




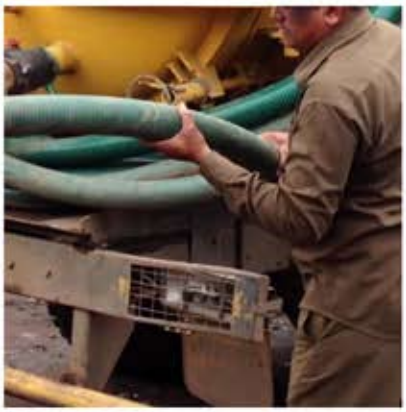


Faecal Sludge and Sullage Management in Urban Maharashtra

Analysis of Institutional Arrangements and Regulations

pas performance assessment system

CEPT UNIVERSITY

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Analysis of Institutional Arrangements and Regulations

Report Prepared By

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CONTENTS

ACRONYMS AND ABBREVIATIONS

AIILSG	All India Institute of Local Self-Government
CEPT	Centre for Environmental Planning and Technology University
CSPs	City Sanitation Plans
GDP	Gross Domestic Product
CO	Chief Officer
CPEEHO	Central Public Health and Environmental Engineering Organisation
DC	District Committee
GoI	Government of India
GoM	Government of Maharashtra
GR	Government Resolution
Rs	Rupees (Indian national currency)
IS	Indian Standards Code
JNNURM	Jawaharlal Nehru National Urban Renewal Mission
MGJWSSP	Maharashtra Golden Jubilee Water Supply and Sanitation Programme
MHADA	Maharashtra Housing and Development Authority
MMR	Mumbai Metropolitan Region
MMRDA	Mumbai Metropolitan Region Development Authority
Mn	Million
MoUD	Ministry of Urban Development
MPCB	Maharashtra Pollution Control Board
MSNC	Maharashtra Sujal Nirmal Campaign
MWRRA	Maharashtra Water Resources Regulatory Authority
NUSP	National Urban Sanitation Policy
OBC	Other Backward Communities
ODF	Open Defecation Free
O&M	Operations and Maintenance
PAS	Performance Assessment System (Project)
SC	Scheduled Caste(s)
STP	Sewage Treatment Plant
TPVD	Town Planning and Valuation Department
UDD	Urban Development Department
UIDSSMT	Urban Infrastructure Development Scheme for Small and Medium Towns
ULB	Urban Local Bodies
UMC	Urban Management Centre

USD	US Dollars (US$)
UWSS	Urban Water Supply and Sanitation
WSSD	Water Supply and Sanitation Department

Note: 1 lakh = 100,000; 1 crore = 10,000,000.

EXECUTIVE SUMMARY

Introduction: The Performance Assessment System (PAS) Project aims to develop appropriate methods and tools to measure, monitor and improve delivery of water and sanitation in urban India. The Project has three major components: performance measurement; monitoring; and improvement. It covers all urban local bodies (ULBs) in Gujarat and Maharashtra. Funded by the Bill and Melinda Gates Foundation, PAS is being implemented by the Centre For Environmental Planning and Technology (CEPT University), with the support of the Urban Management Centre (UMC) in Gujarat and the All India Institute of Local Self-Government (AIILSG) in Maharashtra. As a part of its overall activities, PAS decided to undertake a study on the prevailing institutional and regulatory framework in Maharashtra with respect to management of liquid waste and faecal sludge in cities that do not have any sewerage network. This study is an attempt to understand the rules, regulations and institutional mechanisms that govern faecal sludge management (FSM) and sullage management in urban Maharashtra.

Maharashtra is a fast urbanising state in India, with close to 50 per cent of the state's population living in 252 urban centres. Maharashtra is also one of the economically leading states in India, contributing about 13 per cent national gross domestic product (GDP) and with a high per capita income of US$ 800. The provision of water supply and sanitation services is a basic requirement to sustain this level of urban growth and also the health of its citizens. In particular, studies point to the fact that provision of inadequate sanitation could lead to an economic loss equivalent to 6.4 per cent of total GDP (WSP, World Bank study, 2006).

While many see sanitation as access to latrines, it is actually a cycle that consists of five key activities: appropriate user interfaces; safe collection/containment of faecal matter; its conveyance; its treatment; and safe disposal and/or reuse. The focus in India and Maharashtra thus far has remained mainly on enabling access to improved latrines, neglecting the later activities. As per Census 2011 data, about 68.6 per cent urban households in Maharashtra have access to improved household latrines, about 21 per cent households use public latrines and about 7.7 per cent do not have access to any latrines and could be resorting to open defecation. Close to 36 per cent of the urban population in Maharashtra lives in slums; most of them either depend on community latrines or resort to open defecation. While coverage with improved latrines is still a problem and needs to be tackled to achieve universal coverage, there

is an urgent need to start focusing on the other elements of sanitation cycle, that is, conveyance, treatment and disposal of faecal sludge.

Underground sewerage networks are seen as the only means for conveyance, treatment and disposal of faecal sludge. However, these systems are expensive to build and operate and only a few cities in the state have such systems, at best with partial coverage. Only 31 cities in Maharashtra have underground sewerage systems, with varying extent of coverage, and only 15 cities have treatment plants. Data collected by the PAS Project in the state points to the fact that, in the best of conditions, only about 35 per cent of sewage is being treated – the remaining 65 per cent of sewage is being disposed off into the surroundings without any treatment, endangering the natural environment as well as human health.

With this background, this note focuses on reviewing existing policy and institutional framework for FSM and sullage management in urban Maharashtra and suggests ways to strengthen it. This note was developed through (a) desk review of state Acts, polices and various Government Resolutions (GRs); (b) desk review of existing institutional framework; (c) field visits to two cities; and (d) desk review of a few good international practices.

Policies and regulatory framework: The first comprehensive policy statement on urban sanitation in India came in 2008 from the Government of India (GoI) in the form of the National Urban Sanitation Policy (NUSP), recognising the entire sanitation cycle and need for addressing faecal sludge management with appropriate options, not limited to conventional sewerage systems alone. State governments were encouraged to prepare state-specific strategies and cities were encouraged to prepare City Sanitation Plans (CSPs).

Maharashtra adopted the guiding principles of NUSP in its Sujal Nirmal Abhiyan (SNA), a vision statement for the urban water supply and sanitation sector. SNA prescribes certain reform measures, mainly addressing community/public latrines, but falls short of addressing the entire FSM chain.

Regulations are well laid out for the activities under user interface and collection sections. As around 38 per cent of households depend on septic tanks, they are an important element of on-site sanitation and sullage management. Specifications and principles of constructing septic tanks as prescribed by Indian Standard codes (IS code 2470, 1985, Part-1 and IS 9872, 1981) and Central Public Health and Environmental Engineering Organisation (CPHEEO) manuals have been incorporated in city-level development regulations. The ULBs are responsible for enforcing these regulations. However, they are not effective on the ground due to

multiple factors, such as weak institutional capacity to oversee designs and construction, weak public interest in following regulations, perverse government incentives in the form of regularising 'illegal buildings' through special ordinances such as the Maharashtra Gunthewari Developments (Regularisation, Upgradation and Control) Act, 2001.

Slum sanitation issues need special focus in Maharashtra as about 36 per cent of the urban population resides in slums and depends largely on community/public sanitary complexes. Development in slums is largely guided by the regulations provided in the Maharashtra Slum Areas (Improvement, Clearance and Redevelopment) Act, 1971. Policies and regulations that govern slum sanitation issues do not encourage building of individual household latrines and make slum dwellers dependant on community facilities built by ULBs and or other development authorities through various government schemes.

Policies and regulations related to conveyance are also dealt with in the Acts. They are, however, not clearly defined and also found to be weak in implementation. Various sections of the Maharashtra Municipal Councils, Nagar Panchayats and Industrial Townships Act, 1965 (hereinafter called as Municipal Act) deal with powers of the Chief Officer to (a) inspect sanitary arrangements within buildings and make owners undertake repairs; (b) fine owners if found to be causing nuisance by discharging waste into streets; (c) ensure that no one practices manual scavenging; and (d) specify routes and times for desludging and carrying septage in vacuum trucks. However, there is no clear direction on the responsibility of ULBs to provide directly, or facilitate through private operators, appropriate level of septage cleaning services. The two cities studied in this exercise (Wardha Municipal Council and Mira-Bhayandar Municipal Corporation) had only one operational vacuum tanker, operated by ULBs, covering at best about 20 per cent of properties that needed to be desludged. There are no private septic tanks cleaning operators in both the cities. A partial sewerage system in Mira-Bhayandar city is connected to about 10–15 per cent of properties; latrines in the remaining 85 per cent properties are connected to septic tanks. There is no sewerage system in Wardha city and all the latrines are connected to individual septic tanks. Thus, septage management, the plan and action for desludging, conveying and treating, becomes paramount. However, there are no comprehensive plans and systems for septage management in both the cities. In Wardha, a single vacuum suction tanker is managed by the ULB and desludges about 240 septic tanks in a year, which is about 3 per cent of calculated septic tanks' desludging load in the city. Similarly, in Mira-Bhayandar

city, the ULB operates only one vacuum suction tank and empties about 20 per cent of the calculated load. The septage is not treated in both the cities and is emptied on open land or in water bodies. There is an urgent need for the cities to develop appropriate septage management plans and implement them to achieve the objectives of total sanitation.

Treating and disposal of wastewater are not 'mandatory functions' of ULBs in the state and are treated as 'discretionary functions' under the state Municipal Acts. As of date only about 31 cities have partial sewerage systems and only about 15 cities have secondary treatment capacity.

In consideration of the above situation and rapid urbanisation, it can be concluded that there is a need for a comprehensive policy and regulatory framework, building on the existing provisions, for effectively tackling the full chain of sanitation in urban Maharashtra. Maharashtra can benefit from the efforts made by a few countries, such as Philippines and Malaysia. These cases are discussed in detail in the main report.

Institutional framework: A host of institutions are involved in management of sanitation and sullage activities with varying roles, as detailed in the table below.

	Role		
Institution	**Policy making**	**Service provision**	**Regulation/oversight**
Urban Development Department (UDD)	Detailed guidelines of staffing. Hiring staff in ULBs and transfers. Budget allocation.		Oversight on overall functioning of the ULBs. Approval of CSPs and other proposals that are funded by GoM and GoI.
Water Supply and Sanitation Department (WSSD)	State urban sanitation policy and guidelines.		Approval of CSPs prepared by cities. Approval of schemes taken up under Sujal Nirmal Abhiyan funds of GoM.
Maharashtra Pollution Control Board (MPCB)	Give advice to state on pollution related standards or policies.		Monitoring of surface water quality and seeking polluting cities to take appropriate actions.
Maharashtra Town Planning and		Development of regional	Approve city development plans.

	Role		
Institution	**Policy making**	**Service provision**	**Regulation/oversight**
Valuation Department (MTPVD)		development plans. Develop city development plans, on request of cities.	Approval of town planning schemes.
Maharashtra Housing and Area Development Authority (MHADA)		Implement low-cost housing projects for poor. Implement slum improvement projects under state grants and National Slum Development Programme (NSDP).	
Urban local body (ULB)		Duties prescribed in the Municipal Acts. Construction and maintenance of public facilities. Housing for poor (along with sanitation).	Approval of building plan. Approval of building completion. Planning for cleaning of septic tanks. Other functions as prescribed in Municipal Acts.

ULBs are responsible for actual implementation. As per the Municipal Acts, ULBs have the dual role of service provision for public services (construction of drains, sewerage systems, community/public latrines, etc.) and also regulation of activities of households (construction of household latrines, service connections, etc.).

Three key departments within ULBs – the Town Planning Department, Public Works Department and Public Health Department – are vested with the power to implement the various provisions of the Acts and also the building by-laws. The state has recently decided to create a municipal cadre of officers and approved technical posts of town planners and sanitary engineers. ULBs do not have powers for recruiting staff; all the vacant positions are to be filled up by state level and regional units of Directorate of Municipal Administration and District Collectors. There are delays in hiring. Lack of staff (both technical and support) hampers effective implementation of their mandated duties. For example, in Wardha city out

of the 18 technical staff positions only five have been filled and 13 are vacant. **Efforts should be made to speed up the hiring process and to also hand over the hiring responsibility to ULBs over a period of time**.

Another important issue is related to sanitary workers (safai karamcharis),[1] who are low skilled staff of the Municipality and form a majority of municipal staff. Sanitary workers account for about 67 per cent of available staff in Wardha ULB and about 51 per cent in Mira-Bhayandar ULB. They hail from backward sections of society and are given jobs related to cleaning streets, cleaning drains, community/public toilets, handling solid waste, etc. These positions are governed by special rules formed by the state government based on Lad Committee recommendations. As per these rules, job positions of sanitary workers cannot be terminated and have to be given to people from these families. There is a certain 'social stigma' associated with the nature of these castes and also the jobs performed by them. While the logic is to protect their earning windows, it seems this process is indirectly perpetuating their social status instead of alleviating it. **Efforts should be made to enhance their skill sets and provide them higher level of responsibilities, with higher pay. This way, they will be able to counter the social stigma and also their economic weakness**.

At the state level, while a host of institutions are responsible for policy setting, oversight and monitoring, there is no institution that is clearly charged with **regulation of the service provision of ULBs**. One of the state level institutions, for instance, the UDD, WSSD and/or MPCB could be charged with this responsibility. It is advisable to have one institution clearly mandated with the task of oversight of all the sanitation and sullage management activities carried out by ULBs and/or other organisations.

International cases: The Philippines and Malaysia, both countries which have similar problems with urban sanitation, have adopted innovative policies and institutional mechanisms to address the issue of septage management, in recent years. The population of the Philippines is comparable to that of Maharashtra and that of Malaysia is comparable to the population of the Mumbai Metropolitan Region. Hence, both the cases are relevant for Maharashtra.

The Philippines adopted the national Clean Water Act (CWA) in 2004, which requires national agencies, local governments and other service providers (like water districts) to provide either septage management or sewerage services for all domestic wastewater dischargers. Since sewerage services are very limited and

[1] Employees (permanent/contractual) of the Municipal Council who collect waste, sweep roads and clean toilets and drains.

expensive to construct and operate, septage management is a practical first step for most utilities or LGUs. Early adopting cities, such as Marikina and Dumaguete, have developed local ordinances requiring regular desludging and have constructed new septage treatment facilities. Secondly, the country also developed a National Sewerage and Septage Management Programme (NSSMP) in 2011. These policies and regulations are guiding cities and service providers in developing septage management plans and funds are made available through the NSSMP.

Malaysia enacted the Sewerage Services Act in 1993 that mandated centralising the sanitation facilities owned by local governments and transferred operations, maintenance, and development responsibilities to a private concessionaire, Indah Water Konsortium (IWK). In 2000 the federal government nationalised IWK and turned it into a public owned company under the Finance Ministry to increase government control and subsides in the sector. Through these measures, Malaysia increased the number of households with sewerage connections from 5 per cent in 1993 to 73 per cent in 2009. For households connected to septic tanks, 50 per cent now participate in scheduled desludging in compliance with federal law.

Both these countries adopted locally appropriate legislations, developed national programmes, backed them with funds and created an institutional structure that is capable of translating policies and programmes into reality. While the Philippines continued with its decentralised institutional structure, Malaysia shifted to a centralised institutional structure. Both cases offer good lessons for Maharashtra.

Way forward: Based on the review of the existing polices, regulations and institutional structure in Maharashtra, and understanding gained from limited review of good cases, the following steps are suggested for improving the overall faecal sludge and sullage management in the state. The suggested way forward details actions needed at the state level and city level over the short and medium term in the table below.

Short-term actions (2–3 years)	Medium-term actions (3–5 years)
State-level actions	
Recognise the importance of septic tanks and septage management as an integral part of city-wide sanitation.	Adopt holistic city sanitation legislation, addressing all aspects of sanitation management, including slum sanitation, septage management and sullage management. Amend necessary sections of the existing Acts (Municipal Acts, Alum Acts, etc.) to reflect and support implementation of the above legislation. The Clean Water Act of the Philippines and the Sewerage Services Act of Malaysia are good examples.
Develop and publish guidelines on septage management processes. The Solid Waste Management Rules in India, guidelines from the Philippines are good examples.	Create a fund for piloting septage management activities and demonstrate effective methods of doing this.
Encourage cities to include septage management activities in City Sanitation Plans being prepared. Provide necessary technical assistance for this.	Establish regulatory mechanisms to regulate the activities of ULBs and other players along with necessary capacity. Option of one of the existing regulators (MPCB, MWRRA, etc.) taking on this additional role could be explored.
Develop guidelines for covering residents of slums with decent sanitation facilities.	Undertake a detailed analysis of the capacity of ULBs and strengthen the same for sanitation management. Options of central agencies, like MJP, playing a bigger role should also be explored.
Undertake appropriate amendments to the Municipal Acts to bring treatment and disposal activities under the mandatory functions of ULBs.	
Strengthen the regulatory oversight of cities over building of septic tanks through appropriate measures such as: building political and citizen awareness, strengthening capacity of ULBs, stricter penalties for defaults, necessary MIS systems, etc.	
City-level actions	
Build awareness of citizens about importance of all aspects of sanitation –	

Short-term actions (2–3 years)	Medium-term actions (3–5 years)
septic tanks, desludging, effluent disposal etc. – through effective communications and seek their active participation.	
Build an updated database on the properties with septic tanks and use the data to develop a desludging programme.	Implement the desludging programme and monitor it through GIS-based monitoring systems.
Acquire necessary number of vacuum tanks or license capacitated service providers for desludging.	Build and operate septage treatment plants whether on own or through appropriate private participation.
Undertake measures to improve the number of facilities available in slum pockets and also improve the maintenance of these facilities. Encourage and ensure active community participation in building the facilities and their upkeep.	

