

**Uttar Pradesh State Policy on Faecal Sludge and Septage
Management**

Draft (March 2019)

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Abbreviations

AMRUT	Atal Mission for Rejuvenation and Urban Transformation
BIS	Bureau of Indian Standards
CBO	Community Based Organization
CPCB	Central Pollution Control Board
CSP	City Sanitation Policy
CSE	Centre for Science and Environment
CSR	Corporate Social Responsibility
CSTF	City Sanitation Task Force
DoUD	Department of Urban Development, Govt. of U. P.
FSTP	Faecal Sludge Treatment Plant
IEC	Information, Education and Communication
IHHT	Individual Household Toilets
MoU	Memorandum of Understanding
NGO	Non-Governmental Organization
NMCG	National Mission for Clean Ganga
NUSP	National Urban Sanitation Policy
OSS	On-Site Sanitation
SBM	Swachh Bharat Mission
SGRCA	State Ganga River Conservation Authority
SHG	Self Help Group
SMCG	State Mission for Clean Ganga
STP	Sewage Treatment Plant
ULB	Urban Local Body
UPJN	Uttar Pradesh Jal Nigam
UPSPCB	Uttar Pradesh State Pollution Control Board
WASH	Water, Sanitation and Hygiene

Glossary

Black water: A mixture of urine, faeces and flush water along with anal cleansing water (if water is used for cleansing), and/or dry cleansing materials. Black water contains pathogens of faeces and the nutrients of urine that are diluted in the flush water.

Desludging or Emptying: The operation of removing sludge (and septage) from septic tanks, pit latrines or any other primary treatment units is called de-sludging.

Effluent: The supernatant liquid discharged from a septic tank. The liquid separated out from the septage is also referred to as effluent.

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

Grey water or Sullage: The total volume of water generated from washing food, clothes and dishware, as well as from bathing, but not from toilets. It may contain traces of excreta and, therefore, also pathogens. Grey water accounts for approximately 65 per cent of the wastewater produced in households with flush toilets.

Pit latrine: Latrine with one or two pits for collection and decomposition of excreta. The liquid generally infiltrates into the surrounding soil.

Pour-flush latrine: Latrine with a rural pan, where small quantities of water are poured from a container by hand, to flush away faeces.

Septage: The semi-solid matter from onsite sanitation systems like septic tanks. It has an offensive odour, appearance and high concentration of BOD, COD and TSS etc.

Septic tank: A water-tight single-storied tank in which sewage is retained long enough to permit sedimentation and digestion.

Sewage: The wastewater containing human waste matter (faeces, urine etc), either dissolved or undissolved, discharged from toilets and other receptacles intended to receive or retain such human wastes.

Sewerage System: The underground conduit for the collection of sewage is called Sewer. A network of sewer appurtenances intended for the collection and conveyance of sewage generated from each of the properties to a sewage pumping station for pumping to sewage treatment plant for further treatment and disposal is called sewerage system

Soakpit: A porous, covered chamber that allows wastewater to permeate into the ground. It is also known as a soak-away or leach pit.

Vacuum tanker/truck or Desludging Vehicle: A vehicle that has a pump and a tank, designed to pneumatically suck liquids and slurries (like septage). These vehicles are also used to transport extracted liquids.

1 Introduction

According to Census 2011, Uttar Pradesh reported 44.47 million urban population i.e. 22.28% of total population of state living in 914 urban centers (which accounts 11.79% of total urban population of country). The state has 647 statutory towns i.e. is 16% of total number 4041 towns in country remaining are 267 census towns. The state has 635 urban local bodies (ULBs) including 16 Municipal Corporation (*Nagar Nigam*), 197 *Nagar Palika Parishad* and 424 *Gram Panchayat*. State ULBs with limited local resources and state support is responsible for provision of municipal services. A sanitation snapshot of urban Uttar Pradesh in Table 1 clearly indicates that in the state households with septic tank based sanitation systems (47%) far exceed those with sewer connections (28%).

