAP (Rs 16 cr)	18.39	Considerably lesser area than DEWATs	Cost effective than conventional system	Time effective than UGD network
				DEWATs (Rs 7.14 cr)	9.53	Difficult to acquire land near heritage precincts	Cost effective than conventional system; No need of completely solid free system	Time effective than UGD
			Conventional sewer (Rs 6.87 cr)	NRAP (Rs 16 cr)	22.87	Land required in a stretch. But it can be located outside town	High cost for conveyance system	Time consuming process for laying sewer lines
				DEWATs (Rs 7.14 cr)	14.01	Difficulty in acquisition of land in pockets	High cost alternative	Laying of sewer lines requires a span of few years

For future growth (at present, vacant area), the alternatives similar to new developments are suggested. Since this area is located near new developments, it is advisable to implement conveyance network and treatment similar to newly developed areas.

[21]Having 30 per cent increase in road length in new development areas.

Rationale for selecting a solution:

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

Rehabilitation of drains: Major portion of the city area is covered by either an open/closed drain system. The effluent from septic tanks and greywater is conveyed through these drains. However, in some areas this needs to be rehabilitated and covered. The capital and operating costs for these solutions are not high as compared to the 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, 86 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 sewer 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. The city also 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; the pipe diameters can be less 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 systems. For the successful implementation of this system, however, septic tanks need to be emptied at regular intervals of two to three years as suggested by CPHEEO manual and IS codes – so that solids do not enter the network system choke the settled sewer system.

Simplified sewer: This is an off-site sanitation system. In this solids are also conveyed with the liquid portion to the treatment facility. This is different than conventional sewer in terms of its layout. This type of system can be laid within the plot boundaries, because of which the slopes at which these type of system are laid is less as compared with conventional sewer systems. The capital and operating costs are also less as compared with conventional systems. In a city context, this system is difficult to be laid as the city is very dense and this system would make the existing functioning on-site system redundant. Also, the concept of simplified sewer is still very new in the Indian context, and not many cases studies are available.

Conventional sewer: This is also an off-site sanitation system which conveys the solid as well as liquid portion to the treatment facility. The capital and operating costs of this system are very high as compared with other sanitation systems. The reason is that the slopes are high for this system 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

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

For treatment, decentralised facilities along the river were considered. However, the lack of land availability 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 at the eastern end of the city.

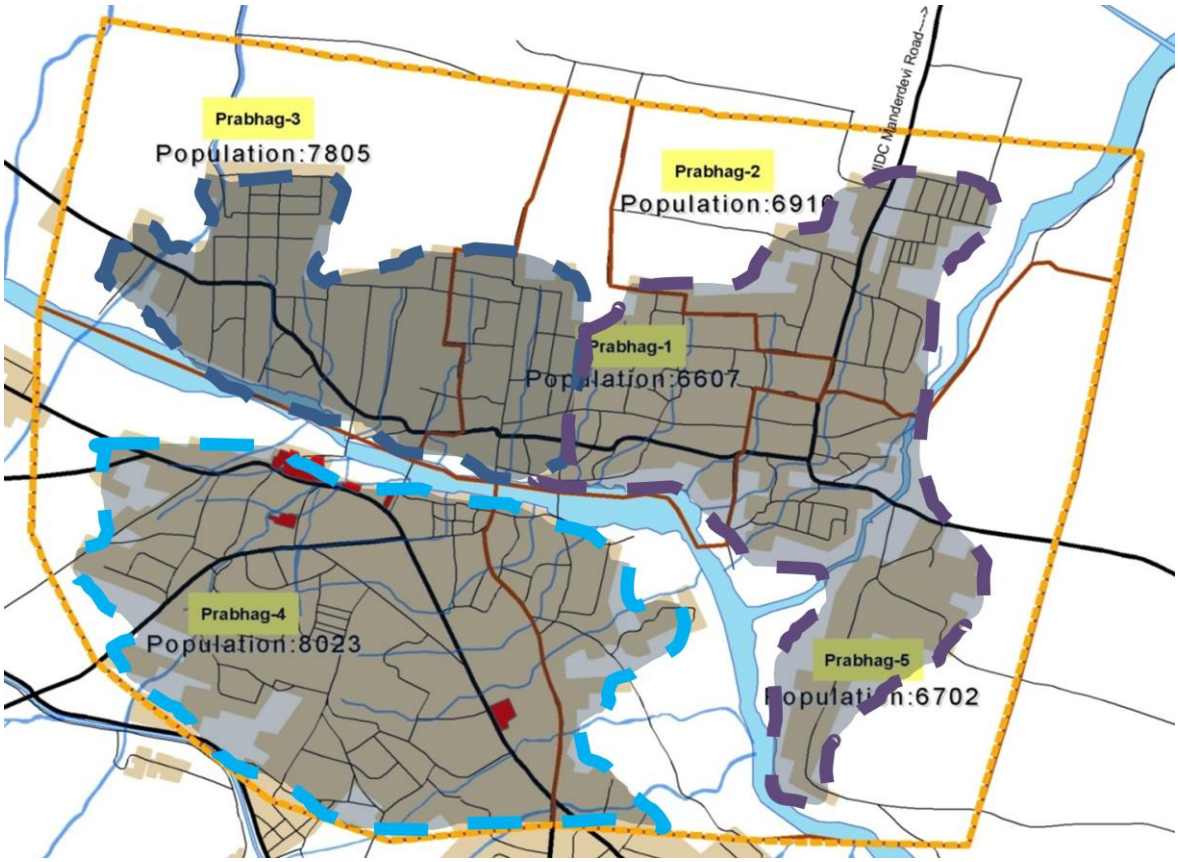
Strategies for improving wastewater and faecal sludge management

At present, the only plan envisaged by the WMC is for cleanup of river Krishna. For this, a project has been submitted for funding to the NRAP (GoI). The NRAP envisages two interceptor sewers along both banks of the Krishna where the wastewater flows through existing drains in the city. The wastewater will be taken to, and treated at, a sewage treatment facility located downstream. There are two limitations of this proposal. First, while this project will help to clean up the river, it will not help clean and sanitise the city. Second, since most of the wastewater comprises greywater or effluent from septic tanks, the proposed STP seems to be overdesigned. To address these concerns, the following strategies are suggested.

Integrated Faecal Sludge Management (IFSM) Plan: Having reviewed various possibilities of sanitation systems, the WMC can aim for city-wide faecal sludge management 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 into compost and can be sold for agricultural use. This option allows disposal of greywater, and septic tank effluent through existing open drains system will be upgraded to a network system which will connect to the treatment plant.

This solution is flexible and builds on existing systems without differentiating for new developments and old city area. The faecal sludge management plan for Wai 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 like 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 27 provides possible phasing of desludging services in Wai based on a three-year cleaning cycle. To maintain a cycle of three years, the city officials need to ensure that 1,760 septic tanks are emptied every year and the sludge is subjected to proper treatment.

Figure 27: Phasing of desluding service



Currently the city authorities in Wai clean only about 2 per cent septic tanks on an annual basis. This varies depending upon the demand generated by the local people. It has been observed from surveys that cleaning of frequency for toilet septic tanks is also five to seven years. In many cases, the faecal part remains in the pit or tank and is not cleaned for many years. The waste is disposed off in the dumping ground (which is also used for dumping solid waste) about 3 km from the town. 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 procurement of additional suction vehicles by the WMC or exploring contracts with private service providers on the basis of a management fee and levying appropriate taxes for sustaining these services. The design of new emptier trucks or services will need to ensure that it is possible to effectively reach septic tanks in the dense areas in the old city.

Considering the current situation in Wai, various management models can be considered to provide regular services for cleaning of septic tanks through involvement of private players, who can offer the services by charging a nominal fee. The WMC currently charges Rs 1,000 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 (PPP) basis. There is also a possibility to earn 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 faecal sludge management programme will facilitate a fully sanitised city through effective and low cost sanitation systems. It will also be more flexible and under effective control of the WMC. However, it will require significant institutional support through comprehensive training programmes for WMC staff and sanitary inspectors, as well as 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 on-site sanitation proposal, citizen groups will need to be closely associated in design and implementation. Awareness related to periodic cleaning and maintenance of septic tanks will also 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 WMC 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 AIILSG under the PAS Project.

Conveyance system for effluent and greywater:

At present, the town has no dedicated sewerage system to collect and convey the domestic level wastewater: open or closed drains along the streets serve as the only means of conveyance; almost 57 per cent of the municipal area is catered by open drain channels. However, these drains are not as per technical design considerations. Mixing of solid waste is also a commonly observed problem which affects the efficiency of the drains. As an immediate intervention, it is suggested to make use of the existing practices and pattern of conveyance system. It is suggested to rehabilitate the existing open drains to tackle:

- 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.

The two aspects can be considered in a phased manner and a pilot can be demonstrated in Prabhag 4 which, at present, is facing intense issues of liquid waste management. These closed drains (which later will be replaced by a suitable sewer network) will be connected to the river.

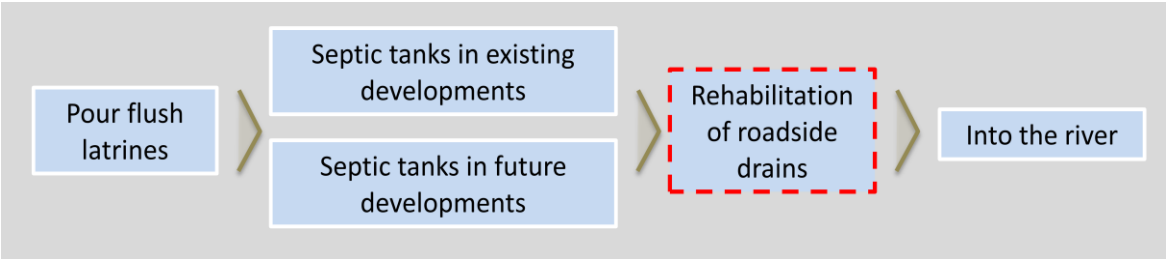


Table 27: Suggested strategies for wastewater management

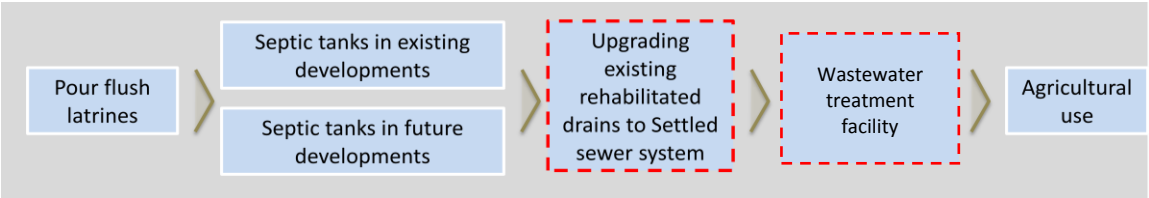
Component	Intervention	Achievement
Integrated faecal sludge management service	Upgrade and refurbish non-functional septic tanks	To develop an effective service for a regular septage management service and avoid pollution at household/property, neighbourhood and city levels
	Develop a regulated septic tank desludging and emptying service for 3-year cleaning cycle	
	Develop treatment facility for faecal sludge	
Conveyance of wastewater	Rehabilitate and cover the existing open drains	Ensure interim collection and safe conveyance of wastewater
	A city-wide settled sewer system	Achieve safe conveyance of black- and greywater to the treatment unit
Treatment of wastewater	A low cost wastewater treatment facility	Treatment and possibility of reuse of the wastewater
Support policy actions	Empanel service providers and regulate tariffs for desludging/cleaning	Ensure successful implementation of Integrated Faecal Sludge Management plan
	Implement user charges for wastewater services	
	Formulate bye-laws/guidelines for on-site sanitation	

Table 28: Indicative costs for wastewater management

Component	Intervention	Capital cost (Rs cr)
Integrated faecal sludge management service	Upgrade and refurbish non-functional septic tanks	1.67
	Develop a regulated septic tank desludging and emptying service for 3-year cleaning cycle	0.10
	Develop treatment facility for faecal sludge	0.28
Conveyance of wastewater	Rehabilitate and cover the existing open drains	1.65
	A city-wide settled sewer system	4.64
Treatment of wastewater	A low cost wastewater treatment facility	1.05

Conveyance system: In the long run, it is proposed to develop a town-wide settled network in a phased manner, where all the septic tanks will be connected to the shallow or small bore, thus ensuring maximum collection and conveyance of blackwater. In that case the existing closed drains will cater for conveying stormwater.

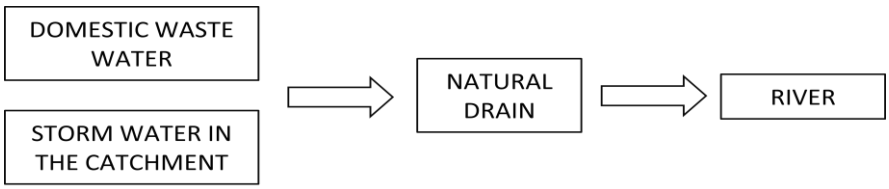
Treatment system: It is proposed that as the appropriate treatment system for treating only the effluent from septic tanks and greywater would be a low cost waste stabilisation pond. This treatment facility would be connected by the city-wide settled sewer system. The treated wastewater will then be used in agricultural purposes. It is suggested that the treatment facility would need to be located downstream of the river at the eastern end of the city.



4.6 Action Plan for Stormwater Management

Strategies for stormwater management

There are about seven to eight natural drains on the southern side which converge in river Krishna at various points. These drains carry rainwater discharged from the hillock (located on the south-west part of the town) and domestic wastewater generated from the urban development areas south of river Krishna. These drains are seeing a lot of construction activities in the vicinity. In addition, siltation over time and dumping of solid waste/garbage has affected the functioning of the drains to some extent. The natural drains passing through the slum area of Kashikapadi are being encroached upon by construction of dwelling units, which pose serious risks during rainy seasons when huge amount of stormwater is discharged.