1 INTRODUCTION

1.1 ABOUT URBAN SANITATION IN MAHARASHTRA

Maharashtra is considered as rapidly urbanising, one of the economically developed states/richest states in India. In 2010–11 the state contributed 14.93 per cent of the national GDP and had the second-highest per capita annual income in the country at Rs 87,686 (US$ 1,594) – the national average is Rs 54,835 (US$ 997). It is also the second most populous state in India with a population of 112.3 mn. The urban population is about 50.08 mn (45.23 per cent) and the total number of urban households is 1.08 mn.[2]

This urban population lives in 252 cities/towns in the 35[3] districts in the state. An estimated 18.10 mn people (36.14 per cent of the total urban population) live in slums, the highest in any state in India. Between 2001 and 2011 the rural population grew at a decadal growth rate of 10.34 per cent and the urban population in the state grew at 23.67 per cent, indicating a rapid urbanisation trend. At the same time, the slum population grew at a decadal rate of 16.9 per cent, a cause for concern for any state. The urban population is not evenly spread in the state, with about 41 per cent of the total urban population living in the Mumbai Metropolitan Region (MMR).[4] ULBs in the state are classified differently as per the population as given in Table 1.

Table 1: Classification of ULBs in Maharashtra

Category of ULBs	Number
Municipal Corporations	26
'A' Class Municipal Councils	18
'B' Class Municipal Councils	62
'C' Class Municipal Councils with population above 20,000	63
'C' Class Municipal Councils with population below 20,000	79
Nagar Panchayats	4
Total	*252*

Water supply and sanitation services are some of the basic amenities expected in urban areas, as these influence public health, human dignity and overall quality of living. It is estimated that the total economic impacts of inadequate sanitation in India amounted to a loss of $53.8 billion in 2006, about 6.4 per cent of India's GDP in

[2] All the population figures are from the data provided by the Census 2011 survey.

[3] Out of the 35 districts, two districts, that is, Mumbai and Mumbai Suburban, are completely urban in classification.

[4] MMR consists of the cities of Mumbai and its satellite towns, that is, Thane, Mira-Bhayander,Vasai-Virar, Kalyan-Dombivali, Navi Mumbai, Ulhas Nagar, Bhiwandi-Nizampur. The population in these cities is about 20.75 mn, being 41 per cent of the state's total urban population.

2006.[5] Of 1.8 mn urban households, about 68.6 per cent have access to improved latrines[6] within the premises and about 21.0 per cent use community/public latrines, which are categorised as unimproved latrines. About 7.7 per cent do not have access to any sort of latrines and, by default, practice open defecation.[7] The details of the coverage in 2001, 2011 and national average in 2011 are given in Table 2.

Table 2: Details of household sanitation coverage (in 2001 & 2011) in Maharashtra and India[8]

SN	Category	2001	2011	National Average, 2011
1.0	Urban population (mn)	41.10	50.08	
	Slum population (mn)	10.60 (25.7%)	18.01(36.14%)	
2.0	Urban households	8,069,526	10,813,298	
	Households in slums			
3.0	% households with water closets	44.40	67.30	72.60
3.1	**Households with piped sewer systems**		**37.80**	**32.70**
3.2	**Households with septic tanks**		**28.60**	**38.20**
3.3	Households with other systems		01.60	01.70
4.0	Households with pit latrines	07.10	02.40	07.10
4.1	**With slab/ventilated improved pits**		02.20	6.40
4.2	Without slab/open pits		00.20	0.70
5.0	% households with other latrines	06.60	01.60	01.70
5.1	Night soil disposed into open drains		01.30	01.20
5.2	Night soil removed by humans		00.00	00.30
5.3	Night soil serviced by animals		00.30	00.20
6.0	% Households with no latrines	41.90	28.70	18.60
6.1	**Public latrines**		**21.00**	**06.00**
6.2	Open		07.70	12.60
	Total	*100.00*	*100.00*	*100.00*

While coverage in the state improved during the last decade, it's a matter of concern that about 31.4 per cent households use unimproved latrines and about 7.7 per cent households resort to open defecation. Though the household coverage numbers

[5] Water and Sanitation Program, World Bank. 2011. Study on economic impacts of inadequate sanitation in India.

[6] The Joint Monitoring Programme (JMP) of the WHO and UNICEF defines an improved sanitation facility as one that hygienically separates human excreta from human contact.

[7] The NHFS–3 survey (2005–06) indicates that about 36.7 per cent of urban population in Maharashtra has access to shared toilets and about 12.1 per cent have no place or use fields or open areas.

[8] Data from Census surveys in 2001 and 2011. All the categories are as defined by Census 2011.

seem relatively better compared with national averages, this data does not present the full picture of sanitation management. Sanitation is defined as *'the complete cycle of managing human faeces (excreta and urine) and wastewater (often referred to as sullage or grey water).* The full cycle of sanitation management consists of five key stages:

- User interface – a household latrine, a public latrine, community latrines, etc.
- Collection/containment – in sanitary pits, septic tanks and sewerage systems.
- Conveyance – emptying of septic tanks, transportation of sludge to treatment sites through vacuum tanks, open/covered drains for sullage, and sewerage systems.
- Treatment – through appropriate technologies that are either centralised or decentralised.
- Disposal and reuse – through appropriate means.

Not much is known about the other stages of the sanitation cycle. Only 31 out of the 252 ULBs in Maharashtra have sewerage networks within the city with varying degrees of coverage.[9] Other cities have some sort of sullage conveyance systems in the form of open or closed drains, but not much is known about the extent of connections or the quantity of wastewater collected, treated, disposed and reused.

While the latrines in homes are usually built by households themselves (with exceptions for poorer cases where government subsidies are available), the management of other elements of the cycle are vested with ULBs. The functioning of these government wings is determined by a set of rules and regulations, institutional capacity and finances available with them. Not much is known about these aspects and hence there is a need to understand these issues to improve the overall sanitation management in urban Maharashtra.

1.2 ABOUT PERFORMANCE ASSESSMENT SYSTEM (PAS) PROJECT

The PAS Project aims to develop appropriate methods and tools to measure, monitor and improve delivery of water and sanitation in urban India. The Project has three major components – performance measurement, monitoring and improvement – and covers all ULBs in Gujarat and Maharashtra.

Funded by the Bill and Melinda Gates Foundation, PAS is being implemented by the Centre For Environmental Planning and Technology (CEPT University) with the support of the Urban Management Centre (UMC) in Gujarat and the All India Institute of Local Self-Government (AIILSG) in Maharashtra.

[9] All India Institute for Local Self-Government. 2011. Urban water and Sanitation in Maharashtra.

As a part of its overall activities, PAS decided to undertake a study on the prevailing institutional and regulatory framework in Maharashtra with respect to management of liquid waste and faecal sludge in cities that do not have any sewerage network.

1.3 ABOUT THE STUDY

This study is an attempt to understand the rules, regulations and institutional mechanisms that govern and manage liquid waste and human faeces in non-networked cities in the state of Maharashtra.

This study has been undertaken by an independent consultant and adopted the following methodology: (i) desk review of literature related to the topic; (ii) desk review of various Acts, government orders, bylaws and construction codes applicable in the state of Maharashtra; (iii) visit to two cities – Wardha (without sewerage systems) and Mira-Bhayandar (with sewerage systems) – in Maharashtra to gain first-hand insights into the above issues; and (iv) desk review of good international practices. Inputs from the PAS team have also contributed substantially to shaping the study. The framework that has been used to guide desk reviews, discussions and the analytical process is given in Table 3.

Table 3: Framework for analysis

	Existing rules, regulations and standards (de jure)	**Responsible institution/s**	**Capacity for performing duties**	**Actual practice (de facto)**
Building by-laws/technical specifications for sanitation in buildings	Are the technical specifications for sanitation and sullage arrangements in buildings clear? If yes, which Acts/rules apply?	Which organisation created these rules? Have these been updated regularly and who did it?		Do building plans follow these rules while planning?
Approval of building plans along with proper sanitation facilities		Who approves the building sanitation plans?	Do the approving units have the required capacity to enforce these rules and regulations?	Are approvals given as per rules? What happens if the rules are not followed?
Approval of building	Are the rules for approving	Who approves construction of	Do the approving	What happens if the approval

	Existing rules, regulations and standards (de jure)	Responsible institution/s	Capacity for performing duties	Actual practice (de facto)
construction – for sanitation part	constructions for sanitation/sullage disposal aspects clear?	buildings and services?	units have the required capacity and authority to for timely inspections, mandating changes if needed, and approving actual construction?	is not as per rules? What happens if subsequent changes are made? What happens if operations start without approval?
Planning and provision of public and community sanitation facilities	Are there rules and specifications for public toilets, community toilets and drains?	Who plans? Who approves? Who inspects regularly for compliance?	Is there required capacity for planning, approval and regular inspections?	What is happening on the ground?
Conveyance	Are there rules and specifications for septage and sullage conveyance?	Who plans? Who approves? Who monitors and who do they report to in case of breach?	Who pays for these functions? Do the ULBs have capacity and funds for these activities?	What is happening on ground?
Treatment, disposal and reuse	Are there rules and specifications for septage and sullage treatment, disposal and reuse?	Who plans? Who approves? Who does the regular inspection and who do they report to in case of breach?	Does the operator have required capacity for undertaking these functions?	What is happening on ground?

This framework acted as an important tool for data collection and analysis. The present chapter attempts to present a background on urban Maharashtra and the rationale for this study.

The second chapter of this report highlights the institutional and regulatory framework in Maharashtra – in terms of what the rules and regulations are regarding management of sanitation and sullage. Chapter three attempts to present the overall analysis and findings through case studies of two cities, Wardha and Mira-Bhayandar, and tries to understand the effectiveness of implementing the policies and regulations across the full chain of septage and sullage management in the field.

Chapter four captures innovative approaches adopted by the Philippines and Malaysia in addressing the problem of septage management and draws lessons for Maharashtra. The last chapter, Chapter five, lays down a suggested roadmap for Maharashtra to address the problems of sullage and septage management, based on discussions in the field and desk reviews.

2 WHAT DO THE POLICIES AND RULES SAY? ANALYSIS OF INSTITUTIONAL AND REGULATORY FRAMEWORK IN MAHARASHTRA

2.1 NATIONAL URBAN SANITATION POLICY (NUSP)

The NUSP is the first policy on urban sanitation in India. It was developed and adopted by the Ministry of Urban Development, GoI, in 2008. Several states, including Maharashtra, follow the overall principles and approaches recommended in the NUSP. The main aim of the policy is to create **'open defecation free (ODF) cities'** in the country so as to impact the life-style, well being and health of urban citizens. **The policy recognises the existence of both off-site and on-site sanitary arrangements in cities within India** and articulates a need for developing mechanisms for addressing the full sanitation cycle in both types of systems. To make cities ODF, GoI advised cities to develop CSPs. There are no declared programmes to fund implementation of such CSPs, but funds from different programmes can be accessed by interested cities. Some key programmes are: Jawaharlal Nehru National Urban Renewal Mission (JNNURM), Urban Infrastructure Development Scheme for Small and Medium Towns (UIDSSMT), etc.

2.2 STATE POLICIES AND PROGRAMMES

There is no formal policy for urban sanitation in Maharashtra, but the state follows the approaches advocated in the NUSP. To promote the aim of achieving ODF cities, the state has designed a few programmes, guidelines from 2008, as described below.

(A) **Maharashtra Sujal Nirmal Campaign:**

The GoM developed a reform-oriented approach to managing water supply and sanitation provision and services in urban areas, named Sujal Nirmal Abhiyan, in 2008. The programme outlines financial packages available to different tiers of cities (especially those that are not covered under JNNURM and UIDSSMT grants) and the reform conditions for availing the package. The reform conditions are related to: levying appropriate user charges, collection of the same, meeting 100 per cent O&M costs over a period, reducing non-revenue losses, etc. The sanitation component of the Sujal Nirmal campaign is presented in Box 1.

Box 1: Sanitation components of Sujal Nirmal Abhiyan

Management of sewerage and sullage:

- Prepare action plans for connecting all the properties in the city with the sewerage/drainage/sullage system.
- Improve or augment the existing sewerage system.
- Reuse of wastewater by decentralised process of wastewater treatment.
- Levy and collect appropriate sullage/sewerage tax.

Toilet management:

- Conduct survey of availability of individual and community/public toilets in the city.
- Repair/rehabilitate community/public toilets in the city.
- Plan and construct additional community/public toilets, as required, with a focus on toilets for women.
- Prepare action plans, based on surveys, to improve the facility of individual/public toilets in the city and to make sufficient funds provision for the same as well as to prepare proposals for individual/public toilets for weaker sections and submit the same to the state government under the Central Government's programme.
- Encourage participation of private organisations/non-governmental organisations for operation and maintenance and/or construction of new public toilets.

(B) **Guidelines for Universalisation of UWSS Services in Cities:**

The government designs and issues guidelines to cities on planning and implementation of measures to achieve universalisation of UWSS services on June 19, 2010. This covers both water supply and sanitation related aspects. The guidelines are detailed in Annexure 1.

(C) **Maharashtra Golden Jubilee WSS Programme:**

On the occasion of completing 50 years of the formation of Maharashtra state, the government has launched a special programme to cover Scheduled Castes and Other Backward Communities (OBCs) with water supply and sanitation facilities. The programme was announced through a Government Resolution on June 25, 2010. As per this programme, cities are encouraged to cover the above special categories with household facilities and public facilities as feasible. The government grants are:

- House connection for water supply: Rs 4,000 per family.
- Low-cost household toilet: Rs 12,000 per family.

Cities are encouraged to undertake special survey of the condition of the category of families mentioned above, and develop plans to cover them all, as appropriate, and seek funding from the state. The state plans to use the funds made available by the GoI under the low-cost sanitation schemes, besides their own funds.

(D) **Standards to be Followed for Public Latrines:**

In May 2008, the WSSD issued guidelines (vide GR dated May 12, 2008) for technical specifications for constructing public toilets by ULBs. The GR clarified that cities should follow standards prescribed by the National Building Code, 2005. The GR also clarifies that the development rules for A Class Municipal Councils have been amended incorporating these specifications. (They are presented in Section 2.2.2.).

(E) **Recycling of Wastewater:**

The Urban Development Department, GoM, issued a GR (dated October 15, 2010) encouraging cities to develop plans to recycle and reuse at least 20 per cent of wastewater being generated. Such wastewater could be used for (a) agricultural purposes; (b) non-drinking water related uses; and (c) industrial use. However, the GR does not provide any other specifications or regulations on the subject.

2.3 REGULATIONS

The focus of this study is management of sullage and management of human faecal matter, also called 'night soil'. The following Sections cover the regulations prescribed by various Acts, government orders, guidelines and manuals that are applicable to the state of Maharashtra. Both sullage management and night soil management involve five key stages: (a) user interface (construction of latrines, bathrooms, kitchens in premises); (b) collection (containment) (construction septic tanks for confinement of night soil and drains for sullage disposal); (c) conveyance of septage/sullage for treatment; (d) treatment; and (e) disposal and reuse.

2.3.1 User Interface

Construction of latrines, bathrooms and kitchens: Latrines, bathrooms and kitchens are part of a building and are governed by building by-laws. The regulatory guidelines and process is well laid out in the Municipal Acts. As per the Act, the Municipal Corporation/Council is responsible for issuing permits for construction of new buildings and/or repairs/renovation of old buildings. The salient features, with respect to sanitation aspects, are presented below:

- Step 1: A person intending to build a building should give a notice to the Chief Officer (Section 189) along with: a plan with information on levels, rooms, height, drain pipes (plumbing), privies, water closets, house gullies, cess pools, etc.

- Step 2: The Chief Officer, after inspection of all due documents as per applicable specifications and rules, should either grant permission for construction, seek clarifications or more information, or deny permission, within 60 days.
- Step 3: The owner/builder should inform the Chief Officer about the due completion of the building construction within one month after the completion of construction (Section 193). The Chief Officer, after due inspection, either gives the Completion Certificate or denies it.

Section 25 of the Model Building By-laws[10] provides specifications for installing plumbing services, mainly water supply, sanitation and drainage facilities. The salient features of the specification are given in Table 4.

Table 4: Sanitation requirements for various types of buildings

SN	Building use	Latrines	Bathrooms	Urinals	Water requirement (litres/seat/day)
1	Dwellings with individual conveniences	1	1	-	270 litres for first seat and additional 180 litres for each additional seat
2	Dwellings with common conveniences	1 for every 3 tenements	1 for every 3 tenements	-	900 litres/seat
3	Nursery school	1 for every 30 students	-	Nil	
4	Other educational institutions	1 for 80 boys; 1 for every 50 girls	-	1 for 20 boys	900 litres/WC seat; 180 litres/urinal
5	Government and public business buildings and offices	1 for every 25 men; 1 for every 15 women	One on each floor	1 for 7–20 people; 2 for 21–45 people; 3 for 46–70 people; and	900 litres/WC seat; 180 litres/urinal

[10] Each Municipal Council is entitled to make its own by-laws for various aspects of city governance, and building by-laws is one of them. The state has provided Model Building By-laws for Class A and B Municipal Councils and these have been adopted by all the Councils. These apply to Corporations also.