Table 1: Urban sanitation in Uttar Pradesh – an overview

Sl. No	No. of Households Connected to	Population	Percentage of Population
1	Piped sewer system	21,07,698	28.29
2	Septic tank	34,91,029	46.86
3	Other Systems	1,49,976	2.01
4	Pit latrine with slab/VIP	1,79,361	2.40
5	Pit latrine without slab	39,634	0.54
6	Night soil disposed into open drain	95,054	1.27
7	Service latrine	128220	1.73
8	Public latrine	1,54,061	2.07
9	Open defecation	11,04,162	14.83

Source: Census of India, 2011

1.1 Status of sewage, FSSM and sanitation in Uttar Pradesh

According to the 3rd State Annual Action Plan (SAAP) for FY 2017-18 to FY 2019-20 submitted to the ministry under Atal Mission for Rejuvenation and Urban transformation (AMRUT), the status of sewerage and sanitation in Municipal Corporation and *Nagar Palika Parishads* indicates a substantial gap in demand and supply in sanitation infrastructure in the state.

The analysis of coverage of latrines in Municipal Corporation shows that most of the municipal corporations have fair coverage of latrines ranging from 83% to 98%. In *Nagar Palika Parishads* the availability of latrines ranges from 39% in Akabarpur to 99% in *Nagar Palika Parishad* Loni. In most cities the coverage of latrines ranges from 80% to 90%.

With regard to coverage of sewerage network in Municipal Corporation, highest coverage of sewerage is in Ghaziabad with 83.82% and lowest is in Aligarh with 3.54% coverage. *Nagar Nigam* Jhansi and *Nagar Nigam* Moradabad has no sewerage network. Among *Nagar Palika*

Parishads the sewerage network ranges from 30% to 0.05%. In more than 34 AMRUT cities there is no sewerage network. **These cities only have Onsite Sanitation Systems (OSS) generating faecal sludge and septage.**

12 large cities Municipal Corporations (Aligarh, Agra, Bareilly, Ghaziabad, Gorakhpur, Jhansi, Kanpur, Lucknow, Varanasi, Muradabad, Meerut, Allahabad) are preparing City Sanitation Plan with support from Ministry of Housing and Urban Affairs, World Bank, JICA and GIZ. In addition, 4 small and medium towns *Nagar Pallika Parishads* namely Ramnagar, Chunar, Bijnore and Gangaghat are being supported by Centre for Science and Environment (CSE) in preparing City Sanitation Plan and effective Faecal Sludge / Septage Management Plan. These town and cities are identified flagship cities that could act as model for other urban centers across state to initiate city wide sanitation.

As per CPCB report 2015, Uttar Pradesh has 73 numbers of sewage treatment plants having treatment capacity of 2646.84 MLD. 07 STPs of capacity 89.59 MLD are non-operational, 03 STPs of capacity 170 MLD are under construction and 01 STP of capacity 15 MLD is proposed.

As of March 2019, the status of treatment of Faecal Sludge in 60 AMRUT cities include:

1. There is only one operational Faecal Sludge Treatment Plant (FSTP) of 6 KLD capacity in the state located at Jhansi.
2. Some cities with operational sewerage network connected to STP which accept Faecal Sludge either at a Sewage Pumping Station or at the inlet of an STP. Such cities include Lucknow, Kanpur, Ghaziabad, Allahabad etc.
3. An FSTP is under construction in Unnao. Tendering is in process by the State through Uttar Pradesh Jal Nigam for FSTPs in Loni and Raebareli and Co-Treatment module at Modinagar.
4. U. P Jal Nigam is also looking to scale-up the implementation of FSTPs and Co-Treatment facilities across the state and has tendered out FSTPs in 31 cities and Co-Treatment of Faecal Sludge in STPs in 21 cities through packaged tenders.