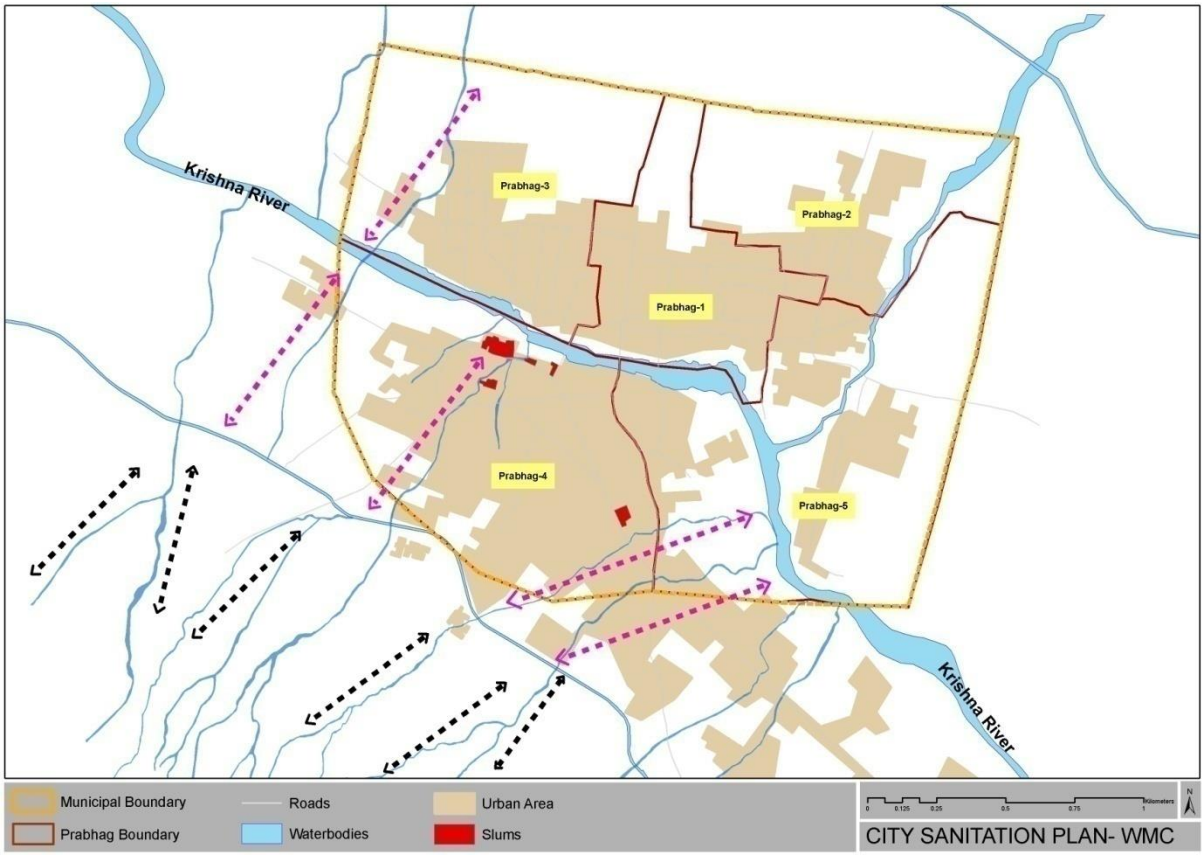
In the rainy season, most of the drains are flooded and clogged due to retarded efficiency. Considering the existing status of natural drains, it is proposed, as an immediate intervention, to carry out desilting and dredging of the natural drains mainly on the southern side. With favourable topography and gravity, this will carry and convey the stormwater loads in the southern area. It is proposed that:

- Natural drains in the municipal limits and in urban areas to be desilted, dredged/excavated and rehabilitated to achieve the desired cross section.
- Natural drains outside the municipal boundary and in green fields to be desilted and excavated to remove any obstructions in the flow coming from hilly areas in the south-west side.
- For the drainage system in the northern side (in Prabhags 1, 2 and 3) it is proposed to rehabilitate the existing drains along the road as per desired section to carry both stormwater and wastewater and cover them in a phased manner.

Table 29: Stormwater management: Phasing of interventions

	Pilot	Short term	Mid term
	Base year	**0-3 years**	**3-5 Years**
Desilting of the drains up to 0.6 m			
Rehabilitation of the drains with RCC			

Figure 28: Existing natural drains and their flow



Indicative cost estimates for stormwater management

Table 30: Cost estimates for stormwater management

Item	Length of drains (south side)	Length of drains (north side)	Unit cost	Total cost (INR)
Desilting of the drains up to 0.75 m	4,000 m within urbanised area 22,857 m outside urbanised area	4,200 m within urbanised area 300 m outside urbanised area	Rs 80 per Brass (2.83 cu m)	79.47 lakh
Rehabilitation of the drains with RCC	4,000 m within urbanised area[22]	4,200 m within urbanised area	Rs 2,000 per cu m	58.80 lakh

Summary of strategies

Thus, two main proposals are suggested for wastewater management. The first is to introduce an IFSM service to improve performance of on-site sanitation systems. The second is for conveyance and treatment of wastewater. For the latter, it is suggested that for the next 10 years city relies on a rehabilitated drain system. At a later stage, a settled sewer system with appropriate wastewater treatment can be taken up.

22With 1.2 km length of nalla flowing through Gure Bazaar slum on the southern side, lined in stone masonry. Remaining natural drains are considered for rehabilitation with RCC walls.

Table 31: Summary of strategies and estimated costing for wastewater and stormwater management

Goal	Current status	Suggested intervention	Cost (Rs cr)	Timeframe
Achieve 100% collection and treatment of blackwater and greywater as well as septage	A network of open and closed drains conveys all the wastewater to the river; Dumping of solid waste in open drains clogs them. Newly developed areas have an intermittent network of open and closed drains. Primary treatment of blackwater in septic tanks is hampered as they are cleaned only when they are full, instead of following a regular cleaning cycle	**Integrated faecal sludge management service** Rehabilitate non-functioning ones and ensure easy access through provision of access covers	1.67	2015–17
		Procure additional suction emptier trucks to ensure a three-year cleaning cycle	0.10	2015–17
		Develop a treatment facility for septage treatment	0.28	2015–17
		Rehabilitation of drains Cover the open portion and rehabilitate where required to ensure smooth flow of wastewater	1.65	2015–17
		Lay a city-wide settled sewer system Segregate collection of stormwater and wastewater	4.34	2019–22
		WW treatment plant Construction of a wastewater treatment facility	1.05	2021–22
		Ensure free flow of stormwater through natural drains Natural drains in the municipal limits to be desilted, dredged/excavated and rehabilitated while those outside the municipal limits only need to be cleaned/desilted to ensure smooth flow		2016–18
Maintain the flow and avoid mixing of solid waste	Clogging of drains due to silting as well as common practice of dumping solid waste into the drains	Desilting of natural drains	0.79	
		Rehabilitation of drains with RCC masonry	0.59	

5. Solid Waste Management

This chapter discusses existing solid waste management practices in the town and highlights existing demand gaps in infrastructure, management issues and suggests improvement strategies with phasing plan.

The service chain for solid waste includes generation of solid waste, which is collected and is transported to dumping ground. The treatment plan in Wai was not functional due to contractual disputes but has now resumed operations after the disputes were resolved. There is no scientific method adopted for disposal of refuse from the vermi-composting plant and non-organic waste which is openly dumped. On the basis of this service chain, the following section discusses each phase/sector of solid waste management in detail.

Service chain for solid waste management.

The segregation of solid waste in Wai is carried out only by informal groups. The details of collection of waste are discussed in successive sections. There is no segregation performed at source or involvement of different stakeholders.

5.1 Generation of Solid waste

In Wai, solid waste is mainly generated from residential areas, commercial areas including vegetable markets *(*mandi*),* institutional campuses and temple precincts that are main focus of attraction for the tourists. The waste generated by variousactivities is as given in Table 32.

Table 32: Quantity of solid waste generated

Source	Quantity
Households	4.5 MT/day
Street sweeping	1.5 MT/day

Source	Quantity
Hotels and restaurants	2 MT/day
Markets (vegetable markets, mandis, etc)	1 MT/day
Commercial establishments (for example, institutions, etc)	2 MT/day
Other sources (for example, debris, horticultural waste, etc)	1 MT/day
Total	**12 MT/day**

Source: Wai Municipality.

On the route to Panchgani and Mahabaleshwar and known for its temple precincts and ghats, Wai attracts many tourists. In addition, it is a Taluka headquarters and regional market place. It therefore experiences a high influx of floating population for commerce and trade which adds to the generation of solid waste.

5.2 Existing Infrastructure for Collection and Transportation of Waste

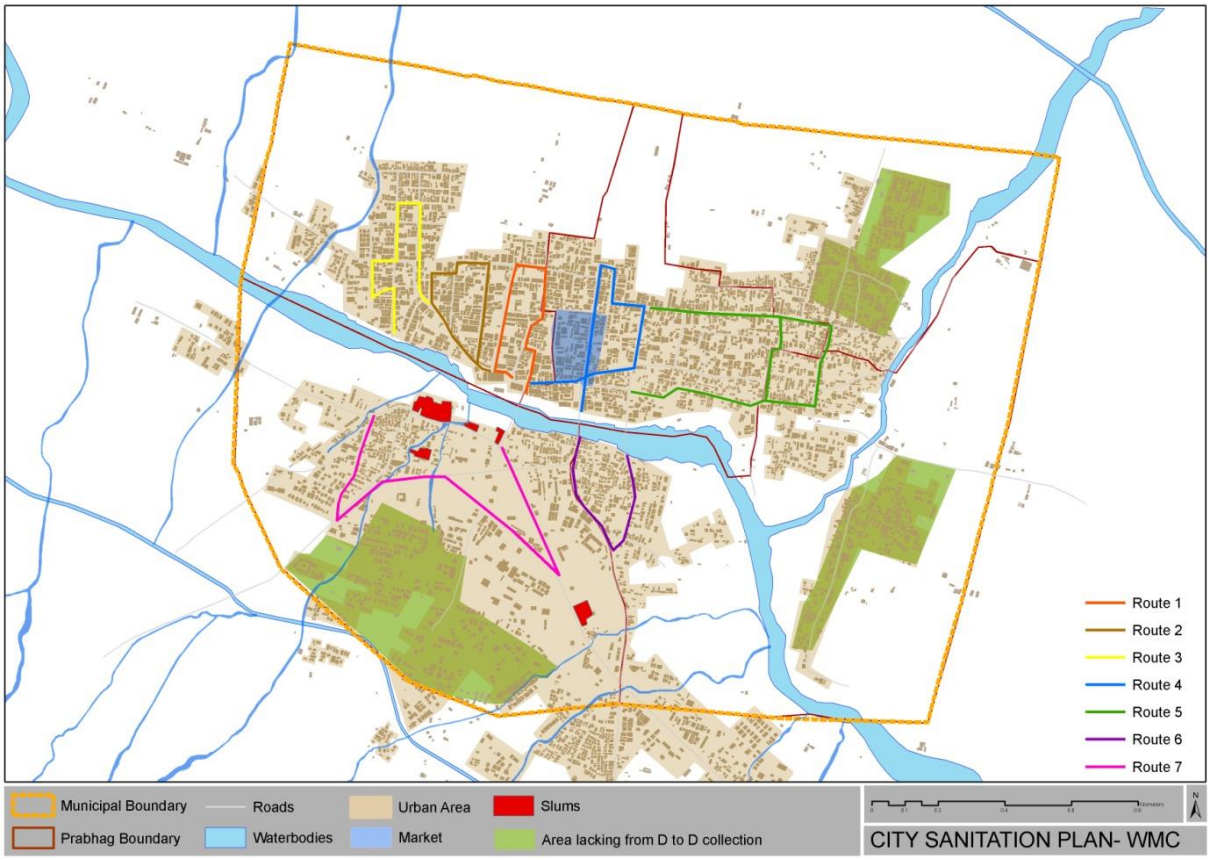
Door-to-door collection by ghantagadis

Domestic waste from residential areas is collected by door-to-door collection facility managed by private operators, which covers more than 80 per cent households. These ghantagadis are owned by the ULB and operated by private operator. Contract staff is hired for this household waste collection. Out of the six vehicles available, three ghantagadis cover the Ravivar Peth area and the other three cover the rest of the town. The contract, in operation since year 2008, has been renewed each year. The ULB provides the necessary equipment and the contractor engages the labour required. For year 2012–13, the contract has been assigned to a new contractor at the rate of Rs 62,000 per month.

In Wai, about 20 per cent households in slums and newly developed residential areas and a few commercial areas are not covered by the collection service provided by the private operator. Non-residential areas like vegetable market (mandi), government institutional campuses, existing slums (namely Kashikapdi and Gure Bazaar) and the temple precincts are not covered by ghantagadis. The ghantagadi does not provide service beyond municipal limits and in slums which rely on community waste bins. Each vehicle makes two or three trips a day depending upon the capacity and the solid waste generated.

There is no segregation of waste done at the user's end or before disposal by the ULB. Ghantagadis are emptied at the existing treatment facility 3 km north of the town. There is no scientific method adopted for disposal and the waste is just dumped in the open ground. Figure 29 shows the routes of ghantagadis followed daily for door-to-door collection. The six collection vehicles cover all the Prabhags but the new developments in Prabhags 2, 4 and 5 (shown in green colour in the above maps) are left unattended. The households in these newly developing areas rely on community bins and open dumping practices are also observed.

Figure 29: Routes of solid waste collection vehicles



Source: Wai Municipality.

Figure 30: Process of solid waste management

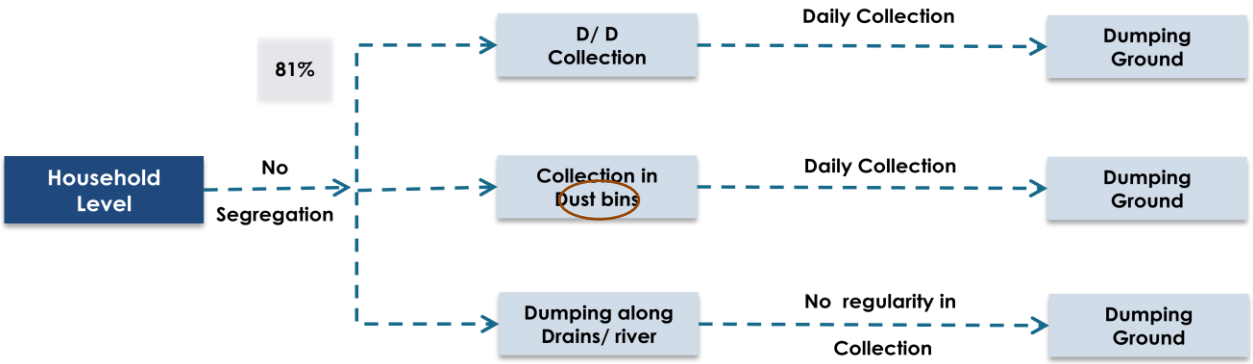


Table 33: Details of solid waste collection vehicles for Wai municipality

Sr. no.	Vehicle type	No.	Capacity	Trips/day	Waste collected
1	Dumper placer	1	1.5 MT	1	1. 5
2	Tractor trailer	1	2 MT	1	2.0
3	3-wheeler auto tipper	6	0.5 MT	2	6.0
	Total				**9.5 MT/Day**

Source: Wai Municipality.

As shown in table above, out of the 360 MT/month, about 285 MT/month is collected, the remaining being laid in open drains and along river dumps along roads. The following table indicates a process of solid waste management from various areas.

Table 34: Solid waste management in Wai

Area	Collection	Transportation	No.	Treatment and disposal
Residential areas	D2D – coverage 81%	3-wheeler auto tipper	6	Dumping ground located 3 km north of the town
Residential (not covered by D2D) and non-residential areas	Waste bins from residential and non-residential areas	Dumper placer	1	
	Open dumps	Tractor trailer	1	
	Along roadside drains			

Vehicles used for solid waste collection in Wai.



Waste collection from community bins and open dumps

There are 95 bins of 0.25 MT capacity placed at 85 locations along roads by Wai municipality. A separate dumper placer is assigned to collect waste from these bins. The households that are not served by the door-to-door collection (mainly the newly developing areas in Prabhags 2, 4, 5) by ghantagadi use the community waste bins to dispose off the waste. Community waste bins are collected daily. Dumper placer covers around 70 to 80 bins in the town every day in three trips to the dumping ground.

Solid waste collection bins.

The WMC has one tractor trailer which collects waste from open dumps and from along roadsides. At some locations, the waste collected through street sweeping (which is piled along the side of the road) is also collected and transported to the dumping ground by the tractor trailer.

In the temple areas and around the ghat precincts, there are no adequate litter bins or waste bins, which leads to waste being dumped in open areas along the river. The precincts are also not covered by the ghantagadis but the dumper placer collects the waste from the bins. Open dumping of waste is done in river Krishna directly in the ghat areas. In spite of having considerable flow of tourists, the area grossly lacks in solid waste facilities.

Waste management near temple precinct.

Street sweeping and nalla cleaning

The street sweepers dump the collected waste in the bins which is collected and emptied by dumper placers operated by the WMC. Street sweeping is carried out daily except for Sundays and government holidays. There are three supervisors and 42 workers from the sanitation department of the WMC involved in street cleaning for market areas and commercial streets on a daily basis.