SN	Building use	Latrines	Bathrooms	Urinals	Water requirement (litres/seat/day)
				so on	
6	Restaurants – for public	1 for 50–100 for men; 1 for 50–200 for women	1 for 50 seats		900 litres/WC seat; 180 litres/urinal
7	Restaurants – for staff	1 for 1–15 men; 2 for 16–35 men; 1 for 1–12 women; 2 for 13–25 women	1 for 7–20 men		900 litres/WC seat; 180 litres/urinal
8	Factories	1 for 1–15 men; 2 for 2–35 men; and so on; and 1 for 1–12 women; 2 for 13–25 women	Same as above		900 litres/WC seat; 180 litres/urinal
9	Cinemas, theatres and auditoria	1 for 100–400 men; 3 for 100–200 women	1 for 25 persons		900 litres/WC seat; 180 litres/urinal

Specifications for latrines and bathrooms: The size of a bathroom shall not be less than 1.8 sq metres with a minimum width of 1.2 metres. The size of a latrine shall be minimum 1.1 sq metres with a minimum width of 0.9 metres. The height of a bathroom or a latrine shall not be less than 2.2 metres. The other requirements are: a bathroom or a latrine shall have one door; at least one wall exposed to open air and should have at least one opening in the form of a window/ventilator and/or louvers.

Connection to drains for disposal of sullage: As per standard clauses in the city development rules, in locations where facilities for drainage and daily conservancy have not been provided (by the city), no dwelling house shall be constructed unless sufficient facilities for drainage and daily conservancy are provided by the owner to the satisfaction of the city authority. A septic tank is the most used option in such

cases. This clause implies that the property owner shall connect to drains wherever provided by the city.

Secondly, the building layout plan should also indicate service plans – plans, elevations and sections of private water supply, sewage disposal systems and details of building services, where required by the authority (Section 6.2.7 of Development Control Regulations of Nagpur City, 2000). However, this does not specifically indicate if the property owner is duty bound to connect to the sewerage/drain systems existing in the locality.

Sanitation facilities in slums: Maharashtra has the highest number of households living in slums across the country. An estimated 18.10 mn people (36.14 per cent of the total urban population) live in slums and most of them are served by community/public toilets.[11] As per PAS data, only about 11 per cent of households residing in slums in urban Maharashtra have individual household latrines.[12]

Development in slums is guided by the regulations provided in the Maharashtra Slum Areas (Improvement, Clearance and Redevelopment) Act, 1971. The following is a gist of the Act, with respect to sanitation.

- A slum dweller is recognised by a photo pass, if he is found to be living in the slum on or before January 1, 1995 (Section 3Y- sub clause2). Such a photo pass holder is called a 'protected occupier' and the 'dwelling structure'[13] that s/he occupies is a protected one. The details of the dwelling structure are also recorded as on January 1, 1995. As per the Act (3Z-1) no such a protected occupier shall be evicted from the slum except under special conditions.
- No person can do any extension to such buildings without prior approval of competent authorities.[14] Such additions to existing buildings, if made, are liable to be demolished (Section 3 Z-1 (1)[15]). The permissions for any alteration to the

[11] As per Census 2011 data, about 21 per cent of urban households in Maharashtra depend on public toilets and experience reveals that most of the public toilets are in slum areas.

[12] All India Institute for Local Self-Government. 2011. Urban water and Sanitation in Maharashtra.

[13] A dwelling structure is defined as a structure used for dwelling or otherwise and includes an out-house, shed, hut or other enclosure or structure, whether of bricks, masonry, wood, mud, metal or any other material whatsoever.

[14] Building a toilet close to the existing structure is also seen as an extension and hence needs permissions, which are not encouraged in slums.

[15] Where a Competent Authority, upon a complaint from any person or report from its officer or police or any other record or information in its possession, is satisfied that any unauthorised or illegal dwelling structure or part thereof has been constructed or any addition to the existing structure as recorded on photo-pass, has been erected, after January 1, 1995, within the area of its jurisdiction, without obtaining necessary permissions required to be obtained in that behalf under the relevant laws, of the concerned statutory authorities, it shall forthwith serve upon the owner of such

existing buildings in slums are to be processed as per the DC rules and building by-laws of the city.

- There are special provisions for in-situ development of dwellings of protected occupiers within notified slums (Section 1C) where a housing scheme is formulated and declared by the state government or the GoI, for the construction or reconstruction of dwelling units or structures in the scheme area for providing basic amenities to the slum dwellers who are protected occupiers (Section 3X). Under any housing scheme the protected occupier in the scheme area may, after obtaining the permission of the Planning Authority (usually the ULB or special body created by state government), in the prescribed manner, construct or reconstruct a dwelling structure as per the terms and conditions of the housing scheme (Section 3Z-5 (i)).
- In some cases the slums are fully redeveloped after being notified as 'rehabilitation areas' and the protected occupiers shall be rehabilitated in the redeveloped area, as per terms and conditions laid down by the competent authority (Section 3A).
- If found feasible, the competent authority can undertake certain in-situ slum improvement works including: (i) laying of water mains, sewers and stormwater drains (ii) provision of urinals, latrines, community baths and water taps, etc. (Sections 5-1 and 5A). Most household latrines in slums in Maharashtra are built under such schemes managed by the Maharashtra Housing and Development Authority (MHADA).

While the above rules protect occupiers with a photo pass from evictions, they cannot modify their existing dwellings (in-situ development) without regular building modification/construction approvals as per city building by-laws. The most common options for providing/enabling improved sanitation to residents in slums are redevelopment of slums and/or in-situ services provision for notified slums through various government schemes. As seen from the schemes of the MHADA and the Mumbai Metropolitan Regional Development Authority (MMRDA), it appears that community sanitation complexes are the most used option for providing sanitation to slum residents in Maharashtra.

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unauthorised or illegal dwelling structure or any other person claiming an interest therein and also upon the person who is in occupation of such structure, a written notice to show cause, within 24 hours as to why an order of demolition of the structure should not be made.

2.3.2 Collection

Septic tank specifications: Septic tanks are the most common method of collecting faecal matter and also sullage (if no drains are available). Section 25.3.1 of the model by-laws, manual on Sewerage and Sewage Treatment (Second Edition) by the CPEEHO and the Indian Standards code (IS 2470 Part-1, 1985) spell out the details of septic tank design and construction. Details of these specifications are provided in Annexure 2. The key features of these specifications include:

- Assumptions and design guidelines for varying sizes and number of users.
- Guidelines on minimum dimensions and volumes.
- Details of inlets, outlets, vent pipes.
- Details of its location and precautions to be taken with respect to adjacent buildings and local environment.

Septic tanks/pits in EWS houses: Specifications for latrines and septic tanks for

Box 2: Septic tanks

A septic tank is a key component of the sanitation system, a small-scale sewage treatment system or a household level decentralised treatment common in areas with no connection to main sewage pipes provided by local governments or private corporations. Septic systems are a type of on-site sewage facility (OSSF). The term 'septic' refers to the anaerobic bacterial environment that develops in the tank which decomposes or mineralises the waste discharged into the tank. The tank is buried underground at individual homes or buildings. Sewage flows through pipes that connect the septic tank to the building. The solids in the sewage sink towards the bottom of the tank where anaerobic bacteria break them down into carbon dioxide, methane and water. The undigested residue (septage) stays at the bottom of the tank and the scum floats to the top. The effluent from the septic tank containing the remaining liquid waste flows through a piping network to a drain field.

The size of septic tanks depends of the number of users. Septic tanks are generally two or three chambered. Septic tanks can be built in-situ on the location or prefabricated tanks can be installed. IS Code 2470 (Part-1), 1985, specifies standards for design, layout, construction and maintenance of in-situ septic tanks for buildings where the number of users does not exceed 300 people. Precast septic tanks are a viable alternative to constructing septic tanks on site. Precast units save time and, if used in large quantities at a given site, are economical also. Technical standards for manufacturing of precast concrete septic tanks and their assembly at site are detailed in Indian Standards Code IS 9872, 1981.

houses constructed by the MHADA for economically weaker sections (EWS) and slum redevelopment schemes are also provided for.[16] The details are:

- A septic tank of a capacity of 141.6 litres/capita shall be provided in these special houses where municipal services (sewerage systems) are likely to be available in four or five years.
- In cases where municipal sewerage services are not available and the water table is not high, pour flush latrines with twin soak pits shall be provided.

MHADA specifications for septic tanks in EWS houses do not confirm to IS Code 2470 (Part-1), which specifies a minimum liquid capacity of 1,000 litres to allow for proper sedimentation and digestion. While the special regulations for EWS housing may have been influenced by cost of construction (usually subsidised by the GoM), there is a need to reconsider these norms from a technical perspective also.

2.3.3 Conveyance

Household facilities: Emptying household septic tanks and transporting the septage is the responsibility of individual households. Under Section 231 of the Municipal Act (Non-removal of filth), an owner/occupier of a building can be fined a penalty of Rs 20 per day if:

- Found to be neglecting removal of filth (dirt, soil, night soil, or any noxious/offensive matter) from a land or building.
- Keeps the receptacles in a filthy shape/condition.
- Does not employ proper means and cleanse and purify such receptacle.

As per the Municipal Acts, the Chief Officer has powers to inspect the sanitation arrangements within the buildings and require the owners to make rectifications as needed or punish them if found to be causing nuisance (Chapter 16).

Under Section 230 (Discharging Sewage etc.) the Chief Officer can punish a person/household with a fine up to Rs 100, if without the appropriate permission from the council, that is:

- Found to be causing nuisance by discharging/causing to discharge any wastewater, cesspool water, etc., to drain, run into any street/open areas or soak through external walls.

[16] As per GR UD and PHED, No DCR-1081/437/A –lf-UD 5, dated 18th January 1982. Also reflected in Development Control Regulations for Mira-Bhayandar Municipal Corporation.

- Allows any offensive matter from any sewer or privy to drain or thrown into open drain in any street.

The Chief Officer also has to regularly inspect the functioning of the various elements of the sanitary arrangements and has powers to make the owners to rectify/demolish the latrines or parts if found to be unfit. Under Section 208 of the Municipal Act, the Chief Officer (subject to the control of the President), after due inspection, can ask the owner of a house to put in due order all drains, privies, water closets, house gullies, gutters and cess pools at the cost of the owners.

It shall be the duty of every owner to get such drains, privies, water closets, house gullies, gutters and cesspools cleaned either by municipal agency or such other agency as the Chief Officer may approve and at such intervals as the Chief Officer may require.

The Chief Officer, by written notice, can require the owner to demolish or close a toilet/urinal (privy) or soak pit/septic tank (cesspool), which in the opinion of the Chief Officer is a nuisance or is inaccessible for cleaning and keeping in good order.

Box 3: Emptying septic tanks

Emptying septic tanks periodically is an important function in the sanitation management chain. This is also called as desludging. Timely desludging of septic tanks is essential to prevent overflows from septic tanks and also achieving the desired settlement of sediments in the tank. The sludge is conveyed to a treatment place for further treatment and disposal and/or reuse. It is mandatory to perform desludging through appropriate instruments such as vacuum suction tanks to prevent human contact with raw sludge/septage and avoid manual scavenging.

The periodicity of emptying depends on the size and use of the septic tanks. The CPHEEO recommends that small domestic septic tanks be cleaned at least once in two years. IS Code 2470, (Part-1), 1985, recommends desludging once or twice in an year. Small domestic tanks can be desludged at least once in two years for economic reasons, provided the tank is not overloaded due to use by more than the number for which it is designed. A portion of sludge not less than 25 millimetres in depth should be left behind in the tank bottom – this acts as the seeding material for fresh sludge.

The Chief Officer is responsible for fixing the timings and specifying routes for removal of night soil, from time to time (Section 232, Removal of Night Soil). The persons involved in removing and carrying night soil can be punished with fine up to Rs 100 if they:

- Use any vehicle[17]/means not having proper covering to prevent falling out of the night soil while transporting or removing.
- Wilfully or negligently spill any night soil while removing it.
- Do not clean the places where such spills occur.
- Places such vehicles in public places.

Public facilities: In general, the ULB is responsible for cleanliness in the public areas of the city. As per Section 49, Clause C of Municipal Act, 'cleansing public streets, places and sewers, and all spaces not being private property, which are open to enjoyment of public, whether such spaces are vested with council or not removing noxious vegetation and abating public nuisance' is the responsibility of the ULB. This applies to public facilities such as drains, public/community toilets/urinals, and is not applied to facilities within private buildings. As exact details of cleaning are not provided in the Act, the interpretation of this ULB responsibility is ambiguous. Discussions with municipal officers revealed that there is no clarity if ULBs are mandated to desludge septic tanks under this Clause. The GoM could take steps to clarify this Clause and mandate ULBs to periodically desludge septic tanks within community/public toilets, to encourage overall city cleanliness.

Manual scavenging: The regulations for 'manual scavenging' are also clearly spelt out in Sub-section (ii) of Section 232 of the Municipal Acts. As per this, 'no person shall require or compel any other person to carry, and no person shall carry night-soil as head load for removing it from any premise or place to any other premise or place, or for disposal in any part of the municipality'. Anyone breaking this rule is punishable, upon conviction, with imprisonment up to six months and/or fine up to Rs 1,000. The Chief Officer has to monitor this aspect also.

[17] There are no technical specifications for this kind of vehicle and it is also not clear as to who will approve/license the operators of these vehicles.

Box 4: Employment of Manual Scavengers and Construction of Dry latrines (Prohibition) Bill, 1993 (passed by the Government of India)

In recognition of the inhuman practice of manual scavenging, the GoI adopted the above Act which is applicable to all states. The aim is to convert all dry latrines/bucket latrines into safe latrines (water seal/pour flush latrines) which need not be serviced by manual scavengers. Secondly, it creates employment opportunities for persons/families involved in this profession and rehabilitates them. As per the provisions of the Bill, people involved in the employment of scavengers or the construction of dry (non-flush) latrines are liable to be punished with imprisonment for up to one year and/or a fine of Rs 2,000.The GoI, through the Ministry of Social Justice and Welfare, launched schemes with financial assistance for both the above activities. The Supreme Court of India directed all state governments to act effectively and put an end to this inhuman practice by 2003 which was later extended to 2005. All states, including Maharashtra, have reported the achievement of this objective.

However, petitions by several non-governmental organisations, such as Safai Karamchari Andolan, and the data from Census 2012 revealed the existence of this practice in several states, including in urban areas. As per Census 2011 data, about 0.3 latrines in urban India are still cleaned by manual scavenging. The corresponding figure for urban Maharashtra is zero, meaning there is no existence of manual scavenging. However, there are some cases in the High Court of Maharashtra and the Court asked the GoM to verify the numbers. Meanwhile, based on directions from the Supreme Court, the GoI is about bring about more strict regulations through amendments to the 1993 Bill.

2.3.4 Treatment and Disposal of Septage/Sullage/Effluent from Septic Tanks

Household level: The development control rules of various cities mandate that effluent from septic tanks should be properly treated before disposing into open drains or a body of water.[18] IS Code 2470 (Part-2), 1985, and the Advisory Note on Septage Management in Urban Indian, MoUD, 2013, recommends a range of technical options for treating effluent from septic tanks, before letting it off into open drains or water bodies. The common methods of septage treatment are sewage treatment plants (STPs), land treatment, composting and mechanical treatment.[19] The most common methods are:

- Sewage treatment plants: The most convenient and effective option where STPs exist within the cities.

[18] For example, Sections 30-sub-section C, G and H of the development control rules of Mira-Bhayandar Municipal Corporation prescribes the need for treatment of effluent from septic tanks and methods of treating the same – either through a seepage pit or through a dispersion trench.
[19] MoUD Advisory.

- Land treatment/soil absorption systems: These systems are simple and cost effective, need minimum energy and recycle nutrients back into the land. However, the use of these systems is determined by land availability, topography, soil conditions, drainage patterns, climate, groundwater tables and distance from water bodies. In these systems the effluent is discharged into pits of pre-determined dimensions with appropriate lining and covering based on the absorption capacity of the subsoil and other factors. Seepage pit and a dispersion trench are the two methods under this treatment system.
- Composting: Composting is another popular method of treating septage. Compost is defined as the stabilisation of organic material through the process of aerobic, thermophilic decomposition. During the composting process organic material undergoes biological degradation to a stable end product.
- Biological filters: Biological filters are suitable for treatment of septic tank effluent where the soil is relatively impervious, or there are water logged areas or where limited land area is available. In a biological filter, the effluent from a septic tank is brought into contact with a suitable medium, the surfaces of which become coated with an organic film. The film assimilates and oxidises much of the polluting matter through the agency of micro-organisms. The biological filter requires ample ventilation and an efficient system of under drains leading to an outlet.
- Upflow anaerobic filters: Upflow type of filters (reverse filters) are used in areas that have dense soil condition, a high water table and limited availability of open land.

Public facilities: It is expected that ULBs carry out the function of providing and managing public facilities for treatment of sewerage and sullage generated in the city. However, such treatment is not a mandatory function of the ULBs. As per the Municipal Acts, Maharashtra Municipal Councils, Nagar Panchayats and Industrial Townships Act, 1965, and Bombay Municipal Corporation (and/or Nagpur Municipal Corporation) Acts 1948–49,[20] *establishing and maintaining a farm or factory for disposal of sewage* is a discretionary function of ULBs.

[20] The Bombay Municipal Corporation Act, 1949, guides the formation and functioning of all other Municipal Corporations in the state.

Box 5: Regulation for reuse of wastewater: Case of Nashik city

While there are no universal cases of regulations for reuse of sullage, Nashik Municipal Corporation introduced such regulations in September 2009, to enable more water being available for use. The Development Control Rules have been amended to incorporate regulations regarding reuse of wastewater for certain properties such as housing complexes with more than 150 tenements, three-star or higher category hotels and commercial establishments of more than 20,000 square metres built-up area. According to the regulations, the existing properties have to make arrangements for separating sullage water, treat it and collect in a separate tank for use other than human consumption. Owners and/or promoters of new developments, within these classifications, have to make necessary arrangements for separating collection and treatment of sullage.

While such reuse is mandated for individual properties, it is not clear if there are any regulations that compel the ULB to reuse some portion of the wastewater that is collected through sewer systems and treated. According to the information provided in the draft City Sanitation Plan for Nashik city, the ULB manages three sewerage treatment plants with an installed capacity of 107.5 MLD and all the plants are working satisfactorily. It is not known if any portion of this treated wastewater is reused.

2.3.5 Summary of Policies and Regulation Framework

The following is a summary of the analysis of policies and regulations for the management of full chain sanitation and sullage.

- The NUSP, adopted in 2008 by the GoI, is a good attempt at addressing the sector issues. The policy recognises the existence of both off-site and on-site sanitation systems and encourages cities to develop CSPs to create cities free of open defecation. However, the policy does not address wastewater aspects and there is no specific focus on management of wastewater in non-networked cities.
- The state of Maharashtra adopted the guiding principles of the NUSP in its Sujal Nirmal Abhiyan and strengthened it with the support of various government orders. As Maharashtra is fast urbanising, it would be useful for the state to develop and adopt a comprehensive policy that addresses specific state level issues.
- Regulations are well laid out for activities under user interface and collection sections. Septic tanks are an important element of on-site sanitation and sullage management in non-networked cities. Detailed guidelines are available from IS codes and CPHEEO manuals. Most of these are incorporated in city level development regulations, excepting treatment options.
- While regulations are strong on treatment of effluent coming out of septic tanks, there are no regulations that mandate cities to treat all the sludge and sullage

coming out of septic tanks and drains. This is the weakest link in the management chain.

- Policies and regulations that govern slums' sanitation issues do not encourage building of individual household latrines; slum dwellers are, instead, dependent on community facilities built by ULBs and or other development authorities through various government schemes. This is very critical issue for Maharashtra as about 36 per cent of urban residents dwell in slums and have limited access to good sanitation facilities. Such a situation impacts the health, dignity and overall quality of living of slum residents negatively. There is a case for special policies for addressing sanitation issues in slums in Maharashtra.

2.4 INSTITUTIONAL FRAMEWORK

The institutional framework for managing sanitation in urban Maharashtra is analysed as per the broad functional responsibilities of: (a) policy making; (b) service provision; and (c) regulation/oversight. The key institutions at the state level dealing with urban sanitation related aspects are the Urban Development Department (UDD), Water Supply and Sanitation Department (WSSD), Maharashtra Pollution Control Board (MPCB), Town Planning and Valuation Department (TPVD), MHADA, MMRDA and Maharashtra Water Resources Regulatory Authority (MWRRA). The ULB is the only key city level institution. Table 5 gives a brief description of their roles under various categories, followed by a detailed analysis.

Table 5: Institutional roles

	Role		
Institution	**Policy making**	**Service provision**	**Regulation/oversight**
UDD	Detailed guidelines of staffing. Hiring staff in ULBs and transfers. Budget allocation.		Oversight on overall functioning of the ULBs. Approval of CSPs and other proposals that are funded by GoM and GoI.
WSSD	State urban sanitation policy and guidelines.		Approval of CSPs prepared by cities. Approval of schemes taken up under Sujal Nirmal Abhiyan funds of GoM.
MPCB	Advise state on pollution related		Monitoring of surface water quality and seeking

	Role		
Institution	**Policy making**	**Service provision**	**Regulation/oversight**
	standards or policies.		polluting cities to take appropriate actions.
MTPVD		Development of regional development plans. Develop city development plans, on request of cities.	Approve city development plans. Approval of town planning schemes.
MHADA		Implement low-cost housing projects for the poor. Implement slum improvement projects under state grants and National Slum Development Programme (NSDP).	
ULBs		Duties prescribed in the Municipal Acts. Construction and maintenance of public facilities. Housing for the poor (along with sanitation).	Approval of building plans. Approval of building completion. Planning for cleaning of septic tanks. Other functions as prescribed in the Municipal Acts.

2.4.1 Urban Development Department (UDD)

The state department under the Urban Development Minister is the overall inc-charge for guiding and overseeing the functioning of all ULBs. The key functions of the UDD include determining the overall state budget, determining staffing patterns within the ULBs, appointments/transfers/promotions of Class 1 and Class 2 officers,[21] passing on budgets or grants to the ULBs, regular monitoring of the functioning of

[21] The Class 1 and Class 2 officers are appointed by the state and are transferable across ULBs. ULBs are empowered to appoint staff in the grades of Class 3 and Class 4.

the ULBs, and setting rules of operations. The UDD is also responsible for management of elections to ULBs under the supervision of the State Election Commission. It also resolves the disputes of the Councillors.

The Directorate of Municipal Affairs (DMA), a unit within the UDD, is the key nodal agency for coordinating with ULBs. It is headed by a Director who oversees the functioning of ULBs as described above.

Though the UDD does not play any direct role in sanitation management directly, some of its activities have an influence on the sector. These are:

- Deciding staffing patterns in ULBs for sanitation management and appointing staff, from time to time. The UDD revised the staffing pattern for all ULBs in the state in 2006 and introduced municipal engineering and planning cadres in 2006.
- Approval of all town planning schemes and changes made from time to time.
- Approval of overall municipal budgets, including state and GoI grants.
- Approval of special projects under various schemes (UIDSSMT, JNNURM, etc.).
- Monitoring performance of the ULBs and guiding them from time to time.

2.4.2 Water Supply and Sanitation Department (WSSD)

This is the parent department for all water supply and sanitation issues within the state, under the Minister for Water Supply and Sanitation. The WSSD is a technical department and does not exercise any control over ULBs. The WSSD is responsible for deciding WSS polices, standards, schemes, etc., and monitor their implementation. The WSSD also prepares annual budgets, raises resources from state, loans and other agencies and passes on the resources to ULBs. The ULBs have the choice to take the help of the Maharashtra Jeevan Pradhikaran (MJP) – the state level Public Health Engineering Organisation – to plan and construct the planned infrastructure or undertake the projects on their own through other agencies.

The MJP, a unit under the WSSD, is one of the key financing vehicles for urban WSS infrastructure in the state – it is the financial intermediary for raising loans and bonds in the state for all the WSS related infrastructure. The finances are passed on to ULBs either directly or indirectly where the MJP designs and builds the infrastructure through consent of the ULBs. The MJP is also designated as the 'technical approval agency' for any schemes formulated by Municipal Councils and Nagar Panchayats with a cost above Rs 75,000. However, the MJP is not involved in the management of on-site sanitation activities, so far. It is also the designated Nodal Agency in the state for the Low Cost Sanitation scheme of the GoI.

2.4.3 Maharashtra Pollution Control Board (MPCB)

The MPCB was established in 1970 under the provisions of the Maharashtra Prevention of Water Pollution Act, 1969. The MPCB functions under the administrative control of the Environment Department of the GoM.

The MPCB is the key regulator for various 'pollution issues' in the state prescribed under: Water (Prevention and Control of Pollution) Act, 1974, Air (Prevention and Control of Pollution) Act, 1981, Water (Cess) Act, 1977 and some of the provisions under Environmental (Protection) Act, 1986 and the rules framed there, such as Biomedical Waste (M&H) Rules, 1998, Hazardous Waste (M&H) Rules, 2000, Municipal Solid Waste Rules, 2000, etc.

Some of the important functions of the MPCB are to:

- Plan for comprehensive programmes for the prevention, control or abatement of pollution and secure their implementation.
- Collect and disseminate information relating to pollution and its prevention, control or abatement.
- Inspect sewage or trade effluent treatment and disposal facilities, and air pollution control systems and to review plans, specifications or any other data relating to the treatment plants, disposal systems and air pollution control systems in connection with the consent granted.
- Support and encourage developments in the fields of pollution control, waste recycle reuse, eco-friendly practices, etc.

Faecal contamination of the water bodies monitored by the MPCB is a major issue. Based on the monitoring of river water quality, the MPCB has powers to make it mandatory for any city to build infrastructure to stop/reduce faecal contamination of the water body. The MPCB monitors water quality in rivers through 250 water quality monitoring stations across the state. This activity is managed by the office of Water Pollution Abatement Engineer through 11 regional and 41 sub-regional offices and regional laboratories. The data is captured by the MPCB in two monitoring systems, the Global Environmental Monitoring Systems (GEMS) and Monitoring of Indian Aquatic Water Resources (MINARS). The frequency of the data collection is determined by the water quality testing protocols.

Faecal contamination of rivers is one of the indicators monitored by the MPCB. The various limits set for faecal contamination of water sources are given in Table 6):

Table 6: Faecal contamination of water

Designated best use	Quality/class	Primary water quality criteria
Drinking water without conventional treatment but with chlorination.	A	Total coliform organisms (MPN/100 ml) should 50 or less.
Drinking water with conventional treatment.	C	Total coliform organisms (MPN/100 ml) should 5,000 or less.

The MPCB has the authority to issue notices to the concerned ULBs and/or concerned establishments (hotels, industry, etc.) to undertake necessary improvements to their sewage treatment arrangements. As per the Water Act 1974, Section 17 (l), the MPCB has authority to make, vary or revoke any order:

(i) For the prevention, control or abatement of discharge of waste into streams or wells; and

(ii) Requiring any person concerned to construct new systems for the disposal of sewage and trade effluents or to modify, alter or extend any such existing system or to adopt such remedial measures as necessary to prevent, control or abate water pollution.

2.4.4 Urban Local Bodies (ULBs)

ULBs are the key organisations in the management of all sanitation issues, including on-site sanitation within cities. Two Acts – (a) the Maharashtra Municipal Councils, Nagar Panchayats and Industrial Townships Act, 1965; and (b) Bombay Municipal

Corporation (and/or Nagpur Municipal Corporation) Acts 1948/49[22] – define the overall structure of ULBs as well as their roles and responsibilities. These Acts also specify the regulations for a range of sanitation issues. The overall structure and functions of ULBs are given below.

- The ULBs are headed by elected councils with a Chairman as the head.
- Each ULB has a Standing Committee and five subject committees, that is, (a) Public Works Committee; (b) Education Committee; (c) Sanitation, Medical and Public Health Committee; (d) Water Supply and Drainage Committee; and (e) Planning and Development Committee.
- The executive head of a ULB is either a Commissioner (for Corporations) or Chief Officer (for councils), appointed by the state government.
- The ULB is also the local planning authority[23] and should develop town planning schemes, as necessary. However, in most cases, the town planning schemes are prepared by the Town Planning Department at the initiation of local governments.[24]
- Sanitation is typically divided across two departments within a ULB:
    - The 'sewerage' part (underground sewers, STP management, etc.), if any, is dealt with by the Water Supply and Sewerage section, headed by an engineer and supported by other staff.
    - Other sanitation activities (maintenance of community/public toilets, cleaning septic tanks, monitoring manual scavenging, converting night soil to manure, cleaning of drains, etc.) are in the realm of the Public Health unit, usually headed by a medical professional. The Medical officer is supported by sanitary/ward inspectors and cleaning staff. Typically, solid waste management is also vested with this unit. In general, this unit has the maximum number of staff and most of them are Class 4 employees (cleaners, sweepers, etc.). The incomes for these services come from special sanitary cess, cleaning of household toilets and sale of compost, if any, besides state grants and other income of ULBs.

The duties and functions of the ULBs are divided into obligatory and discretionary sets. The functions with respect to sanitation related aspects are given below.

[22] The Bombay Municipal Corporation Act, 1949, guides the formation and functioning of all other Municipal Corporations in the state.
[23] As defined in the Maharashtra Regional and Town Planning Act, 1966.
[24] Report on Sustainable Cities in Maharashtra by the AIILSG.

A. Obligatory Duties (Section 49: Sub-section 2):

- (b) Watering public streets and places.
- (c) Cleaning public streets, places, *sewers and all places not being private property*, which are open to the enjoyment of the public..removing noxious vegetation and abating all public nuisance.
- (h) Acquiring and maintaining, clearing and regulating places for the disposal of the dead.
- (i) constructing, altering and maintaining public streets, culverts, municipal boundary marks..slaughter houses, **latrines, privies, urinals, drains, sewers, drainage works, sewerage works,** baths, washing places, ..tanks, wells, dams and the like.
- (j) obtaining a supply of water, proper and sufficient for promoting the health of habitants.[25]
- (r – a) ***converting dry latrines in the municipal area into wet latrines.***
- (s) **disposing night soil and rubbish, if so required by state government, preparation of compost manure from such night soil and rubbish.**
- (s-a) taking such measures, as the state government from time to time direct for improvement of the living and working conditions of the sanitary staff of the council.
- (s-b) manual carrying of night soil (1981) – **ensuring that no person shall require or compel any other person to carry and no person shall carry, night soil as a head load for removing it from one premise or place to any other premise or for disposal in any other part of the municipal area.**
- (v) imposing compulsory taxes specified in Section 105.[26]

B. Discretionary functions (Sub-section 3):

A council may, at its discretion, provide either wholly or partly, out of municipal funds.

[25] The amount of water required for various types of latrines is discussed in later Sections.

[26] The taxes to be imposed by the Municipal Council include: property tax on rateable value, entertainment tax, advertisement tax. Other discretionary taxes include, subject to orders from state government: special sanitary tax for private latrines, drainage tax, special water tax, tree cess.

- (j) supplying, constructing and maintaining, in accordance with a general system provided by Director of Public Health – receptacles, fittings, pipes and other appliances whatsoever, or for the use of private premises: for receiving, conducting of the sewage thereof into sewers under the control of the council.
- (l*) Establishing and maintaining a farm or factory for disposal of sewage.*
- (p) Construction of sanitary dwellings for poorer classes.
- (x) Any other measures not specified in sub-section (2) likely to provide public safety, health and convenience.

It can be concluded that the ULB has some responsibility for (a) ensuring construction of latrines, urinals, etc.; (b) disposal of night soil, if required by the government and converting into compost; (c) conversion of dry latrines into wet latrines; and (d) not permitting manual scavenging. The aspect of appropriate treatment and disposal of night soil is a discretionary function (establishing factory for disposal of sewage).

2.4.5 Staffing within ULBs

The ULBs are headed by a Commissioner (for Corporations) and Chief Officer (for Councils) with staff in various departments. The issues related to sanitation are divided between three departments:

- The Town Planning and Public Works departments review and approve building permits, including sanitation aspects. The Public Works department is also responsible for the design and construction of public toilets and supervises execution of slum improvement schemes, low cost housing schemes, including the sanitation aspects.
- The Water Supply and Sewerage department deals with underground sewerage systems and their maintenance.
- The staff under the Public Health department, generally headed by a Medical officer, deals with on-site sanitation issues (vacuum cleaners, public toilets' upkeep, cleaning of open drains).

In an attempt to enhance the technical capabilities of ULBs, especially Municipal Councils and Nagar Panchayats, the UDD decided to develop and put in place staff under Municipal service cadres, in 2006.[27] As per this the notification, the GoM decided on the following Municipal cadres:

[27] As per gazette notification number MCO. 1203/1246/CR175/03/UD-14, dated February 10, 2006.

- Engineering services;
- Water Supply, Sewerage and Sanitation Engineering services;
- Audit and Accounts services;
- Taxation and Administrative services;
- Fire services; and
- Town Planning and Development services.

The existing staff under these positions would be absorbed into the services cadres and new staff will be recruited as needed. The GoM decided that the minimum number of staff under these services for Municipal Councils should be 2,037 professionals, out of which 413 are sought to be placed under the Water Supply, Sewerage and Sanitation Engineering services. There is no data on how many are actually in place.

The staff in the above cadres will be absorbed/recruited under four service grades according to their qualifications and experience. The powers to appoint professionals under the above classes are vested with different agencies as given in Table 7.

Table 7: Appointment of professionals

Grade of staff	Authority to appoint
Class A	Director, Directorate of Municipal Administration, State office
Class B	Regional Directors, Directorate of Municipal Administration, Regional offices
Class C-1	District Collector
Class C-2	District Collector

The ULBs can appoint staff (as approved by DMA) under Grade-4, mainly semi-skilled workers. A majority of the sanitation staff known as 'sanitary workers' (safai karamcharis) are recruited by ULBs. The UDD has fixed a norm of one sanitary worker per 1,000 population. However, in most ULBs, the number of sanitary staff far exceeds the prescribed limits. The state has promulgated regulations protecting the positions and services of these staff, as recommended by the Lad Committee, in 2006.[28] A gist is given below.

As per this GR, the GoM decided to adopt the recommendation of the Lad Committee on hereditary rights on the post of sanitary workers. If an existing sanitary worker retires or becomes incapable of continuing his/her duties due to injury/health aspects – the post shall not be abolished. The post would be offered to

[28] As per UDD GR dated August 11, 2006.

his/her nearest family members as a hereditary right. The GoM will form another committee to decide on the pay scales of sanitary workers.