Workers from the sanitation department of the ULB also clean nallas every day. About 400 m of *nallas* are cleaned every day and one tractor trailer is available to collect this waste. Since this proves to be insufficient, the collected waste is often left unattended for three-four days and adds to the waste along streets and open dumps. For pre-monsoon cleaning of drains and road sweeping, labour is hired on contract basis for two months. The municipality also hires labour for a month during major festivals. The contractor transports the waste collected to the dumping site and charges are made on a trip basis (usually Rs 1,200 per trip). The prices in the current contract (for

year 2012–13) have been fixed at Rs 1,500 per trip. The WMC is falling short of one tractor trailer and about 15 people for nalla cleaning activity.

Improper waste management leading to blockage of natural drains.



Waste collection by informal groups (scavengers and rag pickers)

Informal groups are active in collection of solid waste in Wai and the activity is divided amongst two groups which collect recyclable material from residential areas and waste bins. A group of rag pickers collects the waste randomly from waste bins and open dump sites across the town. There is another group, locally known as feriwallas, who collect waste from residential areas. However, all of them are involved only in collection of recyclable materials like glass, paper, plastic bottles and other scrap in a segregated manner. In total, there are about 50 people involved in the activity. They collect plastic, bottles, steel, iron, scrap, cardboard, papers, etc (usually at the rate of 100 kg/day).

Recyclable waste collection by informal groups in Wai.



5.3 Treatment and Disposal

At present, there is scientific treatment of solid waste in Wai. The waste collected through various vehicles from the city is dumped at the vermi-composting plant which is currently operated by a private contractor.

The existing solid waste dumping ground in Wai.

The vermi-composting plant has the capacity to treat 20 MT per month. There is a facility for manual segregation at the site and it is also supported by a shredding machine. The annual contract for operating the vermi-compost plant was issued in 2010–11 at the rate of Rs 95 000 per month. The vermi-compost pit installed by the ULB was to be operated by the contractor and 30 per cent of the income from the sale of vermi-compost was to be given to the ULB (approximately Rs 15,000 per month was earned by the ULB as receipts of compost sale).

The existing site for vermi-composting in Wai.

5.4 Suggested Strategies for Solid Waste Management

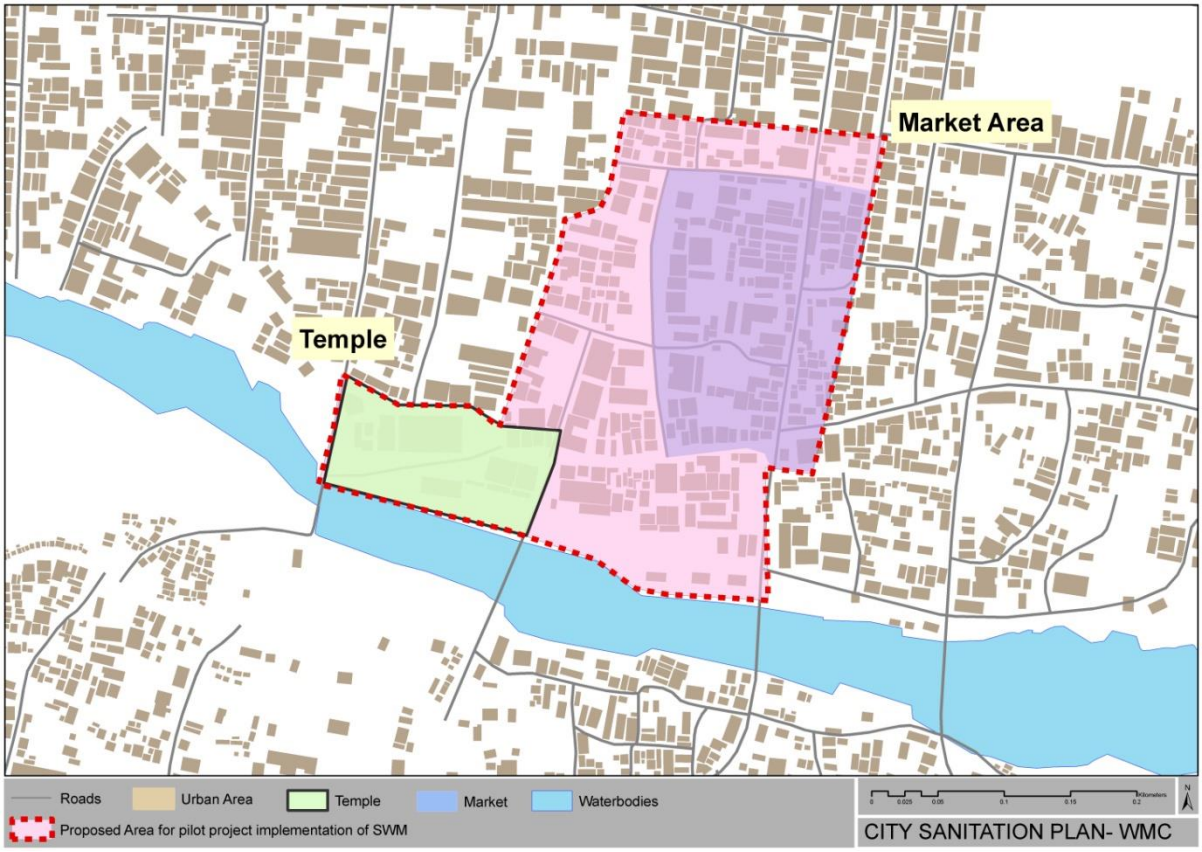
Collection and transportation of solid waste

Currently, a little more than 80 per cent households are covered by the city's door-to-door collection system. It is suggested that the WMC engages the contractor to extend door-to-door collection service to the unserved areas. It will need to procure a tipper truck to ensure that this is achieved.

To ensure that waste from commercial establishments and market is collected, it is suggested to develop a pilot project that involves local SHGs/CBOs and rag pickers in the areas delineated in Figure 31. The WMC will need to carry out the following activities to initiate the pilot project:

- Introduce the concept of projects to the residents/property owners in the pilot area.
- Organise capacity building workshops for the identified group of operators/cooperatives.
- Provide infrastructure such as litter bins, hand carts, shovel, brooms, gloves and required vehicle for transportation.
- Provide dedicated sorting shed for segregation of waste collected from the said areas.

Figure 31: Proposed area for pilot project for SWM



Sustainability of the pilot project:

The concept of piloting for the market area aims at management of the waste through a participatory approach by engaging the local informal sector and registering their cooperation. The required infrastructure shall be provided by the local authority, thus playing a role of a facilitator through handholding support. The residents/property holders (which are mostly shop owners and vendors) will be charged a user fee which will sustain the cooperative. Having developed a dedicated infrastructure to collect, transport and segregate the waste, it will provide a source of income for the cooperative.

Table 35: Profile of the area delineated for pilot project

Area considered for piloting	Wards 1, 9 and 10
Population/households	2,930/750
Land use activities	Predominantly commercial area with shops, market, vegetable mandi and informal vendors, hotels and food joints; Temple and ghat precinct, parking lot with high floating population
Key issues related to SWM	• Waste collected by ULB from waste bins • Lack of adequate bins in temple and ghat areas • Considerable dumping of waste in open nallas and along ghats
Proposed strategy	Forming a cooperative to involve local SHGs/NGOs and informal rag picker groups
Role of ULB	Facilitator: Providing infrastructure for collection–treatment–disposal
Sustainability	Selling of recyclable waste User fee levied on residents in the delineated area

Additionally, assessment of ghantagadi routes and optimising trips with existing fleet will enable the ULB to extend service using the same fleet. As mentioned in previous sub-sections; the total solid waste generated is 12 MT/day and the waste collected is 9.5 MT/day. The waste generated from residential areas is 4.5 MT. Based on prevailing contracts, the door-to-door service is provided to 80 per cent of households. Thus, approximately 3.6 MT/day of solid waste is collected from residential areas. Based on the capacity of auto tipper as 0.5 MT, the remaining 0.9 MT can be collected by increasing a trip of two ghantagadis. This needs a detailed assessment of routes of ghantagadis and required modifications for increasing efficiency.

The following table presents the indicative costs for initiatives to achieve 100 per cent collection

Table 36: Indicative costs for collection of solid waste

Component	Specifications	Cost in INR
D2D collection for residential areas	Outsourced to private operator	14.40 lakh[23]
Auto tipper vehicle[24]	To be used by private operator as well as for Nalla cleaning	3.50 lakh[25]

Segregation, treatment and disposal

Initiating segregation:

It is proposed to initiate the segregation of waste at household level: individual households will be facilitated with the two plastic waste bins to collect dry and wet waste separately at household level. The segregated waste will be collected door-to-door by ghantagadis and transported to the existing dumping ground with vermi-composting plant. It is proposed to initiate the model in Prabhag 4, where door-to-door collection is also proposed. With about 1,200 households, the estimated solid waste is about 0.3 MT per day.

The success of this pilot will be used to promote segregation at source in other parts of the city.

Treatment and disposal:

It is suggested to continue with the existing practice of segregating waste before treatment of organic waste disposal of the rest. It is expected that over the next few years, waste will be segregated at source. Most importantly, the WMC will need to develop an inert dump site to ensure there is no damage to the environment through crude dumping.

Additionally it will be useful to market the compost prepared from organic waste. Having agrarian surroundings, it will not be very difficult for the WMC. Such compost is useful in improving fertility and productivity of land.

[23]Cost is estimated considering prevailing contracts for present door-to-door collection. This is cost of service provision. Hence, it is annual recurring cost.
[24]Same as used currently by the ULB.
[25]Cost of auto-tipper is estimated based on prevailing rates of vehicles in Wai.

Outsourcing:

Considering limited human resource/staff available with the ULB, it is suggested that the WMC continues to engage the private sector in the collection and treatment of waste. Necessary infrastructure, such as sorting sheds, shall be provided by the ULB on the existing site itself. To manage waste, it is proposed to develop two contracts:

Table 37: Outsourcing activities to manage solid waste

Component	Activity
Collection	To include D2D collection in residential areas and transportation to dumping ground Collection in non-residential areas by involving local SHGs or welfare groups and rag pickers for one pilot area
Management of waste	Segregation Treatment Disposal and/or reuse

The following table indicates the likely costs of above suggestions:

Table 38: Indicative costs for segregation and treatment

Component	Specifications	Cost
Initiating pilot for segregation at source	Considering newly developed area in Prabhag 4 where there is no D2D collection: (1,200 HH x 2 bins each x Rs 35)	Rs 0.84 lakh
Sanitary landfill site	Develop an inert landfill site to receive segregated waste, treat organic waste and dump inert waste	Rs 1.9 cr

Summary of strategies

The following two tables present the summary of strategies as well likely costs.

Table 39: Strategies for improvement in solid waste management

Area	Collection and transportation	Segregation	Treatment and disposal/reuse	Implications
Residential areas	Continuing with present model of D2D private operator[26] and increasing the coverage to include left out areas	Shall be conducted by private operator and infrastructure like land availability and sorting sheds provided by ULB	Recyclable waste: Selling to private scrap dealers	Additional income source through selling of recyclable waste; financial sustainability can be ensured
Non-residential areas	Initiating pilot for central commercial area near mandi and temple precinct with involvement of CBO/women welfare/SHG		Bio degradable waste: Existing vermi-composting plant	Selling of the compost in the market and sharing of income with ULB (about 30% share was given to ULB by contractor when composting plant was in operation 4 years ago)
Nalla cleaning	As practised by ULB		Inert waste: On existing landfill site but with proper site management	Improved waste management reducing environmental impact

[26]Where infrastructure like vehicles, etc, is provided by the ULB and service is facilitated and managed by private operators.

5.5 Summary

Table 40: Summary of suggested SWM strategies and indicative cost estimates

Goal	Current status	Nature of actions needed	Costs (Rs cr)	Timeframe
100% collection of waste	81% coverage, slums and some newly developing areas not covered Community bins in commercial areas not regularly emptied	**Procure vehicle** Procure one tipper truck to reach unserved areas	0.035	2015
		Contract improvement Include unserved areas in contract with the existing contractor	O&M expenses	2015 onwards
		Pilot project Involve SHG/CBO in cleaning the market area	O&M	2015
Segregation of waste	Waste is not segregated, neither at source nor before crude dumping	**Pilot project** Initiate a pilot project for segregation at source in a delineated area. Provide two dustbins, one each for dry and wet waste, to HHs in delineated area **Promote segregation at source in the entire city**	0.0008	2015–17
Treatment and safe disposal	Collected waste is crudely dumped	**Inert landfill** Develop an inert landfill site to receive segregated waste, treat organic waste and dump inert waste	1.9	2022–24
Achieve 100% cost recovery	No charges levied towards the service	**Tax/user charges** Initiate levying tax/user charges towards the service	Policy	2015 onwards

The following table highlights the key issues observed in the current practices of solid waste management and also suggests interventions that are needed to deal with the issues.

Table 41: Key issues and interventions for solid waste management

Sector	Key issues	Suggested intervention
Collection	20% HHs not covered by D2D collection system; the two slums and newly developed areas are not served	Increase coverage by extending the existing contract to cover unserved areas
	Irregular collection of waste from bins in non-residential area (mainly commercial market, temple complex and mandi)	Initiate a pilot, involve CBOs, SHGs if required
	No segregation of waste	Initiate a pilot for segregation at source Promote segregation at source by creating awareness generation
Transportation	Inadequate infrastructure for collection of waste	Procure additional vehicles
Treatment	No scientific means adapted for bio-degradable, recyclable and inert waste	Develop sanitary landfill
	No dedicated system for treating biomedical waste	

6. Capacity Assessment

This chapter assesses the financial and technical capacity of the WMC. 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 WMC to meet the gap.

6.1 Municipal Finances

Section 101 of the MMCNPIT[27] Act mandates all municipal councils in the state to make provision for expenditure through their budget and maintain accounts of their receipts and expenditure. The WMC follows a cash-based accounting system. It maintains a consolidated budget that has three parts: revenue, capital and extra-ordinary accounts. No separate budget is maintained for services such as water supply, sanitation and solid waste management. Thus, it was necessary to recast these budgets to properly analyse revenue and expenditure from services. This exercise also helped to align the revenue and capital items that were misclassified. The recasting was done as per the accounting guidelines provided in National Municipal Accounting Manual (NMAM).

Table 42: Summary of municipal finance of Wai (recast budgets)

	2006	2007	2008	2009	2010	2011	2012
Items	**Actual**	**Actual**	**Actual**	**Actual**	**Actual**	**Actual**	**Actual**
Opening Balance	79.0	217.2	287.8	295.2	315.2	300.2	473.3
Revenue Account							
Revenue Receipts	491.6	459.4	579.8	593.3	760.0	807.5	1,002.0
Revenue Expenditure	365.3	444.7	494.3	546.5	802.1	724.7	918.3
Operating ratio	0.7	1.0	0.9	0.9	1.1	0.9	0.9
Capital Account							
Capital Receipts	370.5	158.3	150.6	463.5	196.5	644.0	128.9
Capital Expenditure	186.2	162.2	387.7	365.0	188.3	958.6	215.0
Capital Utilisation	0.5	1.0	2.6	0.8	1.0	1.5	1.7
Extra-ordinary Account							
Extraordinary Receipts	73.1	79.7	142.4	152.8	506.4	137.2	258.5
Extraordinary Expenditure	97.6	141.3	281.4	154.4	275.0	192.2	313.0
Summary							
Total Receipts	935.2	697.4	872.8	1,209.6	1,462.9	1,588.7	1,389.4
Total Expenditure	649.0	748.3	1,163.4	1,065.9	1,265.4	1,875.6	1,446.3
Closing Balance	**365.2**	**166.4**	**(2.8)**	**438.9**	**512.8**	**13.3**	**416.4**

Note: Amounts in Rs lakh.
Source: Budget books of the WMC.

[27] Maharashtra Municipal Councils, Nagar Panchayats and Industrial Townships Act, 1965.

Table 42 presents a summary of the municipal finances of the WMC from 2006–07 to 2012–13. The overall budget size has ranged from about Rs 6.5 to 14.5 crore. Table 43shows details of sources of revenue income. The WMC is mainly dependent on grants from the GoM which contributes two-thirds of its revenue receipts. The major grants received by the WMC include: compensation in lieu of octroi, dearness allowance grants, Nagar Parishad assistance, mudranshulka (stamp duty), entertainment tax grants and the Central Finance Commission grants. Most of these grants are made available by the GoM on a regular basis and are a predictable source of income for the WMC. Amongst its own sources, property tax and other local taxes are the major sources of revenue which contribute 12 per cent and 9 per cent, respectively, to total income. The major non-tax source (11 per cent) comprises rents from municipal properties.

Table 43: Sources of revenue receipts

Source	2006	2007	2008	2009	2010	2011	2012	Avg. % share
Consolidated property tax	47.9	66.3	87.8	89.6	85.8	86.9	142.1	13%
Other taxes	45.4	42.3	56.0	57.9	71.7	63.7	95.8	11%
Other own sources	56.4	67.0	77.3	45.3	56.8	93.2	82.2	9%
Grants and contributions	341.8	283.8	358.6	400.6	545.7	563.7	681.9	67%
Total	**491.6**	**459.4**	**579.8**	**593.3**	**760.0**	**807.5**	**1002.0**	**100%**

Note: Amounts in Rs lakh.
Source: Budget books of the WMC.

The total revenue expenditure of the WMC increased by nearly 150 per cent between FY 2006–07 and FY 2012–13. On average, the WMC spends 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 987 in FY 2012–13 which was slightly higher (Rs 983) than that suggested by a recent GOI Committee[28] that laid out norms for municipal expenditure of basic services.

Property tax is applicable on all properties in the city. It is calculated using the rateable value method. The rateable value is computed on the basis of use of property, carpet area, building type and age of the structure. Assessment of properties is carried out every four years and was last done in FY 2010–11. In FY 2013–14, the WMC raised a total tax demand of 111.6 lakh from 9,982 properties (including 1,715 non-residential properties). This on an average Rs 1,118 is levied as tax on each property. Wai also has high collection efficiency of 82 per cent, that is, it collected Rs 91.8 lakh (of the total demand of Rs 116 lakh). It also collected more than 50 per cent of Rs 37.6 lakh of backlog of property tax.

Water tax is collected on a flat rate basis. The rates are Rs 1,500 per connection per annum for domestic and Rs 6,000 for non-domestic connections. In 2013–14, the WMC raised a demand of Rs 99.7 lakh from 5,918 connections. However, it collected only 72 per cent of the new demand raised. The WMC needs to improve collection efficiency for current demand and also recover arrears.

[28]Report of the High Powered Expert Committee (HPEC) for Estimating the Investment Requirements for Urban Infrastructure Services, March 2011.

Table 44: Details of revenue expenditure

Main head of expenditure	2006	2007	2008	2009	2010	2011	2012
General administration dept	79.5	97.4	109.5	122.0	191.6	163.8	196.3
Water supply, sanitation and SWM	159.0	178.4	202.6	207.9	283.8	300.8	363.7
Other departments	126.7	168.9	182.3	216.6	326.7	260.1	358.4
Total	**365.3**	**444.7**	**494.3**	**546.5**	**802.1**	**724.7**	**918.3**

Note: Amounts in Rs lakh.
Source: Based on budget books of the WMC

The capital account shows considerable volatility, largely due to the fact that the grants from the GoI and GoM are not predictable. These grants are subject to acceptance of proposals submitted for various schemes. The major capital grants availed by the WMC are for slum development and 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 WMC to maintain adequate surplus to avail benefits of these schemes.

Table 45: Grants received by WMC for Capital works

Sector	2006	2007	2008	2009	2010	2011	2012	2013*	2014**
Slum Development (Nagari Dalit Vasti Sudhaarna Yojana grant, Ekatmik Gruh Nirmanva Zopadpattivikas Yojana) and housing (IHSDP)	12.6	18.3	-	99.5	7.2	174.9	41.3	142.0	63.0
Road construction grants	5.7	42.1	58.5	31.3	100.7	140.9	96.9	91.0	98.0
Implementation of development plan and TP schemes	25.1	49.2	59.2	36.0	57.6	21.4	0.5	82.0	85.0
Water and sanitation (MSNA)	-	-	-	-	-	-	-	36.0	38.0
Tourism development	72.5	-	-	-	-	161.7	-	90.0	95.0
Construction (Vaishtyapurna Kaama Yojana)	257.1	65.5	49.2	288.0	60.4	79.9	38.6	75.0	100.0
Unspecified (Maharashtra Nagari Punarutthan Yojana, Vikaskaamasathi Visheshanudaan)	-	-	-	-	-	95.0	-	415.0	198.0
Others	0.4	-	-	-	0.1	40.6	0.2	93.1	73.2
Total	**370.5**	**154.1**	**137.6**	**439.0**	**175.7**	**644.0**	**128.9**	**978.6**	**701.2**

* Revised estimates for 2013–14.
** Budgeted estimates for 2014–15.
Note: Amounts in Rs lakh.
Source: Based on WMC budget books.

It is important to understand that the WMC transfers internal surplus on the non-WSS accounts to meet both capital and revenue expenditure requirement for the water, sanitation and solid waste (WSS) sectors. Over the past two years, the WMC has transferred 74 per cent and 77 per cent of its non-WSS surplus in this manner to meet the shortfalls in the WSS sectors as the taxes and user charges are not able to fully meet the expenditure of these requirements. In order to assess the extent of such surplus likely to be available, the WMC's finances were analysed.

To calculate the WMC'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. For taxes, the tax base (number of properties for property tax, number of connections for water tax) is projected and multiplied by tax rate. 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, finances were projected at aggregate levels.

Based on these forecasts, over the 10-year period till 2025, it appears that the WMC has a capacity to invest about Rs 1,050 lakh. 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 to Rs 1,100 lakh. The WMC can also explore further expenditure control measures to generate additional investible **surplus**.

Table 46: Estimated revenue surplus of WMC

	Estimated revenue surplus over 10 years
Trend based projections (Business as Usual -BAU)	1,048
Financial improvement actions	
Improving Collection efficiency of property tax (current tax to 90% and arrears – 75%)	40
Improving collection efficiency of water (current tax to 90% and arrears 85%)	8
With Improved Collection Efficiency of Property tax and Water tax (90% for current demand and 75% for arrears)	1,096

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

6.2 Institutional Capacity

Wai is governed by the Maharashtra Municipal Council, Nagar Panchayat and Industrial Township (MMCNPIT) Act, 1965. Section 4 of the Act categorises the municipal councils based on its population. Accordingly, Wai falls in Class 'C' (20,000–40,000).

Existing arrangements in Wai Municipality

The town of Wai has 19 wards divided into five 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 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 roles and responsibilities of key departments are discussed inTable 47.

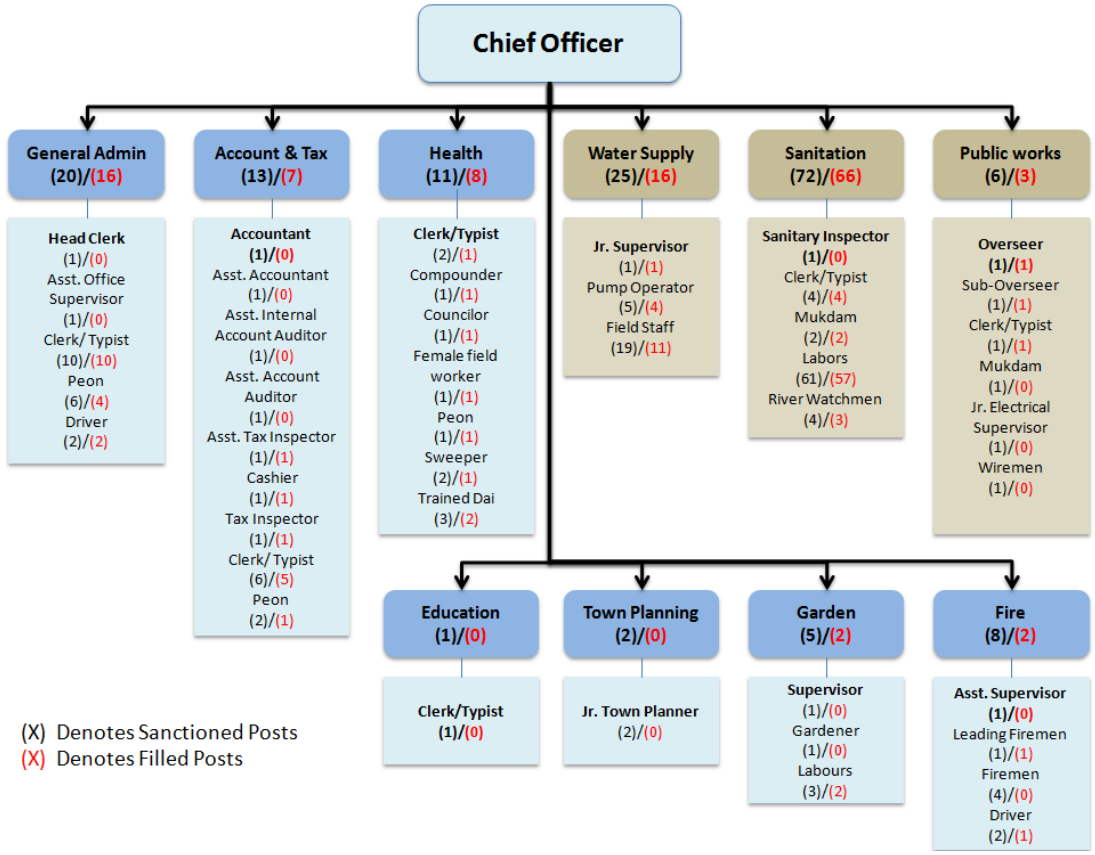
Table 47: Administrative departments and responsibilities in Wai Municipality

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	• Garbage collection and disposal • Street sweeping • Nalla cleaning and disinfecting • Maintaining gardens • Cleaning of community and public toilets and septic tanks

Source: Wai Municipality

The sanctioned staff strength of the WMC is 163, of which 120 are recruited. Figure 32presents the organisational structure of the executive wing, including details of sanctioned and vacant posts. As can be seen in the chart, key positions, such as the sanitary inspector in sanitation department or accountant in account department, are vacant. 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 and revision is done every five years. The 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 2006 may not meet the current prerequisites. The staff primarily performs their responsibilities through on-the-job learning. The required qualifications for staff members in the WMC is given in Appendix 1.

Figure 32: Organisational structure: Executive wing of Wai municipality



Outsourced activities

To meet the gaps in service delivery, private parties are roped in on a contract basis, the details of which are mentioned below:

- Maintenance of all CTs is outsourced to private parties, but there are no user fees charged for this. The ULB pays a fixed annual amount to the contractor who hires cleaning staff and also undertakes minor repairs. The costs for water and electricity are borne by the ULB. In the new blocks, the caretaker is provided with accommodation in the toilet complex.
- Pre-monsoon cleaning of drains: Labour is hired on contract basis for nalla cleaning works and road sweeping for two months prior to the monsoons and for about a month during the rest of the year (during major festivals). The contractor is involved in road sweeping and nalla cleaning and transports the waste collected to the dumping site (paid Rs 1,200 per trip). Contract for 2012–13 is fixed for Rs 1,500 per trip.
- Contract staff hired for door-to-door household waste collection: The contractor collects door-to-door waste in residential areas, which covers 80 per cent households. The remaining 20 per cent households in slums and newly developed residential areas and the commercial areas are not covered under this service. The contract, in operation since 2008, was renewed each year and the annual amount agreed upon to be paid by the ULB was Rs 72,000 per month. The ULB provides necessary equipments and the contractor engages labour for door-to-door collection

service. For 2012–13, the contract has been assigned to a new contractor at the rate of Rs 62,000.

- Another yearly contract was issued in 2010–11 for operating of vermin-compost plant at the rate of Rs 95,000 per month. The vermin-compost pit installed by the ULB was to be operated by the contractor and 30 per cent of the income from the sale of vermin-compost was to be given to the ULB (approximately Rs 15,000 per month was earned by the ULB as receipts of compost sale). But due to lack of timely payment on part of the ULB, the contractor could not cover labour salaries on time and hence stopped operating the plant. Fresh contract is now being pursued by the ULB.

SHGs have recently been assigned the task of bill distribution. A discussion with the ULB officials and ward councillors revealed that there are almost 200 SHGs in Wai. The discussions with local officials suggest a positive response to private sector contracts. These have helped save both time and resources. However, more efforts are needed to improve quality of service delivered by them. During a stakeholder engagement session with ULB staff and councillors, it was observed that several of the councillors are socially active and are involved in provision of basic amenities especially water and sanitation, solving people's problems, promoting SHG involvement, etc. They play a proactive role in the town's development and contribute to bringing people's issues in the forefront and working alongside with the ULB for strengthening of services provided.

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.

The CSP explores various technologies as complimentary to each other and subsequently attempts to phase them to deliver cost effective and sustainable solutions. In this context, it builds upon or consolidates existing systems and adapts new solutions sequentially to lay down a roadmap to achieve universal coverage of sanitation in Wai. It details improvement actions, its prioritisation and precedence of activities across sub-sectors. Finally, it compares service levels that can be achieved through strategic investments. A 10-year improvement plan for Wai has been formulated, spanning from 2015 to 2024 using a decision support tool for city-wide improvement planning developed under PAS project.[29] The tool has been applied to formulate prioritise and phase improvements across the sub-sectors.

7.1 Summary of Strategies

The following table summarises the strategies suggested in earlier chapters and their costs.

Table 48: Projects for improving urban sanitation

Sr. no.	Project	Base cost (INR cr) 2012 prices
	Access to toilets	
1	Household toilets with partial subsidy as incentive	6.30
2	Community toilets refurbishment	0.45
3	Public toilets: new blocks	0.20
	Wastewater and stormwater management	
4	Wastewater conveyance (settled sewer network) and treatment	7.30
5	Desilting and rehabilitation of natural drains	1.40
	Integrated faecal sludge management	
6	Provide regular IFSM service with sludge treatment	0.66
	Integrated solid waste management	
7	Water segregation, tipper truck, provision of bins	0.05
8	Construction of a sanitary landfill site	1.90
	Integrated monitoring systems	
9	Develop IT based monitoring systems	0.30
	Awareness generation	
10	Awareness generation and IEC campaigns	0.30
11	Capacity building for effective implementation	

[29] More details on the tool can be accessed at www.pas.org.in.

The financing plan for a 10-year (2015–2024) sanitation improvement strategy in Wai is based on an analysis of its municipal finance 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 WMC projects are taken into account.

Based on the assessment and actions needed to achieve improvement in sanitation across sub-sectors and service chain, eight specific projects are identified. A ninth project is also envisaged for setting up appropriate monitoring systems linked to WMC's e-governance system. These projects will be supported by ongoing activities for awareness generation among leaders and residents of Wai, as well as capacity building of the local council.

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, WMC'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 projects proposals for each of the project 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 WMC 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 above in municipal finance assessment, the WMC does generate internal surplus and this can be enhanced by improving collection efficiency of taxes and charges. The WMC 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 CSPs 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 using both the conventional sources such as grants from the state or national governments as well as assessing new sources. Essentially, 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 a cost of 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

Wai, two areas are identified for a PPP arrangement: the emptying service component of an IFSM service, and the 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 contractors are 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 the ULB will meet some share of these costs, grants from either state or national government grants 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 sector 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.[30] As sanitation is included in the CSR rules, this could be a potential source.