2.4.6 Department of Housing and the MHADA

The MHADA has been established by the Maharashtra Housing and Area Development Act, 1976. It came into existence on December 5, 1977. At present, the MHADA coordinates and controls the activities of seven regional housing boards, set up for each revenue division in the state (that is, Mumbai, Konkan, Pune, Nashik, Nagpur, Amravati and Aurangabad) and two special purpose boards (that is, Mumbai Building Repairs and Reconstruction Board and Maharashtra Slum Improvement Board). The main role of the MHADA is to plan, develop and make available low cost and affordable housing to the poor and to also improve slums, including sanitary arrangements.

The MHADA currently undertakes two different types of activities:[29]

- Construction of low-cost and affordable housing for various segments, mainly EWS families and LIG/MIG families. Till end-March 2009, the MHADA had constructed about 422,824 houses out of which about 303,794 (72 per cent) are for the EWS and LIG sections. The remaining 28 per cent are for MIG, HIG and other category families.
- Planning and implementation of various types of slum improvement projects with funding from the GoM and GoI. As of end-March 2008, the MHADA had implemented projects benefiting about 14.1 mn slum families across Maharashtra through various initiatives, including provision of 152,887 community toilets in various slum areas across the state.

2.4.7 Mumbai Metropolitan Regional Development Agency (MMRDA)

The MMRDA was established through the MMRDA Act, 1974, on January 26, 1975, for planning and coordination of development activities within Mumbai and surrounding urban areas. The MMRDA covers about eight Municipal Corporations, 13 Municipal Councils and 982 villages. About 18 mn people lived in the MMRDA area in 2001 (out of which 12 mn live in Greater Mumbai Municipal Corporation).

As a part of the Nirmal MMR Abhiyan (Clean MMMR Campaign), the MMRDA decided to provide about 1,289 community toilets with 25,569 seats, in 2007. Out of

[29] As provided in the website of the MHADA.

this 1,264 toilet complexes with 25,157 seats have been completed and commissioned, as of date.[30]

2.4.8 Town Planning and Valuation Department (TPVD)

The TPVD was established in Maharashtra in 1914. Its headquarters were shifted from Mumbai to Pune in 1915, where they still are. The TPVD works under the administrative control of the UDD and Public Health Department. Along with the headquarters in Pune, the department has offices in Mumbai, Kolhapur, Kalyan, Nagpur, Amravati and Aurangabad. The functions of the department are grouped under three heads: (a) town planning; (b) valuation; and (c) other miscellaneous duties.

As per the Maharashtra Regional and Town Planning Act, 1966, local governments have been recognised as the planning authorities and are vested with the responsibility of preparing town planning/development schemes. Hence, the TPVD acts as a specialist advisor to ULBs and the GoM. As most ULBs do not have the required planning capacity to develop town plans, they seek the services of TPVD to prepare development schemes as per provisions in the Act.

2.4.9 Maharashtra Water Resources Regulatory Authority (MWRRA)

The MWRRA was established in 2005 through the MWRRA Act passed in March 2005. The main objectives of the MWRRA are:[31]

- To determine, regulate and enforce the distribution of entitlements for the various categories of use and the distribution of entitlements, within each category of use.
- To establish a water tariff system for levying water charges on various categories of water users to establish stable and self sustainable management of service delivery to such users.
- To review and clear water resources projects, to ensure that a project proposal is in conformity with the Integrated State Water Plan (ISWP).

As per the MWRRA Act, the MWWRA is also required to support and aid the enhancement and preservation of water quality and promote sound water conservation and management practices. The MPCB is the nodal agency for water quality issues, and MWRRA coordinates with it on those aspects.

[30] As per information provided on the MMRDA website- www.mmrdamumbai.org
[31] As per details provided on the MWRRA website. See: www.mwrra.org.

2.4.10 Summary of Institutional Framework

- A host of institutions are involved in management of sanitation and sullage activities with varying roles. While most state level institutions are responsible for policy setting, oversight and monitoring, ULBs are responsible for actual implementation.
- The state Municipal Acts place most of the responsibilities of management of the full chain of sanitation and sullage with ULBs. However, provision and management of treatment facilities are not obligatory for the ULB. This needs to be corrected through appropriate amendments to the Municipal Acts.
- ULBs have the dual role of service provision for public services (construction of drains, sewerage systems, community/public latrines, maintenance of treatment systems, etc.) and also regulation of activities of households (construction of household latrines, service connections, etc.). There is no institution that is clearly charged with regulation of the service provision of ULBs. One of the state-level institutions, that is, the UDD, WSSD and/or MPCB, could be charged with this responsibility. It is advisable to have one institution clearly mandated with the task of oversight of all the sanitation and sullage management activities carried out by ULBs and/or other organisations. The recently initiated Service Level Benchmarking (SLB) exercise would be a good tool for this oversight function.
- Three key departments within ULBs – that is, Town Planning, Public Works and Sanitation departments – are vested with the powers to implement various provisions of the Municipal Acts and building by-laws. The state has recently decided to create a Municipal cadre of officers and approved technical posts of town planners and sanitary engineers. Many of these positions are yet to be filled up by higher tiers of institutions, that is, Director DMA, Regional Director of the regional DMA offices and District Collectors. Lack of technical staff hampers effective implementation of their mandated duties. **Efforts should be made to speed up the hiring process and to also hand over the hiring responsibility to ULBs, over a period of time**.
- Sanitary workers (safai karamcharis) form a vast majority of municipal staff and these positions are governed by Lad Committee recommendations. They hail from backward sections of society and are given jobs related to cleaning streets, cleaning drains, community/public toilets, handling solid waste, etc. In the absence of associated machinery and equipment, such jobs, sometimes, are equivalent to 'manual scavenging' and also perpetuate the social backwardness of these communities. While one understands the logic of the Lad Committee in

protecting the posts of sanitary workers, **efforts should be made to enhance their skill sets and provide them a higher order responsibilities and with higher pay. This way, they will be able to overcome social stigma and economic weakness**.

3 WHAT IS THE GROUND REALITY? CASE STUDY OF TWO CITIES: WARDHA AND MIRA-BHAYANDAR

3.1 ABOUT THE CASE STUDY CITES

In this Chapter, an attempt is made to understand the effectiveness of implementing the policies and regulations as well as management of the full chain of sanitation and sullage management in the field. Rapid assessments have been undertaken in two cities, Wardha (a non-networked city) and Mira-Bhayandar (a city with sewer networks). While the Mira-Bhayandar Municipal Corporation (MBMC) has prepared a CSP, the Wardha Municipal Council (WMC) is yet to prepare such a plan, at the time of the visits. Information provided by the officers is used to analyse the situation in the cities and issues affecting their performance. A brief snapshot of the cities is given in Table 8. In addition, desk reviews have been conducted in analysing a few CSPs prepared by various cities and/or consultant organisations also.

Table 8: Basic information about Wardha and Mira-Bhayandar cities[32]

Details	Wardha	Mira–Bhayandar
Type of ULB	Municipal Council	Municipal Corporation
Population	106,439	814,655
Households	23,532	174,243
No of wards	39	79
No of recognised slums	12	35[33]
No of non-recognised slums	04	No data
Slum population (% of total population)	26,962 (25%)	35,815 (4.3%)
Slum households	6,025	12,832
Total properties	25,497	284,087
• Residential	18,801	235,131
• Commercial	6,319	
• Institutional	193	
• Others	184	48,956
Household latrines (% of total households)	19,951 (85%)	149,554 (86%)
Water supply connections (% of total households)	19,987 (85%)	157,928 (90%)
Households connected to	1,503 (6%)	73,792 (42%)

[32] All data related to population, households, water supply, latrine coverage, etc, is from Census 2011 survey. The rest of the information on slums, properties, community toilets, etc, has been provided by ULBs.

[33] This is based on surveys done in 2002 and is not upgraded. Surveys under Rajiv Awas Yojana programme for poor families are going on in the MBMC and the list of slums will be revised based on the survey results.

Details	Wardha	Mira–Bhayandar
sewerage systems (%)[34]		
Community sanitation complexes /seats (city data)	35 units/492 seats	196 units/3,391seats
Households depending on community/public latrines (Census 2011)	2,179 (9.2%)	18,341(10.5%)
No of households/community latrine seats	4.4	5.4
Households practicing open defection (% of total households)	956 (4%)	4,148 (2.3%)
STP capacity/utilised (MLD)	None	2 STPs – 4.5 MLD

The following is a summary of the analysis of the ground realities captured in the same sub-cycles of sanitation management chain, that is: (a) user interface; (b) collection; (c) conveyance; (d) treatment; and (e) disposal and reuse.

3.2 ANALYSIS OF SANITATION MANAGEMENT

3.2.1 User Interface and Collection Systems

The focus of this analysis is on household latrines, community latrines and in institutions, mainly schools. The study did not cover sanitation coverage and management within other institutions and commercial properties.

Household latrines: As given in Table 8, about 85 per cent of households in the WMC and about 86 per cent in the MBMC have access to improved latrines in houses. In Wardha city, most of them are connected to individual septic tanks. In the MBMC, the residences are flats in large buildings and have large septic tanks for each building. According to data from the CSP of the MBMC, there are about 4,579 large septic tanks, each tank connecting to about 45 latrines, on an average.[35] However, Census data indicates that about 42 per cent households are connected to sewerage system in the MBMC.

[34] While the Census data indicates that about 6 per cent households are connected to a piped sewer network in the WMC, there is no such network in the city. Similarly, while Census 2011 data reveals that about 42 per cent households in the MBMC are connected to a sewerage system, city officers informed that about 10–15 per cent properties are connected to a sewerage system. Due to the limitations of this study, it is difficult to correlate both the numbers.

[35] Draft City Sanitation Plan, Mira-Bhayandar Municipal Corporation, March 2012, prepared by the All India Institute for Local Self-Government (AIILSG).

Latrines and septic tanks are part of building designs which are approved by municipal authorities, as per the city development rules and regulations detailed in the previous Section. The Town Planning officer and city engineer are responsible for approving the building designs as per process laid out in the DCRs.

When a property owner/builder applies to the ULB for approval to construct a building, the city engineer in the Public Works department and the Town Planning officer undertake a technical scrutiny of the designs and verify them for technical compliance. Based on the technical approval, the Municipal Commissioner (for Corporations) or Chief Officer (for Councils) informs the owners to make any necessary changes in the designs, if needed, or approves them if all aspects are in order. This is called a Construction Commencement Certificate (CCC) or No Objection Certificate (NOC) for beginning construction. The owner then constructs the buildings as per the approvals and has to comply with all regulations and specifications approved. Once the building is complete, the owner has to get the approval of the ULB for occupancy. The city engineers inspect the completed building to check that the building has been built as per approvals provided. If the building has been built in compliance with the plans approved, the ULB provides an 'Occupancy Certificate' indicating its suitability for habitation.

As per discussions with engineers and town planning officers, there could be several rounds of revisions in the plans submitted by builders before they are given a CCC. They also informed that several times builders hand over the buildings to the residents without informing the ULB, even if it has not been built as per approved plans.[36] There are no mechanisms within ULBs to track this kind of avoidance of compliance. For example, in Wardha city, about 524 proposals have been received by the ULB and 285 have been cleared for construction during the last two years. However, no one came back for the Occupancy Certificate in the last few years. The officers also observed that people come to seek approvals (NOC/CCC) before starting construction as such approvals are mandatory for seeking loans from formal banks. Data on proposals received by the WMC and approved in the last two years is presented in Table 9.

[36] This is happening on a large scale in Wardha city. No such information is available for Mira-Bhayandar city.

Table 9: Building construction proposals and approvals in Wardha[37]

Year	Building applications received	Approved	Pending (cumulative)	Occupancy Certificate issued
2010–11	302	165	165	Nil
2011–12	222	170	112	Nil

In such circumstances, WMC officers have no idea if the latrines, drains, fittings and septic tanks have been built as per specifications and IS codes. Secondly, there is no systemic data, even of the septic tanks built as per regulations. This is a big lacuna in the sanitation management chain. While travelling in Wardha city, the consultant observed that a large number of septic tanks are not connected to the mandated soak pits for filtering wastewater coming out of the septic tanks. Instead, they are directly draining the wastewater into open drains. Discussions with WMC engineers and staff point to a high possibility of inappropriate septic tank constructions. No such records were shared by the MBMC and hence it is difficult to present the real scenario in this city.

There is a history to why people tend not to seek Occupancy Certificates and undertake construction in violation of development rules. Historically, across India, there are instances where state governments intervened to 'regularise' such unauthorised constructions, either due to political compulsions and/or public pressure. The GoM passed a special ordinance in 2001, the Maharashtra Gunthewari Developments (Regularisation, Upgradation and Control) Act, to regularise such buildings. This Act applied to all the cities in the state and all unauthorised developments existing on January 1, 2001. **This is a super regulation that nullifies all regulations discussed in the previous Section.** Owners of plots and buildings wanting to regularise their property had to apply to the ULB with prescribed fees. Another example is the agitation undertaken by all political parties in Pimpri Chinchwad city demanding regularisation of property developments in August 2012. This kind of 'one time amnesty' scheme is common across the country in various sectors. Thus, people tend to neglect existing development regulations in the hope that they could be regularised at a future date.

Community sanitation complexes: There are 35 community sanitary complexes in Wardha with 492 latrine seats. As per Census data, about 2,179 households access these latrines – this implies a ratio of 4.4 households or 20 people per seat. Most of them are more than 20 years old and are in various stages of dilapidation (broken/no

[37] Data provided by WMC officers.

doors, broken flooring, broken pipes, manhole covers on septic tanks missing, no/limited water supply, etc.).[38] The septic tanks attached to the community toilets are full and overflowing. All these are maintained by the WMC and there is no system of users paying a fee for the upkeep of these units. While the consultant could not inspect the actual designs, it appears that the septic tanks have not been designed and/or built as per standards. The outflow pipes from toilets are connected at five or six different places to the septic tank and indicate bad septic tanks construction/operations. There are about 196 community sanitary complexes, with 3,391 seats, in Mira-Bhayandar city. Census data indicates that about 18,341 households access these latrines, implying a ratio of 5.4 households or 24 people per seat. Most of them are well maintained. Users pay a monthly family fee ranging from Rs 30 to Rs 60.

The available data indicates that there are about 20 users per latrine seat in public/community toilets in the WMC and about 24 people in the MBMC. However, these ratios could vary based on: (a) location of the latrines and users; (b) the actual seats in working order; (c) availability of other facilities such as water supply or lighting in the latrines; and (d) upkeep of the latrines. In some of the complexes, in both the cities, the doors are non-functional and tiles are broken, making them undignified to use. In some cases water is not available in the complex and people have to carry water for cleaning and flushing, again making them inconvenient for use. In both the cities, in some cases, septic tanks were either overflowing or broken, increasing health risk to users and nearby residents. This apathy towards maintenance of community latrines, coupled with regulations that do not encourage construction of individual latrines, force slum resident to resort to open defecation and face environmental health risks.

[38] There is no scientific count of functional units and/or seats. The WMC claims that all the seats are functional.

Box 6: Saga of community toilets in slums

A community sanitation complex is a building with a number of latrines and bathrooms for specific use by a given community. These are different than the public sanitation complexes that are available for the use of a floating population. Public sanitation complexes can be found in places such as railway stations, markets, etc. People in general are used to paying a small token user fee for using public latrines.

The MoUD, GoI, recommends one latrine seat for 50 users for community sanitation blocks in residential areas where the facility is generally not used at night (Guidelines on Community Toilets, 1995). The Environmental Improvement in Urban Slums, 5th Five-Year Plan, GoI, recommends one seat for 20 to 50 users. In Maharashtra, there are no specific state notified norms for the construction of community latrines – the existing practice is to design a 'latrine seat' for 40–50 users. Separate cubicles for men and women and, in some cases, also child-friendly latrines, are built. However, most of them are not very conducive for regular and timely use due to various factors such as: inadequate numbers for the population in an area, lack of adequate water supply, lack of adequate lighting facilities, lack of proper upkeep and maintenance, wrong construction etc. (For example: of the 74 community latrines in slums of Nashik city, two are well maintained, the physical condition of 51 units is average and the condition of the remaining 21 units is very poor. Lighting is available only in 53 per cent of the units. In 26 units people have to carry water for flushing. The average ratio of working latrines is one seat for 65 persons (based on information presented in draft CSP for Nashik city). Women face more challenges than men due to the above factors and lack of open spaces in the vicinity for easing themselves. Such a situation forces slum dwellers to continue to practice open defecation, which is a big health risk not only for them but for the entire city. Community sanitation complexes are usually maintained by ULBs either directly or through contracted agencies and civil society organisations.

A few projects, such as the slum sanitation projects in Pune implemented by the Pune Municipal Corporation in partnership with civil society organisations such as the SPARC and the World Bank–financed Mumbai slum sanitation project, have demonstrated innovative models where slum residents play an active role in decision making, construction of toilet blocks and adopting a pay-and-use system to ensure regular upkeep. Community-based organisations take over the responsibility of the facility's maintenance and charge a user fee for the community members, usually in the form of a monthly charge per family, as seen in the MBMC case. However, there is no evidence that this model has scaled up beyond a few areas.

Institutional latrines: There is no information on toilets in institutions and commercial places. The WMC runs about 12 schools with 900 students. It is not clear how many latrines are available and what their condition is. The consultant visited two such schools. In one school, while toilets and urinals are available, there is no water connection and hence they are not being used. Children go out in the open for attending nature's calls. In the second school, only one latrine is available for 230 students. The Model building By-laws of Maharashtra recommend that there should

be one latrine for every 80 boys and one for every 50 girls in schools. The condition of school sanitation is better in the MBMC, as shown in Table 10.[39]

Table 10: School sanitation in Mira-Bhayandar city

Type of schools	No of schools	Students			Latrines/urinals	
		Boys	Girls	Total	Boys	Girls
Municipal schools	34	4,911	5,385	10,296	31/11	22/10
Government aided private schools	20	4,979	5,555	10,534	29/41	29/41
Unaided private schools	158	32,935	29,049	62,028	264/338	268/226
Colleges	22	47,126	43,747	90,873	377/501	373/370

The ratio of students per latrine across all types of schools varies from 108 students/latrine for girls in unaided private schools to as high as 244 students/latrine for girls in Municipal schools.

The Model Building By-laws of Maharashtra recommend that there should be one latrine for every 80 boys and one for every 50 girls in schools. The ratio of students to latrines in both the cities, thus, is far below the standards prescribed in building by-laws.

3.2.2 Conveyance

There is no sewerage system[40] in the WMC and all the desludging and transportation is through 'vacuum suction tanks' attached to a tractor. The WMC has two vacuum suction tanks with capacities of 3,000 litres and 2,000 litres – out of which only the former is operational; the latter is defunct. There are no private operators in the WMC area providing desludging services.

The desludging operations are managed by WMC staff in the Health Department (two cleaning staff and one driver). The cleaning service is provided on demand at a charge of Rs 600 per trip. The WMC cleaned about 200 septic tanks (Rs 1.25 lakh income) in 2010–11 and 243 tanks (Rs 1.46 lakh income) in 2011–12. If we assume that a septic tank has to be cleaned at least once in 2 years[41] then there should be about 7930 tanks (half of 15855 toilets in WMC) desludged every year. Thus, the current levels of desludging of septic tanks are about 3 per cent of calculated load. The

[39] Data from draft CSP of the MBMC prepared by the All India Institute for Local Self-Government, Mumbai.

[40] Plans have been prepared by the city for a sewerage network of a capacity of 13.5 MLD for funding under the UIDSSMT in 2008, at an estimated cost of Rs 480 mn. This plan is not yet approved and is under revision.

[41] As recommended by the CPHEEO, *Manual on Sewerage and Sewerage Treatment*, Second Edition, 1993.

officers in WMC are not aware of the recommendations and need for desludging septic tanks regularly.

In MBMC about 10–15 per cent properties or 42 per cent of households are connected to sewerage system and the remaining properties are connected to septic tanks. As explained earlier, these are big size septic tanks each connected to about 45 latrines on an average. MBMC has only one vacuum suction tank, with 10,000 litres capacity, to desludge these septic tanks and is operated by the municipal corporation (health department). About 225 septic tanks were cleaned in 2010–11 and about 445 units in 2011–12. As per cleaning cycles prescribed by the CPEEHO and IS codes, at least half of the existing septic tanks should be cleaned every year. Thus, it can be inferred that the MBMC desludged only about 20 per cent of the calculated load. The officers of the MBMC informed that the septage from cleaned tanks is disposed in the STPs and treated. There are no private septic tank desludging operators in both the cities.

Box 7: Desludging septic tanks

Suction tanks are the most common means to desludge septic tanks and to carry the sludge to a treatment site in a safe manner. However, there are no guidelines on how many tankers are required for a given size of population and how to manage them. The role of the ULB is not clearly articulated with respect to making available septic tank cleaning services to property owners/ users. There is a need to make it compulsory for ULBs to make such emptying services available to property owners, either by themselves or through licensed private operators. This can be done by making the necessary amendments to Municipal Acts.

At present, the suction tanks are sent to properties based on requests from owners. Sometimes, the ULB also cleans some septic tanks if complaints are received regarding foul smells, etc. There is a no monitoring system regarding cleaning of septic tanks in cities. There is a need to develop a good MIS system that tracks the cleaning of septic tanks. This is a first step in putting in place a septage management plan. Such a need for a strong MIS system is also recognised in the Advisory note on Septage Management in Urban India, MoUD, January 2013. The note advises that efforts should be made to record the following information: (a) the name and address of the property owner or occupier; (b) septage characteristics (residential or commercial); (c) the volume of septage pumped; and (d) any notes regarding tank deficiencies, missing pipes or fittings, improper manholes or access ports, any other cracks or damage observed. A similar system is to be developed for desludging operators for tracking their operations.

3.2.3 Treatment and Disposal

The WMC has a site of 35 acres situated about four kilometres from the city limits for dumping and treating solid waste and night soil. Some facilities – such as a place for segregation of solid waste, decomposting pits, etc. – have been built for solid waste management. In the same site, pits have been dug to decompose septage carried by

the vacuum tankers. However, over the last three-four years this facility has become dilapidated and is now a dump yard. Sometimes the vacuum cleaning tank cannot reach the site (due to the bad approach road) and, as a result, septage from the vacuum tanks is dumped in unspecified open spaces around the city. There are no records of emptying of septage from vacuum tanks. The ULB officers informed that there are no specific arrangements to treat and/or recycle the sullage, which flows down to open lands and local streams.

The MBMC has two sewerage treatment plants with a capacity of 4.5 MLD. Both the plants are operational and are managed by private operators. These plants undertake primary treatment and the remaining waste is emptied into nearby creeks. The drains carrying sullage also empty into creeks. The officers of the MBMC informed that the septage from cleaned tanks is disposed of, and treated, in the STP plants.

In both the cities the officers informed that the effluent coming out of septic tanks spills directly into drains, in a majority of cases, as the property owners do not prepare leach pits to absorb effluent from septic tanks. This kind of dismal performance of wastewater collection and treatment is common in Maharashtra as also in the rest of the country.

As per the benchmarking data collected and analysed by the PAS Project, the situation with respect to wastewater collection, treatment and disposal in urban Maharashtra is given below:[42]

- Only 31 ULBs have an underground sewerage network, with varying degrees of household coverage and connections.
- The average household connections to the sewerage network are only about 40 per cent. Nashik city reported the highest connections (90 per cent) and only three cities have more than 75 per cent connections.
- Only about 15 ULBs have secondary STPs, and the average state wastewater treatment capacity is only 35 per cent. This implies that even in the best conditions, only about 35 per cent sewage is being treated and the remaining 65 per cent wastewater is disposed of into nature without any treatment.

[42] Urban water and Sanitation in Maharashtra, All India Institute for Local Self Government, 2011

"Only 13 per cent of Thane city was sewered prior to the launch of JNNURM and…current sewerage system is designed to meet the demand of 4.85 lakh population…covering only 23 per cent of current population……rest of TMC area is dependent upon septic tanks and low-cost toilets…**untreated effluents from septic tanks and soak pits is finding its way to the natural drains**…...only some part of Thane is having sewerage facilities and the sewerage generated in other areas is finding its way to the Nalas and degrading the environment."

Source: Extract from Appraisal Note, Central Sanction and Monitoring Committee, Ministry of Urban Development, Government of India, 2008.

3.3 INSTITUTIONAL ANALYSIS

Most of the action related to sanitation and sullage management happens at the city level and is managed by ULBs. The ULBs are governed by a combination of an elected body and administration support structures. An elected council, headed by a Mayor and six committees are responsible for decision making and overseeing the ULB's functioning. A Commissioner (for Corporations) or Chief Officer (for Council) heads the executive wing of the ULB, which has 10–12 departments, such as Public Works, Water Supply and Sewerage, Town Planning, Public Health, Education, Fire services, Tax department, General Administration, Forests, Transport, SJSY (Social Welfare), etc.

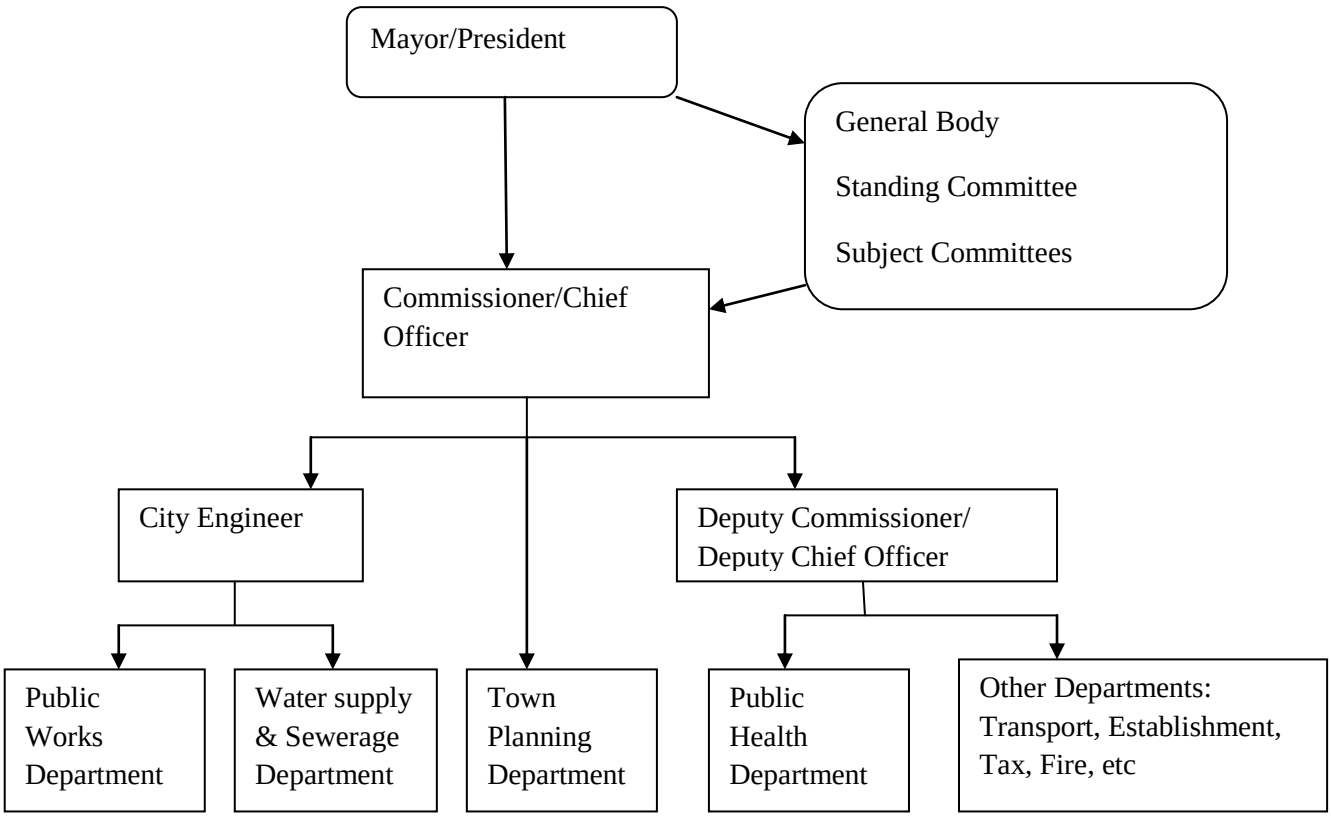
There are six committees of the elected members to enable decision making: (a) Public Works Committee; (b) Education Committee; (c) Sanitation, Medical and Public Health Committee; (d) Water Supply and Drainage Committee; (e) Planning and Development Committee; and (f) Standing Committee. These committees are responsible for planning and approving development schemes, up to a prescribed financial limit, which are then ratified by the Standing Committee and/or General Body. Table 11 captures the limits for administrative and technical approvals within Municipal Councils.

Table 11: Technical and administrative approvals within Municipal Councils

Committee/positions	Administration approval limits (Rs)		Technical approvals
	Municipal Councils	Municipal Corporations	
Commissioner/ Chief Officer	7,500	50,000	Corporations are eligible to provide technical approvals to their proposals without any limits. The MJP is the nodal agency for technical approvals, for projects above Rs 75,000 for Councils, except for projects that are executed fully with the funds of Councils.
Deputy Commissioner/Head of Departments	7,500	25,000	
Subject Committee	100,000	500,000	
Standing Committee	500,000	1,000,000	
General Body	Above 500,000	Above 1,000,000	

The overall structure of ULBs is presented in Figure 1.

Figure 1: Governance structure of ULBs in Maharashtra



The four departments within the ULBs that have been entrusted with key responsibilities by the Acts and government orders are:

- Town Planning department is responsible for activities related to user interface and collection by way of approving building plans and issuing Occupancy Certificates either independently or along with the Public Works department.
- Public Health department is responsible for collection, conveyance and treatment aspects. This includes maintenance of community sanitary complexes, cleaning of drains, desludging of septic tanks (either by own suction tanks or licensing private operators) and treatment of septage in non-networked cities.
- Water Supply department is also responsible for sewerage conveyance and treatment in cities that have partial or full sewer networks.
- Public Works department is responsible for planning and executing projects related to construction of public latrines, community sanitary complexes, drains and other public facilities.

Table 12 presents an analysis of the staffing in both the cities.

Table 12: Staffing in WMC and MBMC

Details	WMC			MBMC		
	Approved positions (nos)	Filled positions (nos)	% of filled posts	Approved positions (nos)	Filled positions (nos)	% of filled posts
Total staff	**203**	**368**	**181**	**2,382**	**1,574**	**66**
Grade-1	1	1	100	72	26	36
Grade-2	8	0	0	49	31	63
Grade-3	84	36	43	682	465	68
Grade-4	143	332	232	1,579	1,052	66
Sanitary workers[43]	111	249	224	1,180	807	68

The MBMC is facing a big shortage of staff overall, with only about 66 per cent of the approved staff currently in position; shortage of staff in the four departments dealing with sanitation is only nominal. While there is overall excess staff in the WMC, there is a huge shortage of technical staff, with only five technical officers available out of the sanctioned 18 positions. Details of technical staff in WMC are given in Table 13.

[43] Sanitary workers are part of Grade-4 staff, but shown separately to give a picture of their numbers.

Table 13: Availability of technical staff in WMC

Department	Approved staff	Posted staff	Comments
Town Planning	5	0	2 town planners and 3 assistant town planners approved. They are vital for city planning and also approving building plans. In their absence, a town planner from the District Town Planning office is approving the building plans.
Public Works	4	2	City engineer and assistant city engineer are posted. This department also approves building plans and keeps all records.
Water Supply and Sewerage	2	0	Water Supply department is currently being managed by clerical staff. Out of the 2 approved technical positions for this unit, no one is currently posted.
Sanitation (part of Health department)	5	1	Only one out of 5 sanitary inspectors is posted.
Electrical department	2	2	
Total	*18*	*5*	

Sanitary workers account for a majority of total staff strength in ULBs in the state. As per rules of staffing decided by the UDD, the sanitary workforce should be one person per 1,000 residents in the city. Sanitary workers account for 54 per cent of sanctioned positions and 67 per cent of actual work force currently on the payrolls in the WMC. These figures stand at 50 per cent and 51 per cent, respectively, in the MBMC. Their role is cleaning roads, picking and transporting solid waste, cleaning drains, cleaning public and community sanitary complexes and support works in the treatment areas. While most of these functions could be outsourced to private service providers, the rules of the Lad Committee protect their employment. Officers in both the cities felt that this regulation is detrimental for both the workers and the work for the following reasons:

- The social stigma associated with unclean jobs being done by a selected social class/caste gets perpetuated. Efforts should be made to enhance the skills of these staff members and either promote them in the ULBs or make them marketable. The MBMC has taken a lead in this direction by reposting all the sanitary workers with other departments, some even in a promoted position. The MBMC outsourced all the cleaning jobs to private organisations.

- Due to psychological issues, unionism and political support, it is difficult to get work out of these people.

3.4 SUMMARY

While a good set of specifications and regulations exist for management of some of the key elements of sanitation and sullage management, the ground realities are different and are summarised below.

- In the cities studied, 70 to 90 per cent have access to household sanitation.
- Property developers plan for sanitary infrastructure as per rules and specifications but avoid building them as per standards, adversely affecting the standard of septic tank construction, mainly the size, outlets and effluent treatment mechanisms.
- The GoM, in the past, announced an amnesty scheme to regularise all unauthorised buildings across the state. Such amnesty nullifies all other development regulations. Given the political economy situation, people expect such amnesty windows in the future also and seem not to care for building regulations.
- In a majority of the cases, effluent from septic tanks flows directly into drains and gets discharged into creeks, open fields and/or water bodies along with untreated sullage.
- Both the cities offer septic tank desludging services, but do not have a plan, monitoring mechanism and required number of vacuum suction tankers. There are no private operators providing this service in both the cities. The septage from septic tanks in disposed of in open fields or creeks. Only a small part of it is treated to primary levels.
- There is almost no treatment of sullage and this usually gets disposed of in open fields and natural drainages. The sullage also contains effluent from septic tanks.
- While required capacity is an issue in Municipal Councils (such as Wardha) there is no proper monitoring and records of septic tank cleaning operations. ULBs do not have any guidelines on the quantity and quality of equipment required and monitoring systems required for managing desludging and emptying operations.
- About 31 ULBs have underground sewerage systems and are being expanded to improve reach and effectiveness with support from the JNNURM programme. Another 15 cities are in the process of developing such systems with support from the UIDSSMT programme. However, the gestation period for such projects

to be completed is long (from five to eight years from the start) and there is no thinking on treatment options in the interim.