Grants from Corporate Social Responsibility 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 WMC, with possible support from civil society organisations and academic institutions, will need to be proactive and identify such possibilities. Projects such as the ones for provision of toilets through incentive subsidy, construction and management of community and public toilets, procurement of vehicles for solid waste collection and septage, awareness campaigns may receive funding from such sources.

WMC own funds: Besides exploring other external funds, the WMC 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 WMC's finances discussed earlier suggests that the Council will be able to meet funding requirements for some of the CSP projects. In addition, however, the WMC will need to explore external funds.

Table 49 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 City Sanitation Plan.

Table 49: Potential sources of financing various CSP projects

	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 refurbishment	a) ULB **own funds**; b) **CSR funds**; and c)**Swachh Bharat Mission**

[30] 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.

3	Public toilets: New blocks	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; and 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**; b) **Maharashtra Nagarotthan Yojana**. In such state schemes, ULB has to **contribute** a part ranging from **10% to 20%** of the project cost; and 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 drains	
	Integrated faecal sludge management	
6	Provide regular IFSM service with sludge treatment	For suction emptier trucks: a) **private player**; b) **GoM** grant under MSNA/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; and d) **borrowing**. For septic tank access refurbishment: **Households** to bear these costs themselves
	Integrated solid waste management	
7	Water segregation, tipper truck, provision of bins	Tipper truck: a) GOM's grants for **purchase of equipment;** b) **CSR** funds Pilot project for segregation at source: WMC's **own funds :** b) **CSR** funds
8	Construction of a sanitary landfill site	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; and c) CSR funds
	Integrated monitoring systems	
9	Develop IT based monitoring systems	Grants from **GoM** which include training of officers and staff. **ULB** will bear a part of the cost
	Awareness generation	
10	Awareness generation and IEC campaigns	a) **SBM** funds for IEC campaigns; and b) **CSR** funds
11	Capacity building for effective implementation	a) WMC **own funds**; b) **GoM** capacity building funds; and c) supported through ongoing projects and support from CEPT University and AIILSG under the **PAS Programme**

Priorities, phasing and project development

A phasing plan has been developed to implement the CSP proposals over a 10-year period based on local priorities and capacity for implementation. Table 50 presents proposed phasing of all projects. 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, those projects that 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 WMC will need to treat this as a rolling plan that can be adapted to match its efforts at mobilisation of capital funding. The WMC 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.

Table 50: 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 refurbishment										
3	Public toilets: new blocks										
	Wastewater and stormwater management										
4	Wastewater conveyance (settled sewer network) and treatment										
5	De-silting and rehabilitation of natural drains										
	Integrated faecal sludge management										
6	Provide regular IFSM service with sludge treatment										
	Integrated solid waste management										
7	Water segregation, tipper truck, provision of bins										
8	Construction of a sanitary landfill site										
	Integrated monitoring systems										
9	Develop IT based monitoring systems										
	Awareness generation										
10	Awareness generation and IEC campaigns										
11	Capacity building for effective implementation										

Financial assessment

The proposed phasing will result in a total requirement of Rs 28.4 crore for the full CSP to be implemented over a 10 year-plan period. Based on an assessment of financing sources above, Table 51 presents sources of financing all the CSP projects identified above. The WMC will have to mobilise 60 per cent of the total costs as grants through central and state schemes, or from CSR sources. It will have to contribute Rs 3.5 crore as its own share. This can be met through its internal surplus or by borrowing from a commercial bank.

Table 51: 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	870	131 (15%)		696 (80%)	44 (5%)
2	Community toilets refurbishment	55				55 (100%)
3	Public toilets: new blocks	23		23 (100%)		
	Wastewater and stormwater management					
4	Wastewater conveyance (settled sewer network) and treatment	1,165	1,049 (90%)			117 (10%)
5	De-silting and rehabilitation of natural drains	182	164 (90%)			18 (10%)
	Integrated faecal sludge management					
6	Provide regular IFSM service with sludge treatment	86		12 (14%)	43 (50%)	31 (36%)
	Integrated solid waste management					
7	Water segregation, tipper truck, provision of bins	5				5 (100%)
8	Construction of a sanitary landfill site	374	337 (90%)			37 (10%)
	Integrated monitoring systems					
9	Develop IT based monitoring systems	41	37 (90%)			4 (10%)
	Awareness generation					
10	Awareness generation and IEC campaigns	40	24 (60%)			16 (40%)
	Total	**2841**	**1741 (61%)**	**35 (1%)**	**739 (26%)**	**326 (12%)**

In addition to capital financing, new projects will also entail considerable additional O&M expenditure. To meet both capital and O&M expenditure requirements, the WMC will need to consider improvements in three areas: a) 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 Council will need to introduce new taxes for sanitation (Rs 300/annum) and SWM (Rs 180/annum) in 2015. This will mean a less than 20 per cent one-time increase in total taxes paid by individual property owners. This can be further reduced for households by charging higher increases for non-residential properties. To meet both the capital and O&M financial requirements of implementing the full CSP, the WMC will need to increase its average tax levels as shown in Table 52. If the WMC does manage

to improve efficiency in tax collection, its required tariff increases will be only 18 per cent to 42 per cent over the 10 year period.

Table 52: Percentage increase in average tariff/tax levels required by year 10 to implement CSP

		Transfer of internal surplus to WSS account	
		No increase (75%)	Increased to 84%
Collection efficiency	No increase (83%)	94%	54%
	Improved to 90%	42%	18%

Based on its own priorities and assessment of possible funding, the WMC has identified two projects for early implementation from the full list of 11 projects. These focus on the goal of making Wai open defecation free and having proper faecal sludge management systems in place in the next three years. For the ODF plan, the Council plans to provide an incentive grant of Rs 5,000 per household for toilet construction. This will be made available to households to make their 'own toilets' either as individual toilets or a group toilet shared by three to four families that know each other well. For Integrated faecal sludge management, the Council has decided to seek the support of private sector contractors for a three-year scheduled cleaning service and a treatment facility to treat the collected faecal sludge.

The WMC receives support in design and implementation of these two projects from the CEPT

Survey to assess the possibilities of group toilets in Wai.



University and All India Institute of Local Self Government (AIILSG) under the PAS Project.

8. Strategies for Institutional Strengthening and Awareness Generation

8.1 Overall Institutional Issues

The following broad issues were identified in the course of discussion with the ULB team and review of current institutional framework. Staff crunch is currently leading to sharing of responsibilities and work overload. This is also reflected in issues of non-recovery of taxes, billing, and lack of proper supervision of tasks performed. The authority of filling up cadre posts lies with the DMA; the ULB has no role to play. Hence important positions in the departments remain vacant. Discussions revealed that formal monitoring and reporting structures for staff are not in place, which makes it difficult to keep tab on tasks performed. The current qualification norms for recruitment are higher than when posts were filled. For example, the qualification required for an accountant pre2006 was B.Com, but now the requirement is CA or ICWA.

Besides, there is a lack of capacity building training and/or sensitisation programmes for staff, and there is no complaint redressal mechanism in place. Though the complaints are redressed by field staff, the time taken and quality of service provided is not recorded. The issue of staff crunch is handled by outsourcing works on contract, but lack of timely payments and management has created hindrance in smooth operations.

8.2 Strategies for Institutional Strengthening

The Institutional Strategy should be 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 leading to ODF town, scientific sewerage system leading to cleaner environment and proper solid waste management practices (including collection, disposal and treatment of waste).
- Lack of providing sanitation services as per norm, especially O&M of basic services such as toilet cleaning and waste management.

The strategies are proposed aiming at dealing with the above two issues and to tackle the workload of existing staff due to staff crunch.

Intervention at state level (DMA office) is needed to fill up cadre-related posts such as Sanitary Inspector, Jr. Water Supply Engineer, Internal Auditor, Administrative Officer, etc, which are currently vacant. This will help in reduction of workload on existing staff and ensure smooth functioning of each department. It will also help in strengthening the monitoring of work of the department.

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. In addition, 29 out of 61 sanctioned posts of sanitary workers are provisional positions – which means that as and when staff members in this category retire, the post will not be filled, leading to 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 there is a need to strengthen the public health department of the ULB which looks after the sanitation aspects for effective monitoring of implementation and O&M. The role of the ULB will be more facilitator and provider of infrastructure and monitoring. The monitoring of the contract work and also that of the existing sanitary workers can be achieved by filling up the post of Sanitary Inspector (sanctioned, but currently vacant).

Table 53: Strategy for outsourcing O&M activities in Wai

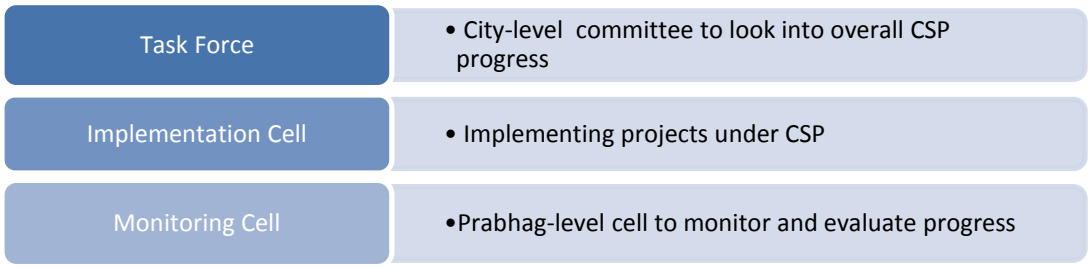
Sector	ULB role	Stakeholder's role	Implications for ULB
Solid waste management: Waste collection	• Infrastructure provision like vehicles, hand carts, gloves, etc • Payment to the contractor • Issue of well defined contract • Monitoring of services provided	• 100% door to door coverage for waste collection • Transportation to vermin-compost plant • Hiring of required staff and related payments	
Solid waste management: On-site management of waste	• Infrastructure development like vermi-compost pits, water, electricity, vehicles, etc. • Payment to the contractor • Issue of well defined contract • Monitoring of services provided • Identifying land for scientific landfill site and provision of related infrastructure	• Operation of vermi -compost pits • Sale of compost and sharing of income as per pre-decided conditions with ULB • Sale of recyclable waste • Operation and maintenance of scientific landfill site	• Appointment of additional staff in long run • Appropriate disposal of waste and hence cleaner town • Less load on nalla cleaning works (which currently is chocked due to waste dumping) • Income from sale of compost
Involvement of informal sector groups like rag pickers/SHG on user fee basis	• Infrastructure provision like hand carts, brooms, gloves, etc • Facilitating formation waste pickers cooperative and	• NGO role: Identify and form cooperative of rag pickers/interested community	

Sector	ULB role	Stakeholder's role	Implications for ULB
(pilot in commercial area/temple precinct area) with support from NGO/CBO as facilitator	their training with the help of local NGO/CBO • Issue of well defined contract • Monitoring of services provided	members (from slums) • Cooperative's role: Daily street sweeping and collection of waste; selling of recyclable material; fee collection and account management	

8.3 Strategies for Effective Implementation

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

Figure 33: Roles of various stakeholders



The Task Force 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, 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, etc. It will be responsible for:

- Coordinating with concerned 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.
- Taking decisions on updating and extending CSP implementation as per future needs.

Table 54: Suggested 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 CSP will be the primary responsibility of the Wai Municipal Council. The responsibility will be carried out in coordination with Prabhag level ULB Staff and contractors, CBOs/SHGs and NGOs as facilitators, etc.

Figure 34: Structure of the implementation cell

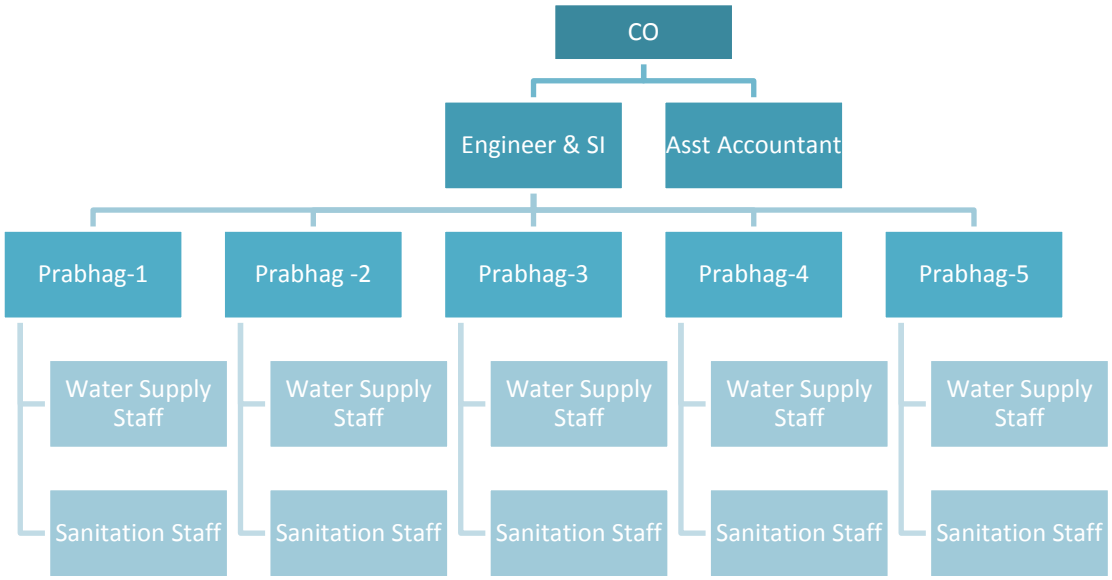


Table 55: Roles and responsibilities of various stakeholders in the Implementation Cell

Stakeholder	Role
CO	• Administrative/decision-making authority
Engineer/SI	• Supporting preparation and implementation of CSP • Supervising tasks carried out by Prabhag-level ULB staff, O&M tasks carried out by private operator/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 of progress • Holding bi-monthly review meetings with field-level staff
Asst Accountant	• Ensuring reforms are on track

Stakeholder	Role
	• 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 • 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, door-to-door collection, O&M of toilets, etc • Timely implementation of projects as envisaged in CSP • Identifying and motivating CBOs to partner, for undertaking O&M, waste collection, etc • Carrying out IEC programmes with identified stakeholders • Following MIS and reporting schedules • Communicating citizens feedback to concerned 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 is proposed to include a mix of councillors, head clerk, engineers, mukadams, as well as mohalla committee members and representatives of CBOs/SHGs.

Table 56: Roles and responsibilities of stakeholders in the Monitoring Cell

Councillors	Enabling tariff and institutional reforms Interface 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	Organising monthly meetings with implementation cell and trouble shooting Reporting to Task Force Being the bridge between Task Force and Implementation Cell
***Mohalla* Committees**	Taking on a 'watchdog' role in monitoring of CSP implementation Doing IEC activities and citizen interaction and involvement Undertaking third party assessment and evaluation
NGOs/CBOs	Organising community mobilisation, demand promotion Doing IEC activities Enabling training and capacity building Doing surveys and evaluation

It is envisaged that outsourcing of O&M related to sanitation services will not only help solve the issue of staffing, but also decrease the burden on the finance arrangements. Institutional strengthening can also take place by clear assignment of 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 (M&E), and regulatory arrangements. Involving various stakeholders in the implementation and monitoring/evaluation process will help improve the ownership of sanitation situation, leading to a cleaner town.

A state-level sanitation policy –specifying institutional strengthening and capacity building measures at the ULB level, including awards, rewards and incentive framework –needs to be developed.

Discussion with staff members of the ULB 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 as well. 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 redressal, etc.