- Slum sanitation is a highly neglected issue. Design and management of community sanitary complexes is not well handled. The practice of designing one latrine seat for 40–50 users is highly inhumane and needs to be revised. Successful models for management of community sanitary complexes should be promoted as rule and not as an option.
- Last but not least, the NIMBY (Not In My Backyard) syndrome is clearly at play in this sector. While owners seem to be happy to invest in latrines in their homes, they tend not to be bothered about letting effluents out into public spaces. There is a need to inform and educate citizens about the ill effects of this wrong notion and practice, and motivate them to participate in managing sanitation and sullage aspects. This task is highly impossible without active citizen engagement and participation.

4 WHAT CAN MAHARASHTRA LEARN FROM OTHERS? INTERNATIONAL GOOD PRACTICES IN SEPTAGE MANAGEMENT

4.1 INTERNATIONAL CASES

Most developing countries experience problems similar to those prevalent in Maharashtra. While access to and use of latrines is high in urban areas of other developing countries, sewerage systems are low in number and only a small per cent of household latrines are connected to sewerage systems.

To address the issues of treating and disposal of faecal matter, a few countries started developing septage management policies and practices. Septage management refers to comprehensive programmes for managing septic tanks and the procedures for desludging, transporting, treating, and disposing of septic tank contents. An attempt is made is in this Chapter to capture the experiences of the Philippines and Malaysia, and draw lessons that are applicable to Maharashtra. It may be noted that the cases are developed based on secondary literature only and based on information given in the following sources:

- A Rapid Assessment of Septage Management in Asia: Policies and Practices in India, Indonesia, Philippines, Sri Lanka, Thailand and Vietnam.
- Department of Health, Philippines. 2008. Operations Manual on the Rules and Regulations Governing Domestic Sludge and Septage.
- Note on National Sewerage and Septage Management Programme (NSSMP), Philippines.
- Japan Sanitation Consortium. November 2011. Country Sanitation Assessment in Malaysia.
- Indah Water Konsortium, Malaysia. Sustainability Report, 2011.

4.2 SEPTAGE MANAGEMENT IN THE PHILIPPINES

The total population of the Philippines is 92 mn; it is the 7th most populated country in Asia and 12th in the world. Of this, about 62 mn people (67 per cent) live in urban areas. Of the urban population, 79 per cent have access to improved sanitation facilities, 17 per cent use shared facilities, 1 per cent use unimproved facilities and 3 per cent defecate in the open.[44] It is estimated that more than 80 per cent of households in the Philippines use septic tanks as their only form of sewage

[44] WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation, Estimates for Use of Improved Sanitation in Philippines, March 2012.

treatment. Only 4 per cent of all citizens have a sewer connection that leads to a treatment facility. As there are only a few septage treatment facilities in the entire country, the Philippines treated very little of its domestic wastewater, till recently.

Administratively, the Philippines is divided into 17 regions, 80 provinces, 138 cities, 1,496 municipalities and 42,025 barangays. The administrative units are the provinces, municipalities and barangays, which are also called Local Government Units (LGUs). The responsibility for water supply and sanitation services is not very well defined and is with multiple agencies. The main models of service delivery are:

- **LGU:** Most households in the Philippines are served by their LGUs, either directly through a city or municipal engineering department or through community-based organisations (CBOs).
- **Water districts:** A water district is a utility that is legally and financially separate from the municipality. To form a water district, a local government needs a confirmation by the LWUA, from which the water district then receives technical assistance and financial support. The local government appoints the board members of the water districts.
- **Large private operators:** These are mainly the two private concessionaries operating in Metro Manila since 1997.

Overall, the UWSS sector is governed by the Department of Environment and Natural Resources (DENR), Government of Philippines. The DENR formulates policies and is regulated by the National Water Resource Board (NWRB), an independent sector regulator.

Recognising the gravity of the situation, the DENR designed and adopted the Clean Water Act (CWA) in 2004, which requires national agencies, LGUs and water districts to provide either septage management or sewerage services for all domestic wastewater dischargers. Since sewerage services are very limited and expensive to construct and operate, septage management is a practical first step for most utilities or LGUs. Early adopting cities, such as Marikina and Dumaguete, have developed local ordinances requiring regular desludging and have constructed new septage treatment facilities.

The salient features of the Act are:

- Defining responsibility for ensuring that septic tanks are constructed in accordance with revised national plumbing codes, provide access and ports for inspections and desludging, and ensure that septic tanks are desludged before the solids exceed 50 per cent of the tank's volume.

- Mandating septic tank permits by LGUs for all new constructions, change of use substantial repairs are undertaken by local authorities. Rules for inspecting the sites during construction process by the local government officers specified.
- Local governments to prepare septage management plan with supporting ordinances to regularly desludge septic tanks in the covered area. These plans should be in accordance with the National Sewerage and Sanitation Management Programme (NSSMP). A comprehensive septage management programme includes the following aspects:
    - Septic tank design and construction – regulatory oversight for the design, installation, and use of septic tanks;
    - Septic tank inspection and desludging – requirements for periodic inspection and desludging of septic tanks;
    - Procedures for septic tank desludging and septage transportation – rules for transporting septage once it is removed from the tank;
    - Record keeping and reporting – tracking mechanisms, such as use of manifests and self-monitoring reports; and
    - Septage treatment and disposal – rules that prescribe septage treatment and disposal requirements.

The LGUs can undertake these services either by themselves or engage qualified service providers. The requirements of service providers and process of accrediting them are also defined.

Besides mandating LGUs and water districts to develop local septage management plans and action, the CWA also mandated the Department of Public Works and Highways (DPWH) to develop the NSSMP, which is a component of the Sustainable Sanitation Roadmap for the country. Accordingly, the DPWH developed a NSSMP to enhance the ability of local governments and water districts to build and operate wastewater treatment systems, which was approved by the Cabinet in August 2011. The NSSMP aims to achieve a target of helping about 60 LGUs by 2020. The estimated cost of implementing this target is Php 13.4 billion (US$ 335 mn). Each individual septage management project is estimated to cost between Php 4 mn (US$ 100,000) to Php 71 mn (US$ 1.7 mn) – the entire cost is planned to be raised through loans that can be paid back in five to 15 years through an affordable user fee. However, some discussions are going on in the country about evolving cost sharing between the national and local governments to reduce burden on citizens.

While the NSSMP has only recently been approved and large scale actions are yet to start, a few cities have taken the lead in developing their own action plans, local regulations and piloting septage management works. These are the cities of Marikina, Dumaguete and Metro Manila. Case studies of the initiatives undertaken by Marikina city and Metro Manila are presented in Boxes 8 and 9, respectively (reproduced from the report titled 'A Rapid Assessment of Septage Management in Asia: Policies and Practices in India, Indonesia, Philippines, Sri Lanka, Thailand and Vietnam', published by USAID, Eawag[45] and Water Links in 2010).

Box 8: Community participation and outreach: Septage management in Marikina city

To achieve its goal of desludging all septic tanks in the city by 2011, Marikina city is implementing the 'Oplan Todo Sipsip' programme with Manila Water Company, Inc (MWCI). Developed with support from the ECOAsia programme, the initiative mobilises local barangay leaders to educate communities about desludging septic tanks. As a result, Marikina city has increased the percentage of households using desludging services from 40 to 55 per cent. Cooperative actions include:

- Community meetings are held to explain the programme in advance of the desludging.
- A sound truck and fliers advertise desludging in the community the day before it is done.
- Local barangay staff members accompany the MWCI desludging crews to encourage homeowners to cooperate and open inaccessible septic tanks.
- The MWCI places stickers on houses that have been desludged, so a second visit can be made later to the homes without stickers.
- Promotion campaigns are conducted that include distributing informative calendars, art contests and handwashing events.

The project aims to desludge all 90,000 septic tanks in Marikina city on a rotating five-year cycle. At the time of writing, however, the MWCI had desludged only 5,400 septic tanks.

[45] Eawag is the Swiss Federal Institute of Aquatic Science and Technology.

Box 9: Metro Manila's concessionaires implement scheduled desludging

Metro Manila's two water utilities are leaders in septage management in the Philippines. In the city's East Zone, Manila Water Company, Inc (MWCI) provides water and sanitation services for 5.6 mn people. It has initiated septage management pilot projects to provide routine septic tank desludging services. Although the original MWCI concession planned to phase out the use of septic tanks in favour of centralised sewerage systems, this plan proved too difficult due to low customer willingness to pay for sewerage services and lack of available land for treatment facilities. Instead, the MWCI has shifted its emphasis towards septage management and smaller, localised treatment plants.

At present, the MWCI maintains a fleet of over 90 vacuum trucks. Since 2005, the MWCI has desludged more than 400,000 septic tanks and aims to desludge all tanks in its service area on a rotating, five-to-seven-year cycle. The MWCI has three dedicated septage treatment facilities with a total treatment capacity of over 1,540 cubic metres per day. In the West Zone, Maynilad Water Services, Inc (MWSI) provides water and sanitation services for 6.2 mn people. It has desludged over 160,000 septic tanks and operates a dedicated STP with a capacity of 450 cubic metres per day.

To pay for desludging services, these utilities add an 'environmental fee' of 10 per cent to the water bill – compared with 50 percent in areas with sewerage connections. In the future, the utilities plan to charge all households a 'sewerage services' fee of 20 per cent of the water bill, regardless of whether they are connected to the sewer or a septic tank. Though a good start, the current total treatment volume provides only 5 per cent of the capacity required if all household tanks in Metro Manila were to be regularly desludged.

4.3 SEPTAGE MANAGEMENT IN MALAYSIA

Malaysia has a total population of 28 mn, out of which 18 mn (65 per cent) dwell in urban areas. Of the urban residents, 98 per cent have access to improved water supply and 95 per cent have access to improved sanitation.

Malaysia increased the number of households with sewerage connections from 5 per cent in 1993 to 73 per cent in 2009. For households connected to septic tanks, 50 per cent now participate in scheduled desludging in compliance with federal law. Malaysia's experience provides many important lessons in policy formation, institutional and implementation capacity and funding for other countries interested in implementing successful septage management programmes.

Prior to 1993, all the 144 local governments were responsible for both water and sewerage services, but typically lacked the capacity to provide adequate sewerage services, which were more expensive and complex than water supply. In 1990, 40 per cent of the population were connected to a septic tank while only 5 per cent were connected to sewer system.

Guided by former Prime Minister Mahathir's Vision 2020 plan, which aimed to transform Malaysia into a modern and developed nation, the federal government

passed the Sewerage Services Act (SSA) of 1993 to nationalise sewerage assets. The salient features of the SSA are:

- Owners or occupiers of properties with septic tanks are responsible for its operation and maintenance.
- A new federal Sewerage Service Department (SSD) was created under the Ministry of Energy, Water and Communications. The purpose of the SSD is to develop infrastructure projects, regulating IWK and other private service providers and hold the title to the nationalised sewerage infrastructure.
- All local governments were requested to transfer the sewerage assets and staff to the new SSA; in return, a portion of their debts are written off. About 86 local governments have done this.
- Operations, maintenance and development responsibilities were transferred to a private concessionaire, Indah Water Konsortium (IWK). In 2000 the federal government nationalised IWK and turned it into a public-owned company under the Finance Ministry. This was done to increase government control and subsidies in the sector. The IWK is a service provider and not an asset holder.

To standardise service rules and regulations for both water services and sewerage services (managed through the SSA), the federal government enacted the Water Service Industry Act (WSIA) on January 1, 2008, which replaced the SSA. Under this Act the water services assets were also centralised through a new body called National Water Services Commission (SPAN), set up in 2008. The SSD will be eventually merged into the sewerage regulatory department of SPAN.

The IWK serves all of Malaysia, except for the states of Kelantan, Sabah and Sarawak, and two Municipal areas in Johor. In its concession in 1993, the IWK agreed to expand sewerage coverage to 85 per cent in major cities, 30 per cent in smaller cities, and provide septage management. To achieve these targets, the IWK first undertook basin-wise studies to understand the current situation and demand over a 30-year horizon and developed a three-stage strategy as given below:

- Located and rehabilitated old sewerage treatment plants and developed their septage collection capacity.
- Used available oxidation ponds, as an interim arrangement for septage disposal, while developing new sites.
- Since 2000, built centralised and mechanised septage and sewage treatment plants for more densely populated areas.

In addition, the IWK also undertook measures to enhance public understanding on the need for desludging and need to pay a user fee for this service. The IWK developed a database of properties that had septic tanks and undertook scheduled desludging. The property owners are contacted beforehand and a time for desludging is fixed. By these efforts, yearly desludging has increased from 8,268 tanks in1994 to about 143,824 tanks in 2001.

From 1993 to 2008, the IWK built sewers, developed desludging services, constructed septage and wastewater treatment facilities across the country and, together with the regulatory agency, established clear policy guidelines and standard operating procedures for developers and wastewater operators. In 2012, the IWK operates and maintains about 5,834 public sewerage treatment plants and a 15,645-kilometre network of sewerage pipelines.

4.4 SUMMARY OF INTERNATIONAL CASES

The population of the Philippines is comparable to that of Maharashtra, and that of Malaysia is comparable to the population of the Mumbai Metropolitan Region. Both cases, hence, are relevant for Maharashtra. The situation of septage management, in particular, and sewerage management in Maharashtra compares well with the starting situations in both the countries.

While the Philippines adopted mechanisms to strengthen the current set of institutions through appropriate legislations and support, Malaysia followed the route of centralising infrastructure creation and service delivery through a set of new institutions. It is interesting to note that both the approaches have been developed and implemented in a decentralised environment, with varying success levels.

The key lessons for Maharashtra and India are:

- There is a clear and immediate need for realising that septage management plays a crucial role in keeping cities clean and improving the overall health of citizens. In both the countries reforms were hinged on this realisation.
- Need for appropriate legislation that enables enforcement of responsibilities of various institutions and citizens in septage management process. The Clean Water Act in Philippines and the Sewerage Services Act in Malaysia are good examples.
- Educating community members is an important element of the septage management process, as seen from case studies of Marikina city and the IWK's efforts.

- Financing of infrastructure and services is an important element in septage management. In Malaysia the federal government invested in building infrastructure and subsidising service delivery. In the Philippines, while the current plan is that LGUs will finance this through user fees, there is thinking on cost sharing by the national government.
- The processes of developing a database of septic tanks, pressing vacuum tankers into service, following up with the owners for desludging, tracking the treatment and disposal of septage are all very crucial elements of septage management and have been detailed in operational guidelines in both the countries.

5 WHERE CAN THE STATE GO FROM HERE? A SUGGESTED WAY FORWARD

5.1 SUGGESTED WAY FORWARD

Maharashtra has much ground to cover in achieving a full scale sanitation chain that includes good user interface systems, collection (septic tanks), conveyance, treatment and disposal of faecal sludge and sullage. Just about two-thirds of the urban population (67 per cent) have household latrines and about 20 per cent use shared facilities that are inadequate and not well maintained. About one-third of the households connect to sewerage systems and another one-third are connected to septic tanks. While there are good regulations for design of septic tanks, the regulation of their construction is weak and not much is known about how they are constructed. Most of the septic tanks leach out the effluents into drain systems, which are disposed of into the environment without any treatment. Data available from the PAS Project indicates that less than a third of urban faecal load is safely treated and disposed; the remaining is disposed of into the environment without any treatment. This situation does not augur well for the health, dignity and economic growth of urban Maharashtra. It is interesting to note that a similar situation triggered reform actions in the Philippines and Malaysia that triggered action on 'septage management'.

There is an urgent need for Maharashtra to accept the current situation and design reforms that can address the many gaps in the full cycle of sanitation and sullage management. Lessons from the Philippines and Malaysia, along with other countries, will be useful in designing reforms in the state.

It is also important to realise that addressing all the issues takes a long time. While some steps could be taken in the short term, some actions need more time. A list of such activities and action is presented in Table 14 for the consideration of the GoM. These suggested actions are broken down into short-term (two or three years) and medium-term (three or five years) time periods. The actions are also divided into those that are state issues and those that can be undertaken by ULBs. However, it is very unlikely that ULBs will undertake these actions without state orders and guidance.

Table 14: Suggested actions by state and ULBs

Short-term actions (2-3 years)	Medium-term actions (3-5 years)
State-level actions	
Recognise the importance of septic tanks and septage management as an integral part of city-wide sanitation.	Adopt holistic city sanitation legislation, addressing all aspects of sanitation management, including slum sanitation, septage management and sullage management. Amend necessary sections of the existing Acts (Municipal Acts, Slum Acts, etc.) to reflect and support implementation of the above legislation. The Clean Water Act of the Philippines and the Sewerage Services Act of Malaysia are good examples.
Develop and publish guidelines on septage management processes. The Solid Waste Management Rules in India, and guidelines from the Philippines, are good examples.	Create a fund for piloting septage management activities and demonstrate effective methods of doing this.
Encourage cities to include septage management activities in CSPs being prepared. Provide necessary technical assistance for this.	Establish regulatory mechanisms to regulate the activities of ULBs and other players along with necessary capacity. Option of one of the existing regulators (MPCB, MWRRA, etc.) taking on this additional role could be explored.
Develop guidelines for covering residents of slums with decent sanitation facilities.	Undertake a detailed analysis of the capacity of ULBs and strengthen it for sanitation management. Options of central agencies, like the MJP, playing a bigger role should also be explored.
Undertake appropriate amendments to the Municipal Acts to bring the treatment and disposal activities under the mandatory functions of ULBs.	
Strengthen the regulatory oversight of cities over building of septic tanks through appropriate measures – such as building political and citizen awareness, strengthening capacity of ULBs, stricter penalties for defaults, necessary MIS systems, etc.	

Short-term actions (2-3 years)	Medium-term actions (3-5 years)
City-level actions	
Build awareness of citizens about importance of all aspects of sanitation – septic tanks, desludging, effluent disposal etc. – through effective communications and seek their active participation.	
Build an updated database on the properties with septic tanks and use the data to develop a desludging programme.	Implement the desludging programme and monitor it through GIS-based monitoring systems.
Acquire necessary number of vacuum tanks or license capacitated service providers for desludging.	Build and operate septage treatment plants whether on own or through appropriate private participation.
Undertake measures to improve the number of facilities available in slum pockets and also improve the maintenance of these facilities. Encourage and ensure active community participation in building the facilities and their upkeep.	

Box 10: Rules to be adopted by state/cities for improved septage management

An Advisory on Septage Management in Urban India (MoUD) recommends that the state and ULBs should take steps to adopt details on the following aspects in respective Acts and Building by-laws:

- Design of septic tanks, pits, etc, (adapted to local conditions) and methods of approval of building plans, or retro-fitting existing installations to comply with rules.
- Special provisions for new real estate developments.
- Periodicity of desludging, and operation and maintenance of installations.
- Operating procedures for desludging, including safety procedures.
- Licensing and reporting.
- Methods and locations of transport, treatment and disposal.
- Tariffs or cess/tax, etc, for septage management in the city.
- Penalty clauses for untreated discharge for households as well as desludging agents.

The Advisory further emphasises the need for effective communications in implementing septage management plans – awareness needs to be created amongst authorities, households, communities and institutions which are part of the city's fabric, about sanitation and its linkages with public and environmental health. CSP implementation strategies and the communication component of this should also seek to promote mechanisms to bring about and sustain behavioural changes aimed at adoption of healthy sanitation practices.

Note: Excerpts from Advisory on Septage Management in Urban India, MoUD, 2013.

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ANNEXURES

Annexure 1: Universal WSS Services (Government Resolution dated June 19, 2010)

This Government Resolution encourages cities in the state to plan for universal coverage for water supply and sanitation facilities and services. The following are the guidelines issued for achieving universal sanitation coverage.

- Conduct a survey of below-poverty line families not having toilets and prepare a plan to cover them through GoI-sponsored Low Cost Sanitation Scheme.
- Prepare a city sanitation plan for all parts of the city as per National Urban Sanitation Policy guidelines.
- Encourage those households not having toilets to construct one. For this, cities can decide the type of incentives to be provided to households, if needed.
- The city should provide desludging equipment to clean the septic tanks of individual/community toilets, either on their own or through contracting private operators. The required service charges should be recovered from property owners.
- Undertake awareness activities for educating citizens about need for toilets and good sanitation through non-governmental organisations (NGOs), community-based organisations (CBOs), etc. Inform citizens to use either individual toilets or public toilets.
- The city can decide appropriate fines for people not using individual or public toilets and practicing open defecation, despite all the above activities. This should be communicated to citizens in advance.
- The city can facilitate financing for building toilets to needy households through its own funds or through banks.
- The city should build public toilets in dense areas if households do not have space to build toilets.
- Ensure that appropriate facilities and adequate number of seats are built to suit the needs of special categories, such as women, children, elderly and handicapped persons.
- The city should plan and provide public toilets in all public places in the city (markets, bus stations, government offices, etc.). The maintenance of such toilets is also important. Hence, the city can invite NGOs, etc., to build and/or operate such public toilets through public-private partnership models. The private partners can be allowed to use about 15 per cent of space (provided

for public toilets) for commercial exploitation. There should be sufficient parking facilities in such public toilet complexes.

- The city should undertake special campaigns to repair and rehabilitate existing public toilets and provide for their maintenance either on its own or through NGOs and CBOs. Alternately, the families using the public toilets can be handed the operations and maintenance responsibilities.

Annexure 2: Details of Septic Tanks

The following are details of septic tank construction as detailed the following notes: (a) Advisory Note on Septage Management in India, Ministry of Urban Development, 2013; (b) Central Public Health and Environmental Engineering Organisation guidelines; and (c) ISO Code – IS Code of practice for installation of septic tanks (IS:2470 (Part 1) – 1985; and other sources.

Definition of Septic Tanks

IS: A watertight single storied tank in which sewage is retained sufficiently long to permit sedimentation.

CPHEEO: A septic tank is a combined sedimentation and digestion tank where the sewage is held for one to two days.

MoUD: An underground tank that treats wastewater by a combination of solids settling and anaerobic digestion. The effluents may be discharged into soak pits or small-bore sewers, and the solids have to be pumped out periodically.

Other Definitions Related to Septic Tanks

Effluent: The wastewater that flows out of a treatment system (in this case, septic tank) or supernatant liquid discharged from the septic tank.

Sludge: The settled solid matter in semi-solid condition. It is usually a mixture of solids and water deposited on the bottom of septic tanks, ponds, etc. The term 'sewage sludge' is generally used to describe residuals from centralised wastewater treatment, while the term 'septage' is used to describe the residuals from septic tanks.

Faecal sludge: The solid or settled contents of pit latrines and septic tanks. Faecal sludge differs from sludge produced in Municipal wastewater treatment plants. Faecal sludge characteristics can differ widely from household to household, from city to city, and from country to country. The physical, chemical and biological qualities of faecal sludge are influenced by the duration of storage, temperature, intrusion of groundwater or surface water in septic tanks or pits, performance of septic tanks, and tank emptying technology and pattern.

Septage: Faecal sludge produced in septic tanks.

Sullage: Domestic dirty water not containing excreta. Sullage is also called grey water.

Scum: The extraneous or impure matter like oil, hair, grease and other light material that float at the surface of the liquid, while the digested sludge is stored at the bottom of the septic tank.

Septic Tank Functioning

Septic tanks are designed to act as a settling and digestion unit, with a liquid retention period of one or two days. The solids in the wastewater settle at the bottom of the tank where they undergo anaerobic degradation along with the organic matter in the wastewater. Studies have shown that only about 30 per cent of the settled solids are anaerobically digested in the septic tank and the remaining 70 per cent gets accumulated at the bottom as solid or semi-solid matter. The performance of septic tanks gets affected if the settled solids are not removed frequently.

Designing of Septic Tanks

Liquid retention period: The tank is designed that the sludge and scum together occupy about half to two-thirds of the tank's capacity. Studies have established that a liquid retention of time of 24 hours ensures quiescent conditions for effective settling of suspended solids. Considering the volume required for sludge and scum, septic tanks are designed with liquid holding times of two days.

Shape and size: Septic tanks are normally rectangular in shape with a length to breadth ratio of 2:1 or 4:1. The liquid depth in the tank shall be 1 to 2 metres. When the capacity of the tank exceeds 2,000 litres, the tank may be divided into two chambers, with the capacity of the first chamber twice that of the second chamber. Two-compartment septic tanks have been found to be more effective with lower solids' concentration in the treated effluent.

Volume: Volume of the septic tanks depends on the number of people using the septic tanks and the period of desludging the tanks. The table here captures the standard sizes prescribed by the CPHEEO and ISO. These dimensions have been recommended based on the assumption that septic tanks are connected only to latrines and not any other device.

No. of users	Length (metre)	Breadth (metre)	Liquid depth (cleaning interval of)	
			2 years	3 years
5	1.50	0.75	1.00	1.05
10	2.00	0.90	1.00	1.40
15	2.00	0.90	1.30	2.00
20	2.30	1.10	1 30	1.80

Septic Tank Construction Details

Floor: The floor of the tank should be watertight and of sufficient strength to bear the weight of the tank walls and the septic tank contents. The floor should have a minimum slope of 1:10 sloping towards the sludge outlet to facilitate easy removal of sludge.

Walls: The walls could be of brick work with a minimum thickness of 200 millimetres and should be plastered to a minimum thickness of 12 millimetres on the inside and outside. The walls should be watertight and have adequate strength to withstand the force and pressure of the liquid.

Inlet and outlet: The inlet and outlet should not be located at such levels where the sludge or scum is formed to prevent disturbance of the scum or sludge by the liquid entering or leaving the tank. The inlet and outlet should be located as far away as possible from each other and at different levels to avoid short circuiting of the liquid. Baffles, provided at the inlet and outlet of the tank, aid to distribute the flow evenly across the width of the tank. Baffles should dip 25 to 30 centimetres (cm) into the liquid and project 15 cm above the liquid surface. A ventilation pipe should be provided which should extend 2 metres above the height of tallest building within a radius of 20 metres. The top of the ventilation pipe should be covered with a suitable mosquito-proof wire mesh.

Watertightness: Watertight tanks are a necessity for the protection of the environment and for the operation of the system. Each tank should be tested for watertightness and structural integrity by filling the tank with water before and after installation. Hydrostatic testing is conducted at the factory by filling the tank with water and letting it stand for 24 hours. If no water loss is observed after 24 hours, the tank is acceptable. Because some water absorption may occur with concrete tanks, the tank should be refilled and allowed to stand for an additional 24 hours. If the water loss after the second 24-hour period is greater than 1 gallon, the tank should be rejected (ASTM C1227 (Precast Concrete Septic Tanks)). It is important that the above procedure be repeated once the tank is installed.

Ventilation pipe: It is recommended that every septic tank be provided with a ventilation pipe of a minimum diameter of 50 millimetres. The top of the pipe should be secured with mosquito-proof net to avoid insects entering septic tanks through the vent pipe. If no buildings are located within 20 metres of the septic tank, then the height of the vent pipe could be a minimum of 2 metres. If buildings are located within 20 metres, the vent pipe should be at least 2 metres taller than the height of the buildings to avoid foul gases reaching people.

Schematic Drawings

Figure A1: Typical layout for a single compartment septic tank for 20 users

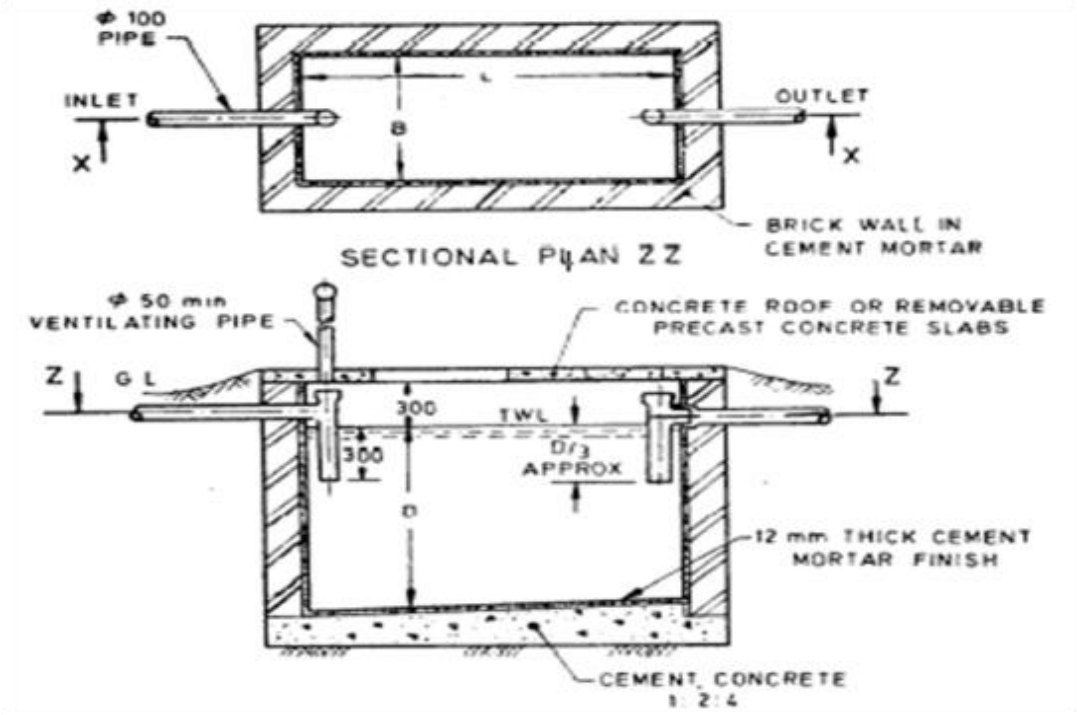


Figure A2: Typical layout for a double compartment septic tank for 50 users

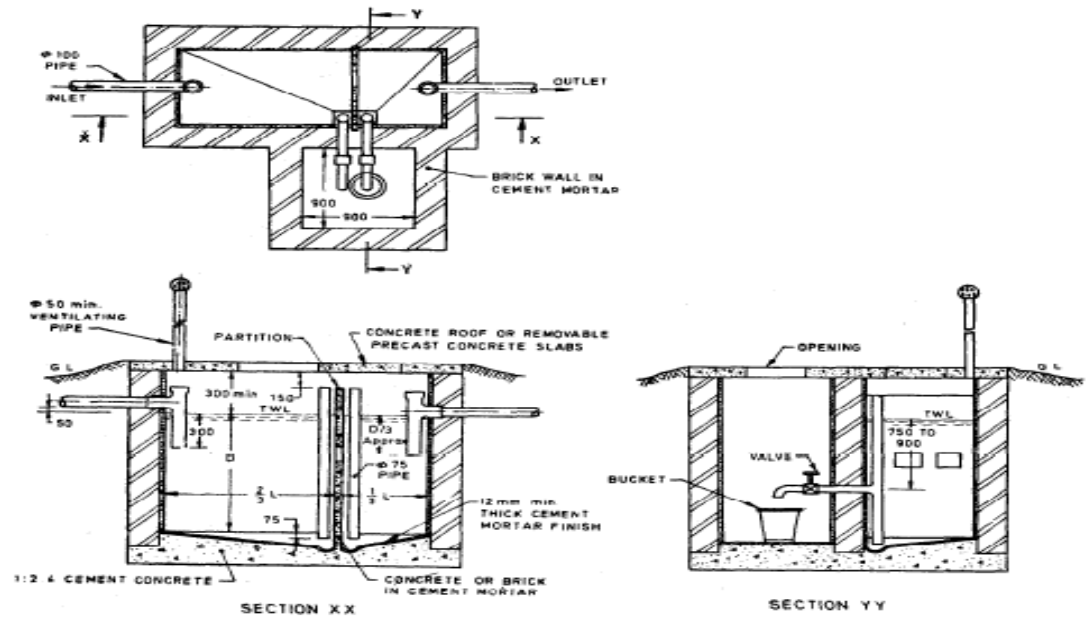
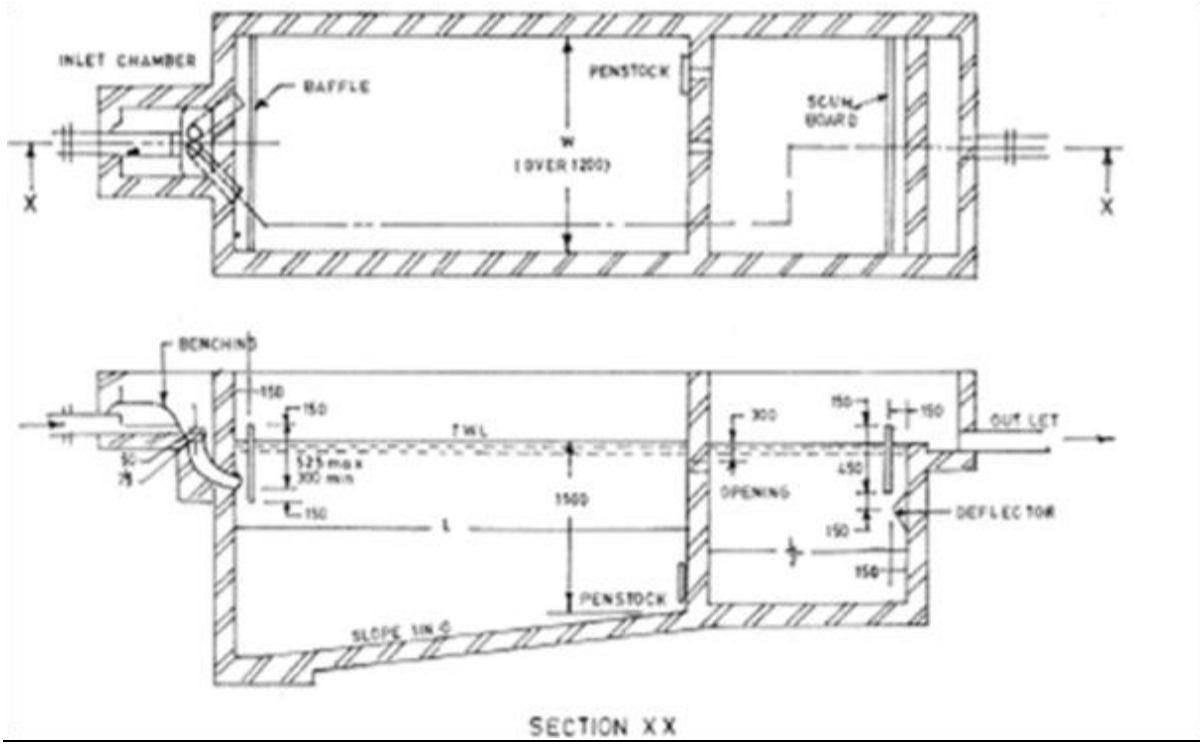


Figure A3: Typical layout for a double compartment septic tank for more than 50 users



The Performance Assessment System (PAS) Project

The Performance Assessment System (PAS) Project 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 includes three major components of performance measurement, performance monitoring and performance improvement. It covers all the 400+ urban local governments in Gujarat and Maharashtra.

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PAS Project

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