The ULB can tie up with existing training institutes and arrange for exposure visits, workshops for discussion and experience sharing by subject experts for the purpose. Skill transfer can be achieved through on-the-job training and deputation of municipal staff for short to medium term durations, in 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 undertaken should be done at two levels: internal monitoring and use of social accountability and participatory monitoring and evaluation. Participatory monitoring involves local beneficiaries in measuring, recording, collecting, processing and communicating information to assist local development project extension workers and local group members in decision-making. Issues such as lack of monitoring, citizen's interface, MIS, work overload, etc, can be managed effectively through automations and e-governance models.[31]

8.4 Awareness Generation and IEC measures

The previous Sections have thrown light on the key issues in sanitation in Wai. 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 disposal of household waste, its treatment and reuse. FGDs were conducted in slum/non-slum areas, commercial/market places and educational institutes to understand the level of sanitation-related awareness. The FGD outputs are summarised in Appendix 6. It can be concluded that levels of awareness vary 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 communication as a means plays an important role in achieving 100 per cent access to sanitation. Complete sanitation can be ensured by bringing about changes in existing mindsets through an integrative process of behavioural change. This goal can be met by

[31]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 year 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.

implementing a comprehensive IEC plan, targeting stakeholders at various levels in the town and introducing them to the purpose and rationale of the plan in detail.

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

For communication to be effective among different stakeholders, different channels are suggested depending upon the level of understanding, education levels, environment in which they stay, etc. The channels of communication are broadly divided into channels for:

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

Though IEC should be an ongoing activity, it is important to match it with the timeframe set by the ULB to achieve certain sanitation practices, such as pilots for waste segregation, waste collection systems 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 programmes targeted.

Table 57: Costs of IEC campaign

Sr. no.	Component	Description	Cost (Rs in lakh)
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**

To achieve the objectives of IEC, the cost per year would be Rs 10 lakh for the short term period (three years). Different IEC strategies for different stakeholders can be effectively utilised for 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 a period of around three years to bring about change in behaviour.

9. Options for Early Implementation of Projects

Taking into consideration the outline city-wide sanitation development strategy as discussed in the previous chapters, the CSP team has started identification of potential larger implementation projects that could be implemented immediately by the WMC without waiting for larger grants or new investments. In this context, two potential projects have been identified. The activities and progress related to them are elaborated below.

9.1 Demand-led Scheme for Group/Shared Toilet Construction

One of the key goals of Wai CSP is to make the city ODF and have universal access to sanitation. As elaborated in the CSP, Wai can pursue individual toilets or look at possibilities of 'group toilets' to ensure that all households in Wai have access to toilets. Based on surveys conducted in Wai, and results of 2011 Census, it is estimated that about 2,400 households in the city do not have their own toilets. The key reasons for this are lack of space and/or lack of adequate funds to construct toilets. It was observed during the survey that households prefer 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 to them in the form of subsidies from the WMC.

Existing group toilets shared by households in Wai.

Group/shared toilets will essentially mean the construction of a toilet that is shared by two to four households residing in close proximity, depending on the availability of common space in the vicinity. This will decrease the investment needed from each household, in addition to creating joint ownership and providing access to safe sanitation. A group toilet is maintained by the households, who also undertake repair and maintenance like in the case of individual toilets.

Surveys to assess cases for group toilets in Wai.



The CSP team has compiled the results of the group toilets assessment and has shared it with the WMC. Assistance is also being provided to the WMC to draft a scheme to announce subsidies for eligible households for construction of group toilets. The objective of the scheme is to promote use of group/shared toilets for households that do not have a toilet facility within their premises. 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. Successful implementation of such a scheme can help save the ongoing expenditure on community toilets, as well as, in the future, free up land used for housing community toilets in the city.

For the scheme design, it is assumed that subsidies will be granted by the WMC to such households for constructing toilets with septic tanks (as per specifications/guidelines). 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 implementation of this scheme, support is being provided to the WMC 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 WMC 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 possibility of granting subsidies to the applicants. The CSP team is developing detailed specifications/guidelines for toilet construction in coordination with the Council to ensure quality construction and standardisation of materials used for construction. Additionally, based on field survey, the CSP team has also identified potential cases for group/shared toilets and interacted with the households interested in availing the benefits of the scheme. Detailed documentation of such cases with architectural designs is being prepared to build cases for group toilets in Wai 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. Thus, the Septage Management Plan for Wai 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 like 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.

In Wai, septic tanks are largely oversized and do not confirm to standards prescribed in IS codes and CPHEEO manuals. In addition, the erratic 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 (empty) the septic tanks every three years. This will help in effective treatment of sludge and lead to overall reduction in pollution levels due to indiscriminate discharge in 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 WMC. As part of the Management Plan, specific recommendations are being prepared for following activities:

Septic tank Improvement: Field investigations reveal that septic tanks tops are sealed with stone slab (farsi). Thus, the cleaning process, whenever it happens, has to be done after breaking up the sealed top. It is suggested that while advocating for periodic cleaning, households should be trained to provide an RCC access manhole cover over each chamber of the septic tank. This will ensure easy access during emptying process.

Septic tank emptying: As recommended by the MoUD advisory, households need to follow a three-year emptying cycle of septic tanks. Annually, ULB officials thus need to empty around 1,760 household-level septic tanks. The WMC needs to procure one 5-kilolitre capacity suction emptier truck (capital cost: Rs 8 lakh) which can empty six household-level septic tanks daily in six trips. It is proposed that septage will be dumped at a septage treatment facility which is proposed at the existing solid waste dump site. The truck operations would be carried out for 300 working days. The Septage Management Plan helps identify spatial distribution of the desludging process. The annual target of this plan is to empty 1,760 household-level septic tanks in the city. Due care should be taken that the emptier leaves around one or two inches of septage inside the tank so that it acts as a seeding material to the new incoming waste. The estimated O&M cost of operating this services would be around Rs 9.41 lakh/annum. Under this plan it is suggested that the emptying should be regulated and not demand based. Thus, mechanisms need to be built in to ensure that households empty their septic tanks once every three years. In addition, the existing suction emptier truck that the ULB has will continue its operations of cleaning septic tanks of six to seven community toilet blocks daily.

Private sector participation: There is a possibility of outsourcing the emptying services to a private operator in Wai. The plan considers two types of business models for emptying services: a PPP mode or through a management contract. In the PPP mode, the capital costs (that is, purchase of suction vehicle) and O&M costs are borne by the private operator. The WMC will collect charges/taxes from the households and pay a fixed contract amount to the private operator. The Council will mainly

monitor the activities of by private operator. Under the management contract, the capital costs (that is, purchase of suction vehicle) is borne by the WMC and O&M costs are borne by the private operator. The WMC will collect charges/taxes from the households and pay a management fee to the private operator for operating the services. The WMC will also monitor the activities done by the private operator.

Septage treatment and reuse: It is estimated, for a three-year cleaning cycle in Wai, the daily load on the septage treatment facility will be 26.3 cu m/day.[32]The treatment option proposed for Wai is sludge drying bed (SDB). The simple technology is also recommended by the MoUD advisory in case land is easily available. Under this option, septage is distributed over a filter media of sand and gravel and left for drying for a few weeks. The liquid portion seeps through the filter media and collects in an under drain pipe and is disposed off or further treated if disposal standards are not met. This septage can be treated at the WMC solid waste dump site campus which is located around 3 km from the city.

Figure 35: Proposed location for septage drying beds

The existing vermi-composting plant can use this treated septage (mixed with vermi-compost after drying and can also be sold as a soil enriching fertiliser). It is proposed that dried sludge cakes can be mixed with organic solid waste and sold as fertiliser to the nearby farm industries like Mapro. As per

[32]As per USEPA, 1984 the estimated septage that is generated per person is around 230 litres/capita/year.

estimates, if 30per cent of the collected septage is reused at 50 paise/kg, Rs 14.4 lakh/annum can be earned as revenue.

Table 58: Septage Management Plan - Summary of proposals and costing

Sr. no.	Description	Details	Finances
Septic tank emptying			
1	Vehicles required	1	**Capex** – Rs 8 lakh
	Capacity of the vehicle	5 kilolitre	
2	Septic tanks to be emptied daily	6	**Opex**– Rs 9.41 lakh /annum
	Septic tanks to be emptied annually	1,760	
	Number of working days	300 days	
3	Annual taxation[33]	Rs 190residential property and Rs 230 /non-residential property	**Revenue** – Rs 19.7 lakh /annum
	Revenues from emptying services	Annual	
Septage treatment and reuse			
1	Single sludge drying bed area (12 x 10)	120 sq m	**Capex** – Rs 27.5 lakh
	Max septage depth	0.3 m	
	Sludge drying cycle (days)	15	
	Total number of SDBs required	11	
	Total site area (SD bed area + 10% SD bed area + and dried storage + area of ancillary units)	1,709 sq m	
2	O&M cost of treatment facility	Annual	**Opex**– Rs 3 lakh /annum
3	Rate of sale for treated septage	50 paise /kg	**Revenue** – Rs 14.4 lakh /annum
Summary of costs			
1	**Total Capex**		**Rs 35.5 lakh**
	Total Opex /annum		**Rs 12.41 lakh**
	Total Revenue /annum		**Rs 34.1 lakh**

It is proposed that some wastewater management charges should be levied by the WMC and made a part of annual property tax system. Under this proposal, each residential and non-residential property would be taxed Rs 190 and 230 every year, respectively, and provided free emptying services under the regulated emptying service once every three years. The estimated annual revenue from the taxation would be to the tune of Rs 20 lakh.

[33] In year 2012–13, there are 8,267 residential properties and 1,715 non-residential properties.

Appendixes

Appendix 1: Required Staff Qualifications for Wai Nagar Parishad

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/Eng. MS-CIT
Senior Clerk	3	HSC & 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	BCom 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

Post	Grade	Qualification required
		Training Heavy Driving License
Junior Water Supply/Sanitation Eng.	3	BE/DE Mechanical/Environment or Degree/Diploma in Environmental Science MS-CIT
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
Officers/Head clerk/Compounder/ Assistant Internal Account Auditor/Accountant/Overseer/Meter Reader/Female Field Worker/Councillor	3	--
Labourers/Gardener/*Mukadam*/Sweeper/*Chowkidar*/Trained Dai/River Watchman	4	--
Garden Supervisor	3	Degree from Agriculture College in Horticulture MS-CIT

Appendix 2: Case Studies: Conditional Assessment of Household-level Sanitation

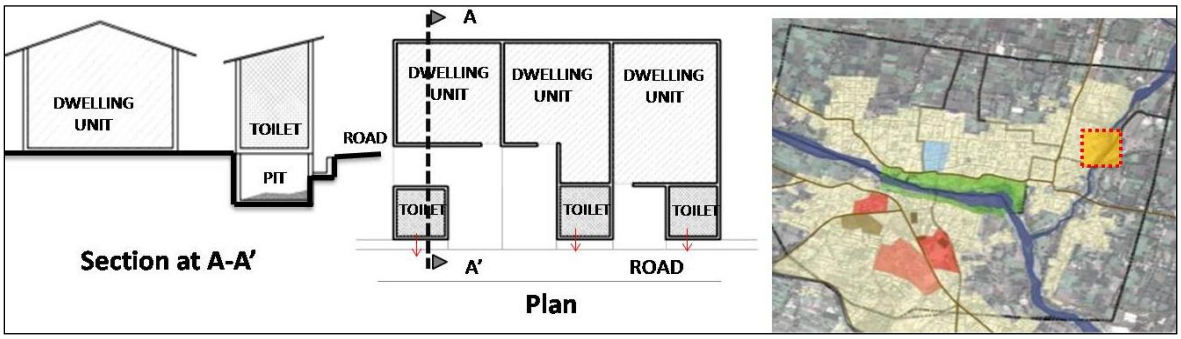
Case Study 1

Location: Ravivar Peth

It is located in the northern part of the town. House is one-storey high with detached toilet blocks. The toilet is constructed towards the roadside. The constructed toilet is of 3' x 4' size. Pit of size 3' x 4' is constructed below toilet and effluent from pit is directly discharged to open drains along roadside.

Sanitation service chain

The sanitation service chain here starts with pour flush toilet as user interface. There is pit latrine for collection of waste. The effluent is discharged into roadside open drain. There is no provision of soak pit and pit size is also inadequate compared to desired sizes. Thus, it affects primary treatment. Pit latrine is cleaned with interval of more than two years, which is higher than desired.



Observations:

- No provision of soak pits.
- Effluent discharged into open or closed drains along road.
- Inadequate pit sizes affecting the primary treatment.

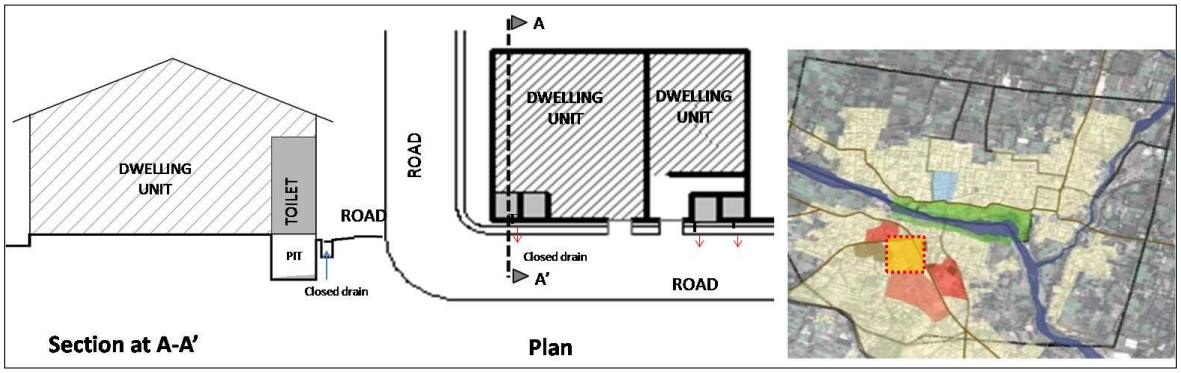
Case Study 2

Location: Prabhag 4

Prabhag 4 is one of the newly developed areas in Wai. The house is located in the southern part of the town. The toilet is constructed along the roadside. The size of the toilet is 3' x 4' and pit of same size is constructed below superstructure.

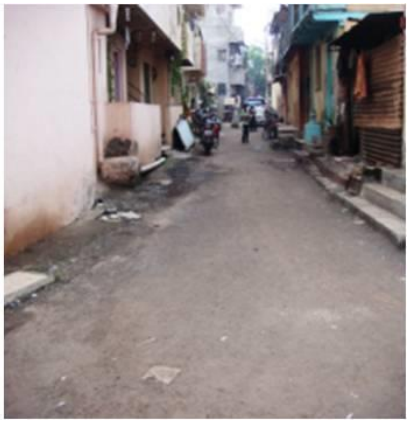
Sanitation service chain

At user interface level, a case comprises of pour flush toilet. Pit latrine is constructed below superstructure for collection of liquid waste. Hence, there is no accessibility for cleaning of pit latrine. Also, there is no provision of soak pit. Therefore, on-site primary treatment is affected. Further, effluent from pit latrine is discharged into roadside closed drain. From there it is discharged to river Krishna without any treatment.



Observations:

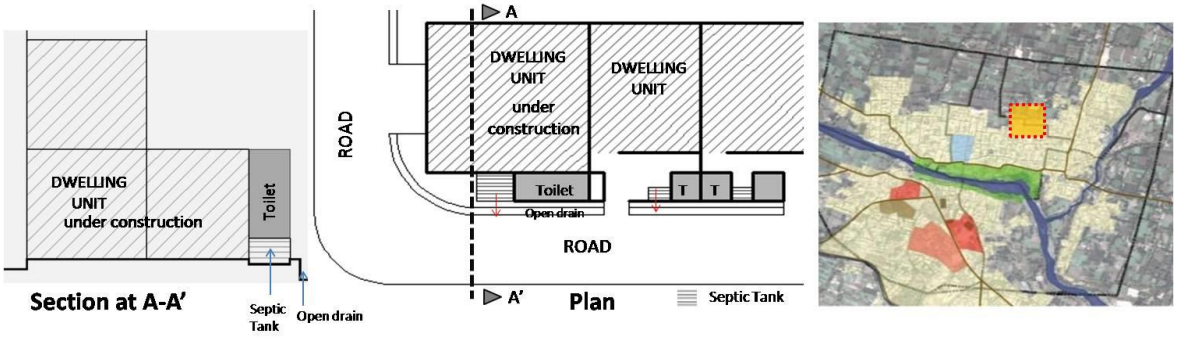
- No provision of soak pits.
- Inadequate pit sizes affecting the primary treatment.
- Discharge of effluent into roadside closed drains.



Case Study 3

Location: Prabhag 2

The house is located in the northern part of the town. It is situated on the junction of two roads. In the case, the house is under construction. The septic tank of desired size is being constructed facing roadside. The size of the toilet is 3'6" x 4'.



Sanitation service chain

There is pour flush toilet. The liquid waste and night soil is discharged into a septic tank of size 8' x 5'. The septic tank is constructed facing the road so that effluent from the tank will be discharged into open drain along roadside. The septic tank has three parts for settling of sludge. Since septic tank is under construction, it is not cleaned yet. However other houses near the case household clean the septic tanks within intervals of two years. There is no provision of soak pit. Hence, primary treatment is not completed. The effluent carried through open drain is discharged into river Krishna.

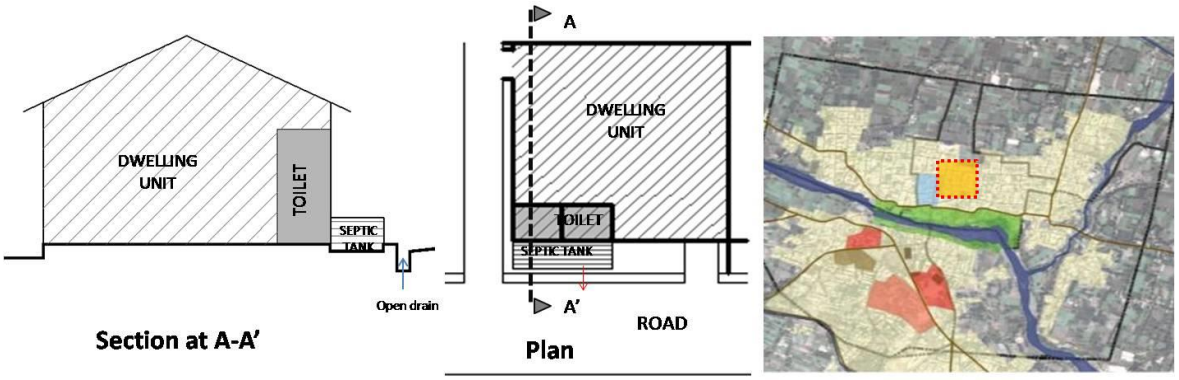
Observations:

- No provision of soak pits.
- Discharge of effluent into roadside open drain invites mixing of effluent with garbage and dust due to street sweeping.

Case Study 4:

Location: Prabhag 1

The house is located in the north to river Krishna in the old town. The toilet is constructed on the front side of the house with size of 3’ x 4’. The septic tank of three parts is constructed along the road. The effluent from septic tank is discharged into open drain along the road.



Sanitation service chain

Pour flush individual toilet is connected to septic tank of size 8’ x 4’. As mentioned, the septic tank is constructed along the roadside and effluent from septic tank is directly discharged into open drain along the road. Effluent is then conveyed through the open drain, it is discharged into natural drains and at the end goes to river Krishna.

Observations:

- No provision of soak pits.
- Discharge of effluent into roadside open drain invites mixing of effluent with garbage and dust due to street sweeping.

Appendix 3: Case Study: Conditional Assessment of Community-level Sanitation

Case Study 1

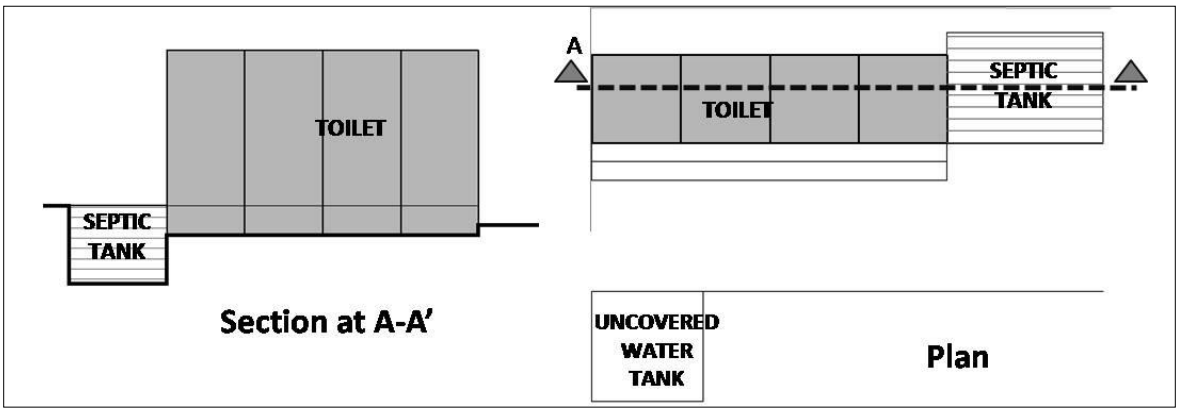
Location: Gangapuri, Prabhag 3

The community toilet in Gangapuri has eight seats, four each for men and women. The toilet is in working condition and cleaned by the WNP every day. There are about 750–1,000 users every day. The only issue is non-availability of electricity, due to which the use of the toilet is restricted to day time.

Sanitation service chain

Pour flush toilets are connected to septic tank of size 6' x 10'. Effluent from septic tank is discharged into closed drain and into the river at the end.

Seats	4 (men); 4 (women)
Approximate users	750–1,000users/day
Doors	In good condition
Water	Available (1 tank)
Electricity	Not available
Hygiene level	Neat and clean
User perception	Usable toilet and cleaned every day by the WNP



Case Study 2

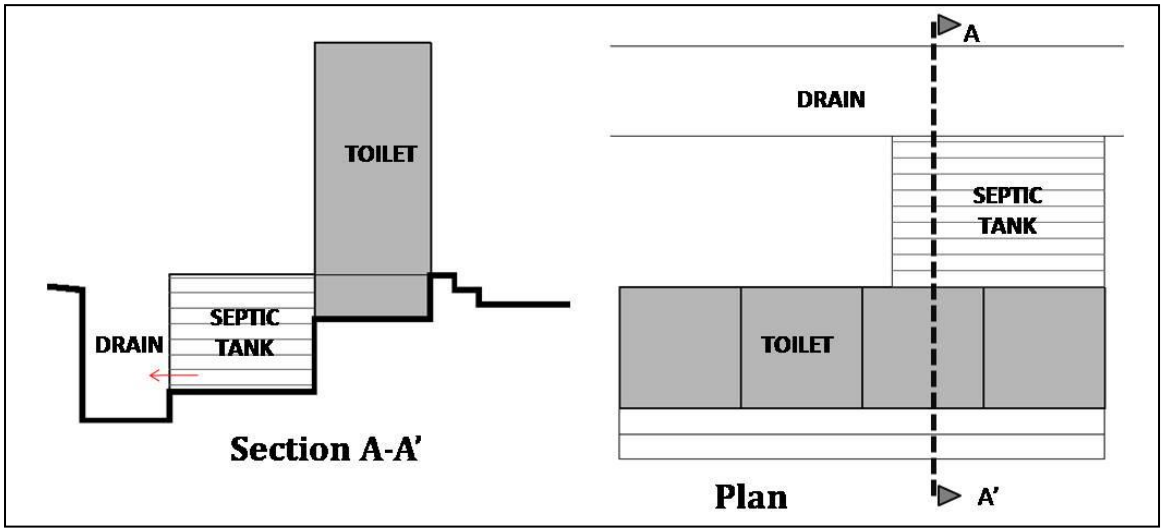
Location: Gangapuri, Prabhag 3

Different from Case Study 1, the toilet block in the same Prabhag has four toilets. However, there is no gender segregation. The infrastructure of the toilet block is poorly maintained and broken doors and unavailability of electricity makes the toilet unfit for use. Overall hygiene level of the toilet is poor.

Sanitation service chain

Septic tank of approximate 7' x 5' size is constructed adjacent to toilet block. The effluent from septic tank is discharged into open drain next to septic tank. At the end, effluent running from open drain is discharged into natural drains or rivers without any treatment.

Seats	Out of 4, only 2 functional seats; no gender segregation
Approximate users	200–250 users/day
Doors	Partly broken
Water	Available (1 tank)
Electricity	Not available
Hygiene level	Unclean



Case Study 3

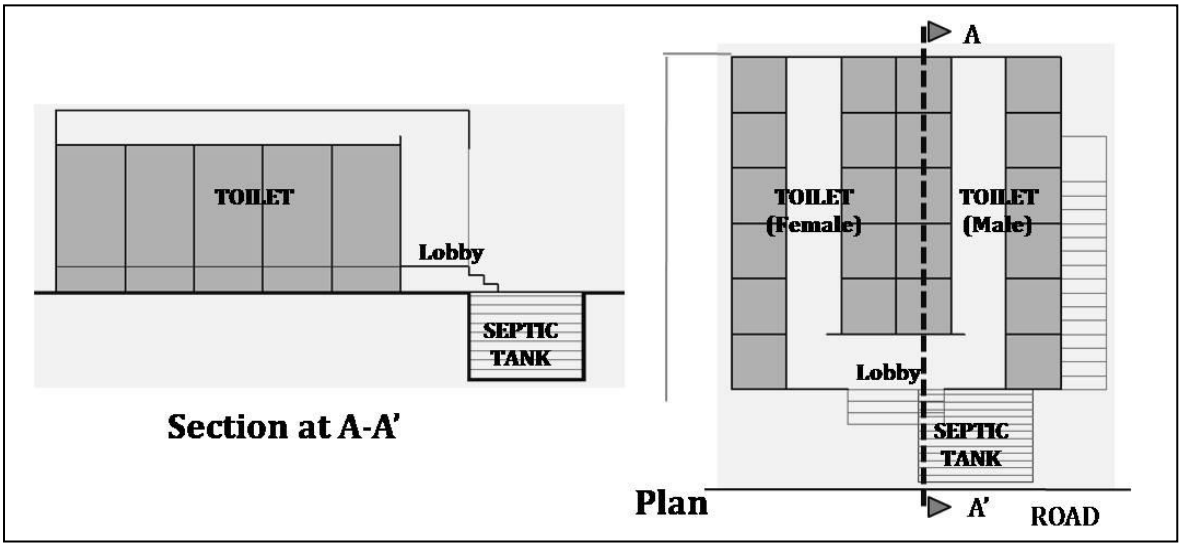
Location: Ramdoh Ali, Brahmanshahi

The community toilet is of almost 22 seats. Almost all seats are functional seats. Most of the infrastructure, such as doors, water taps, is in working condition. But electricity is not available in the toilet block. Every alternate day the toilet block is cleaned by the WNP. Though toilet block is usable, it is poorly maintained and unclean.

Seats	11 (men); 11 (women); 10 functional
Approximate users	1,000–2,000 users /day
Doors	In good condition
Water	Individual tap for each seat
Electricity	Not available
Hygiene level	Unclean
User perception	Usable toilet and cleaned by the WNP every 2 days

Sanitation service chain

Pour flush toilets are connected to septic tank of size 8'x 5'. The effluent of septic tank is discharged into closed drains along roads. Without any secondary treatment, the wastewater is directly discharged into natural drains and rivers.

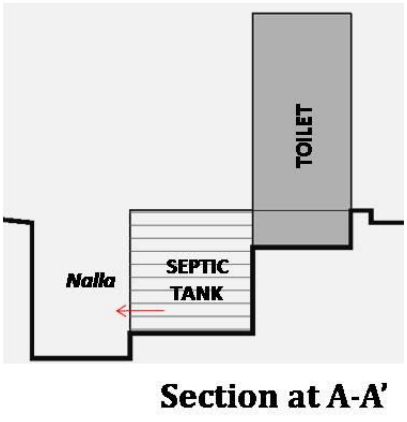


Case Study 4

Location: Parakandi road, Raviwar Path, Prabhag 2

The community toilet block is of 10 seats, located in the northern part of the town. Almost all infrastructure has been put in place. Though water is available, the water tank is uncovered, leading to mosquitoes and flies in the area. Electricity is not available. According to user perception, the toilet is usable and neat and clean. It is regularly cleaned by the WNP.

Seats	5 (men); 5 (women)
Approximate users	500 users /day
Doors	In good condition
Water	1 uncovered tank
Electricity	Not available
Hygiene level	Neat and clean
User perception	Usable toilet and cleaned regularly by the WNP



Sanitation service chain

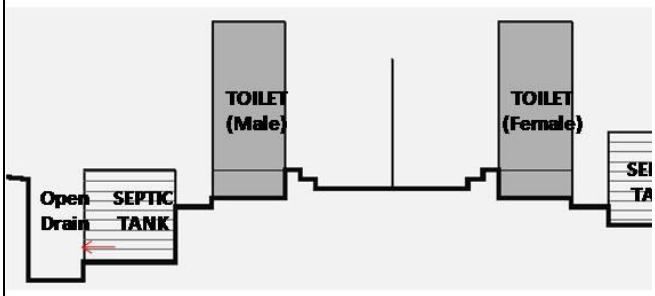
One septic tank of size 8' x 6' is constructed along nalla flowing at the back of the toilet block. The effluent from septic tank is directly discharged into natural drains/nallas. There is no secondary treatment before discharging into river Krishna.

Case Study 5

Location: Mungshe Ali, Raviwar Path, Prabhag 2

The community toilet block in Mungshe Ali is used by around 500–1,000 users every day. Infrastructure such as doors, etc, is in good condition and water tanks are also available. Overall, hygiene level of the toilet block is neat and the block is cleaned by the WNP every alternate day.

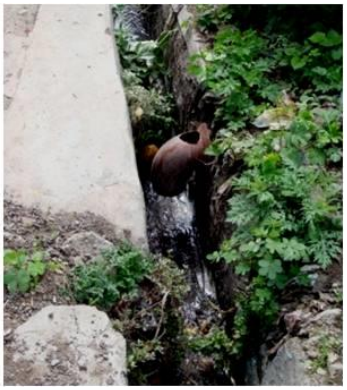
Seats	4 (men); 4 (women)
Approximate users	500-1,000 users /day
Doors	In good condition
Water	2 tanks
Electricity	Not available
Hygiene level	Neat and clean
User perception	Usable toilet and cleaned by WNP every 2 days



Section at A-A'

Sanitation service chain

The toilet blocks for men and women are separate. Hence there are two septic tanks constructed at the back of the toilet. The effluent from the tank is discharged into open drains.



Appendix 4: Comparative Analysis of Treatment Alternatives

Component	1 Activated Sludge Process (Conventional) ASP	2 Aerated lagoon (AL)	3 Extended Aeration System (EA)	4 UASB & Polishing Pond (PP)	5 Waste Stabilisation Pond (WSP)	6 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 & 1 day 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

	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 30 yrs
Operational Problem	Substantial	Moderate	Low	Substantial	Least	Least
Odor problem	Slight	Minimum	Minimum	No Odor	Odor problem in anaerobic pond but can be minimised by due care in maintenance	No odor
Cost/Mld (Rs in Lacs)	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 Cost of Strategies for Wastewater

COST ESTIMATE FOR CITY-WIDE SETTLED 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	56,600				56,600	Meter			
Sewer line to be provided	1.2	56,600			1	67,920	Meter			
UPVC 75 mm dia secondary sewer	1	67,920			0.8	54,336	Meter			
RCC NP2 Trunk sewer (avg dia 500 mm)	1	13,584				13,584	Meter			
Excavation costs										
UPVC 75 mm dia secondary sewer	1	54,336	0.5	0.6		16,300.8	cum	100	Rs/cum	1,630,080
RCC NP2 Trunk sewer (avg dia 500 mm)	1	13,584	1	1.5		20,376	cum	100	Rs/cum	2,037,600
Pipe installation costs										
UPVC 75 mm dia secondary sewer	1	54,336				54,336	Meter	58.75	Rs/Meter	3,192,240
RCC NP2 trunk sewer (avg dia 500 mm)	1	13,584				13,584	Meter	910	Rs/Meter	12,361,440
Miscellaneous item costs										
Junction boxes	1,509					1,509	No.	7,000	Rs/No	10,565,333.33
Pumping stations	0					0	No.	0	Rs/No	0
Rising mains DI K-7	0	0				0	Meter	0	Rs/Meter	0
Add 25% for road restoration & crossings, implementation charges								25%		7,446,673.333
Total cost (Rs)										37,233,366.65
Total cost (Rs in crore)										**3.72**

COST ESTIMATE FOR SETTLED SEWERAGE NETWORK IN OLD TOWN										
Description	**Quantity**					**Final quantity**		**Amount**		
	No	**Length (m)**	**Breadth (m)**	**Depth (m)**	**Assumptions**	**Quantity**	**Unit**	**Rate**	**Unit**	**Total amount (Rs)**
Length of roads	1	34,500				34,500	Meter			
Sewer line to be provided	1.5	34,500			1	51,750	Meter			
UPVC 75 mm dia secondary sewer	1	51,750			0.8	41,400	Meter			
RCC NP2 trunk sewer (avg dia 500 mm)	1	10,350				10,350	Meter			
Excavation costs										
UPVC 75 mm dia secondary sewer	1	41,400	0.5	0.6		12,420	cum	100	Rs/cum	1,242,000
RCC NP2 trunk sewer (avg dia 500 mm)	1	10,350	1	1.5		15,525	cum	100	Rs/cum	1,552,500
Pipe installation costs										
UPVC 75 mm dia secondary sewer	1	41,400				41,400	Meter	58.75	Rs/Meter	2,432,250
RCC NP2 trunk sewer (avg dia 500 mm)	1	10,350				10,350	Meter	910	Rs/Meter	9,418,500
Miscellaneous item costs										
Junction boxes	1,150					1,150	No.	7000	Rs/No	8,050,000
Pumping stations	0					0	No.	0	Rs/No	0
Rising mains DI K-7	0	0				0	Meter	0	Rs/Meter	0
Add 25% for road restoration & crossings, implementation charges								25%		5,673,812.5
Total cost (Rs)										28,369,062.5
Total cost (Rs in crore)										**2.8**

COST ESTIMATE FOR SIMPLIFIED SEWERAGE NETWORK IN OLD TOWN										
Description	**Quantity**					**Final quantity**		**Amount**		
	No	**Length (m)**	**Breadth (m)**	**Depth (m)**	**Assumptions**	**Quantity**	**Unit**	**Rate**	**Unit**	**Total amount (Rs)**
Length of roads	1	34,500				34,500	Meter			
Sewer line to be provided	1.5	34,500			1	51,750	Meter			
UPVC 110 mm dia secondary sewer	1	51,750			0.8	41,400	Meter			
RCC NP2 trunk sewer (avg dia 500 mm)	1	10,350				10,350	Meter			
Excavation costs										
UPVC 110 mm dia secondary sewer	1	41,400	0.5	0.7		14,490	cum	100	Rs/cum	1,449,000
RCC NP2 trunk sewer (avg dia 500 mm)	1	10,350	1	1.75		18,112.5	cum	100	Rs/cum	1,811,250
Pipe installation costs										
UPVC 75 mm dia secondary sewer	1	41,400				41,400	Meter	123.5	Rs/Meter	5,112,900
RCC NP2 trunk sewer (avg dia 500 mm)	1	10,350				10,350	Meter	910	Rs/Meter	9,418,500
Miscellaneous item costs										
Junction boxes	1,725					1,725	No.	7,000	Rs/No	12,075,000
Pumping stations	0					0	No.	0	Rs/No	0
Rising mains DI K-7	0	0				0	Meter	0	Rs/Meter	0
Add 25% for road restoration & crossings, implementation charges								25%		7,466,662.5
Total cost (Rs)										37,333,312.5
Total cost (Rs in crore)										**3.73**

COST ESTIMATE FOR SETTLED SEWERAGE NETWORK IN NEWLY DEVELOPING AREAS										
Description	**Quantity**					**Final quantity**		**Amount**		
	No	**Length (m)**	**Breadth (m)**	**Depth (m)**	**Assumptions**	**Quantity**	**Unit**	**Rate**	**Unit**	**Total amount (Rs)**
Length of roads	1	22,100				22,100	Meter			
Sewer line to be provided	1.5	22,100			1	33,150	Meter			
UPVC 75 mm dia secondary sewer	1	33,150			0.8	26,520	Meter			
RCC NP2 trunk sewer (avg dia 500 mm)	1	6,630				6,630	Meter			
Excavation costs										
UPVC 75 mm dia secondary sewer	1	26,520	0.5	0.6		7,956	cum	100	Rs/cum	795,600
RCC NP2 trunk sewer (avg dia 500 mm)	1	6,630	1	1.5		9,945	cum	100	Rs/cum	994,500
Pipe installation costs										
UPVC 75 mm dia secondary sewer	1	26,520				26,520	Meter	58.75	Rs/Meter	1558,050
RCC NP2 trunk sewer (avg dia 500 mm)	1	6,630				6,630	Meter	910	Rs/Meter	6033,300
Misc item costs										
Junction boxes	737					737	No.	7,000	Rs/No	5,156,666.667
Pumping stations	0					0	No.	0	Rs/No	0
Rising mains DI K-7	0	0				0	Meter	0	Rs/Meter	0
Add 25% for road restoration & crossings, implementation charges								25%		3,634,529.167
Total cost (Rs)										18,172,646.83
Total cost (Rs in crore)										**1.81**

COST ESTIMATE FOR SIMPLIFIED SEWERAGE NETWORK IN NEWLY DEVELOPING AREAS										
Description	**Quantity**					**Final quantity**		**Amount**		
	No	**Length (m)**	**Breadth (m)**	**Depth (m)**	**Assumptions**	**Quantity**	**Unit**	**Rate**	**Unit**	**Total amount (Rs)**
Length of roads	1	22,100				22,100	Meter			
Sewer line to be provided	1.5	22,100			1	33,150	Meter			
UPVC 110 mm dia secondary sewer	1	33,150			0.8	26,520	Meter			
RCC NP2 trunk sewer (avg dia 500 mm)	1	6,630				6,630	Meter			
Excavation costs										
UPVC 110 mm dia secondary sewer	1	26,520	0.5	0.7		9,282	cum	100	Rs/cum	928,200
RCC NP2 trunk sewer (avg dia 500 mm)	1	6,630	1	1.75		11,602.5	cum	100	Rs/cum	1,160,250
Pipe installation costs										
UPVC 75 mm dia secondary sewer	1	26,520				26,520	Meter	123.5	Rs/Meter	3,275,220
RCC NP2 trunk sewer (avg dia 500 mm)	1	6,630				6,630	Meter	910	Rs/Meter	6,033,300
Miscellaneous item costs										
Junction boxes	1,105					1,105	No.	7,000	Rs/No	7,735,000
Pumping stations	0					0	No.	0	Rs/No	0
Rising mains DI K-7	0	0				0	Meter	0	Rs/Meter	0
Add 25% for road restoration & crossings, implementation charges									25%	4,782,992.5
Total cost (Rs)										23,914,962.5
Total cost (Rs in crore)										**2.39**

COST ESTIMATE FOR CONVENTIONAL SEWERAGE NETWORK IN NEWLY DEVELOPING AREAS										
Description	**Quantity**					**Final quantity**		**Amount**		
	No	**Length (m)**	**Breadth (m)**	**Depth (m)**	**Assumptions**	**Quantity**	**Unit**	**Rate**	**Unit**	**Total amount (Rs)**
Length of roads	1	22100				22100	Meter			
Sewer line to be provided	1.5	22100			1	33150	Meter			
UPVC 160 mm dia secondary sewer	1	33150			0.8	26520	Meter			
RCC NP3 trunk sewer length (avg dia 1000mm)	1	6630				6630	Meter			
Excavation costs										
UPVC 160 mm dia secondary sewer	1	26520	0.6	1		15912	cum	100	Rs/cum	1591200
RCC NP3 trunk sewer length (avg dia 1000mm)	1	6630	1.2	2		15912	cum	100	Rs/cum	1591200
Pipe installation costs										
UPVC 160 mm dia secondary sewer	1	26520				26520	Meter	261.3	Rs/Meter	6929676
RCC NP3 trunk sewer length (avg dia 1000mm)	1	6630				6630	Meter	5603	Rs/Meter	37147890
Miscellaneous item costs										
Manholes	1105					1105	No.	7000	Rs/No	7735000
Pumping stations	0					0	No.	0	Rs/No	0
Rising mains DI K-7	0	0				0	Meter	0	Rs/Meter	0
Add 25% for road restoration & crossings, implementation charges								25%		13748741.5
Total cost (Rs)										68743707.5
Total cost (Rs in crore)										**6.87**

COST ESTIMATE FOR SETTLED SEWERAGE NETWORK (PILOT PROJECT)										
Description	**Quantity**					**Final quantity**		**Amount**		
	No	**Length (m)**	**Breadth (m)**	**Depth (m)**	**Assumptions**	**Quantity**	**Unit**	**Rate**	**Unit**	**Total amount (Rs)**
Length of roads	1	3,500				3,500	Meter			
Sewer line to be provided	1.5	3,500			1	5,250	Meter			
UPVC 75 mm dia secondary sewer	1	5,250			0.8	4,200	Meter			
RCC NP2 trunk sewer (avg dia 500 mm)	1	1,050				1,050	Meter			
Excavation costs										
UPVC 75 mm dia secondary sewer	1	4,200	0.5	0.6		1,260	cum	100	Rs/cum	126,000
RCC NP2 trunk sewer (avg dia 500 mm)	1	1,050	1	1.5		1,575	cum	100	Rs/cum	157,500
Pipe installation costs										
UPVC 75 mm dia secondary sewer	1	4,200				4,200	Meter	58.75	Rs/Meter	246,750
RCC NP2 trunk sewer (avg dia 500 mm)	1	1,050				1,050	Meter	910	Rs/Meter	955,500
Miscellaneous item costs										
Junction boxes	117					117	No.	7000	Rs/No	816,666.7
Pumping stations	0					0	No.	0	Rs/No	0
Rising mains DI K-7	0	0				0	Meter	0	Rs/Meter	0
Add 25% for road restoration & crossings, implementation charges								25%		575,604.2
Total cost (Rs)										28,780,201
Total cost (Rs in crore)										**0.28**

For rehabilitation works of roadside open drains in old town area	Rs/Rmt[34]	Length (m)	Total cost in Rs
100–150 mm PCC lining NP2 at bottom and 100 mm brick work on both sides with cement plaster and having width and depth of 0.45 m	900	5,100	4,590,000
Covering of drains by RCC slabs of 1.00 x 0.60 m size and with perforated grating at 3.6 m intervals	700	17,000	11,900,000
Total cost			**16,490,000**
Having about 50% of the total 34 km length of drain channels in the old town area already covered, the remaining 17 km is considered for estimation. Having about 30% of the remaining 17 km drains without lining and channelling, approximately 5.10 km drain channels need to be rehabilitated as per above specifications.			

For Stormwater mananagement								
Length of natural drains	Length (m)	depth (m)	width (m)	cum	Brass	Rs/brass	Cost of desilting (Rs)	Cost of transportation (in Rs)
Within Municipal limits	8,200	0.75	2.4	14,760	5,216	80	333,795	1,955,830
Outside Municipal limits	23,157	0.75	2.1	36,472	12,888	80	824,815	4,832,898
Cost							**1,158,609**	**6,788,729**
Total cost								**Rs 79.47 lakh**

For channelizing works						
Item	Length (m)	width (m)	depth (m)	Cum	Rs/Cm	Cost Rs
Reinforced side walls up to 100 mm and bottom with PCC bed up to 200 mm	7,000	4.2	0.1	2,940	2,000	5,880,000
Width refers to the sum of retaining walls on both the sides up to 0.9 m and average width of drain taken as 2.4 m (0.9 + 0.9 + 2.4 = 4.2 m); **Depth** is the thickness of RCC retaining wall and taken as 0.1 m.						

[34]The rates assumed are based on prevailing rates of item as suggested by officials, Wai Nagar Parishad.

Appendix 6: Focus Group Discussion Outputs

Area	Toilets, sewerage, stormwater drains	Solid waste management
Non-slum	• Reliance on CTs is high in Gaothan areas • CTS used even by some HHs who have individual toilets due to habitual practice • Most respondents had knowledge about septic tanks and pits for on-site waste disposal • Almost all respondents were aware of the need to channellise HH wastewater through proper conveyance to reduce stench; option shared was covering existing drains • But not sure about whether existing septic tanks were appropriately designed • Half the people spoken to did not have knowledge about sewage treatment and reuse • **Indication:** There was a consensus amongst most respondents about need to solve the conveyance of wastewater, but knowledge on technical options available was limited	• Disposal methods • Door-to-door collection • Community bins (often outside the bins, when bins are filled to capacity and not cleared) • Open spaces/roads/nallas • Well aware of inconvenience caused and health hazards posed • **Indication:** Though people are aware of the ill effects of open waste dumping, due to lack of timely collection of waste and also habit, they give less importance to appropriate waste disposal. Lack of ownership of maintaining clean surroundings
Slums	• Reliance on community toilets/OD mostly by children • Very few respondents had idea about septic tank but in general lack of awareness about sewerage management systems/treatment and reuse • Well aware of illness due to OD and unhygienic conditions of toilets • Inconsistent pattern of hand washing after defecation/before meals • Aware and willing to pay for sanitation services • **Indication:** All respondents wanted better sanitation services and were willing to pay for the same, but were not aware of how to go about it, whom to approach, and what would be their role	• Waste dumped in open spaces • No idea about waste segregation, recycle and reuse
Market place & commercial area	Only one public toilet in market place run on user fee basis Septic tank ill designed Need for more toilets expressed and vendors, shopkeepers willing to pay for the same **Indication:** People frequenting the markets, shop owners, vendors have experienced that 'pay and use' toilets are well kept and hence are willing to continue with the same model if more public toilets are constructed	Waste thrown in open spaces, roads, community bins Collection from bins not regular In mandi area waste dumped in open roadside nallas **Indication:** Lack of ownership of keeping the market area clean. Shopkeepers have covered the stormwater drain only outside their shop but these are individual efforts not solving the problem

Area	Toilets, sewerage, stormwater drains	Solid waste management
Educational institutes	Sufficient toilet seats/urinals in schools In public schools toilet cleanliness is an issue Cleaning is handled by ULB or privately appointed persons Private schools toilets are well maintained Toilets connected to septic tanks which are not properly designed In ULB-run schools a good practice observed was after the prayer session: children take an oath to keep toilets clean after use and also wash hands. It was also followed practically **Indication:** Since the role of IEC is to ultimately bring behaviour change and which has already taken place in school children, this group can be utilised for toilet promotion activities, promoting hand wash and cleanliness, etc	Premises well kept and cleaned regularly by appointed staff Collection done by *ghantagadis*/disposed in community bins Awareness on waste recycle, reuse was low. **Indication:** Clean surroundings and premises is a result of proper waste disposal. So these institutes have an active role to play in promotion of proper waste disposal.

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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