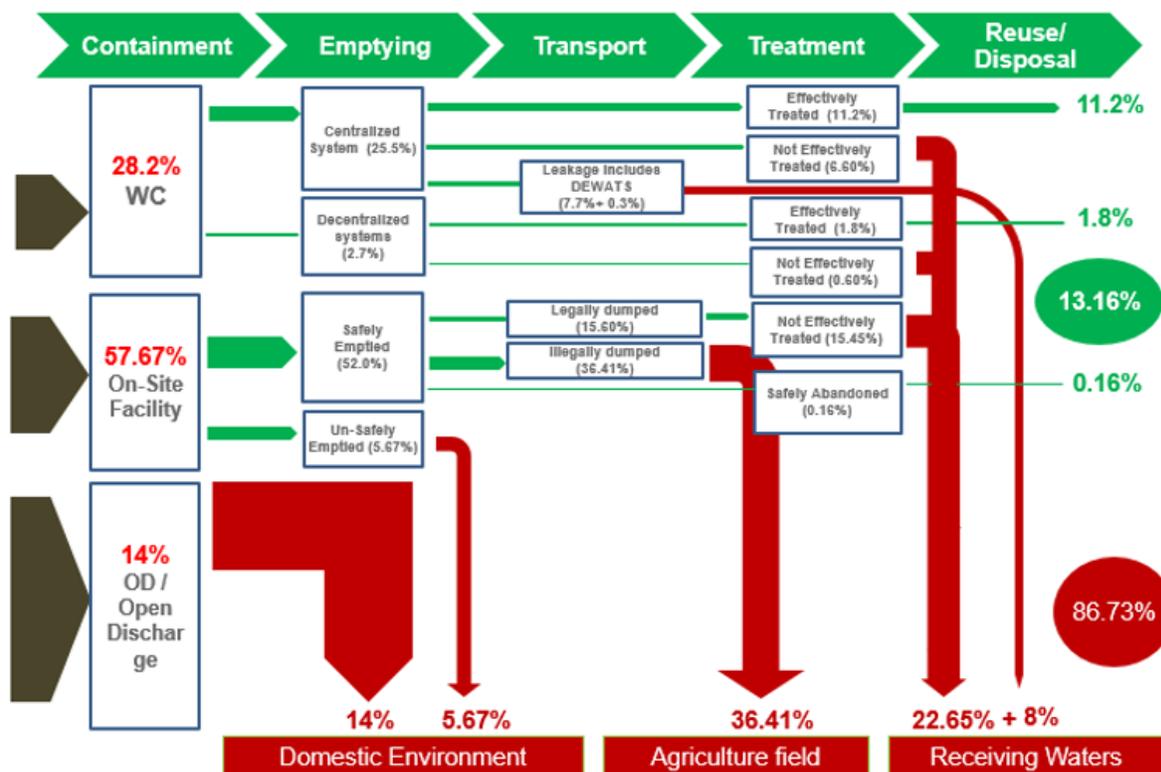


Figure 1: Faecal waste flow diagram - Uttar Pradesh state

All the households that are connected to septic tanks, and those connected to pit latrines (both sanitary and insanitary), generate faecal sludge. This faecal sludge finds its way to an open drain/ open ground/ vacant plot/ solid waste dump site: need to be covered under faecal sludge and septage management (FSSM). Figure 1 shows a Faecal Waste Flow Diagram (often referred as “SFD”), is a visualization of faecal waste (both faecal sludge and wastewater) based on Census (2011), showing that 86.73% of excreta either mixes with the water bodies or is disposed of in the agricultural land or domestic environment which poses a huge risk to public health and the environment at large. This situation is evident in the absence of an effective post toilet infrastructure.

The proportions of population using different sanitation option are shown according to where waste goes (e.g. sewer, on-site containment, etc.). At each stage of the chain, the proportion of faecal waste that is effectively managed continues as green arrow, while any proportion identified as ineffectively managed is represented in red arrow.

While on site sanitation is prevalent across town and cities in the state, there are major gaps across sanitation service chain. Further as urban households without toilets obtain facilities over the next few years under Swachh Bharat Mission (SBM) across town and cities, it is likely that many will require on-site arrangement like pit latrines and septic tanks in cities at locations where sewerage systems are not available. While construction standards have been codified by Bureau of Indian Standards (BIS), the actual construction is largely with households to manage – in practice, the installations are subject to local practices and considerable variations. In many instances for example, soak-ways or drain fields are not provided.

Limited capacities and resources with ULBs have also resulted in little regulation of maintenance and cleaning of septic tanks and pits – in many cases, households do not report cleaning for a number of years. Some ULBs have desludging equipment or there are private players providing cleaning services but the supply of desludging service is far from adequate – resulting in many instances of faecal sludge and septage being dumped in drains and open areas posing considerable health and environmental risks. Sanitation workers also work in hazardous conditions to clean onsite sanitation system (OSS)- pits and tanks, sometime without protective gear and equipment.

1.2 Faecal sludge and septage: how is it different from sewage?

Sewage is untreated wastewater which contains faeces and urine, this wastewater gets conveyed through the sewerage system. Generally, grey water from the kitchen and bathroom also becomes part of sewage. The biochemical oxygen demand (BOD) of sewage ranges from 150–350 mg/l and all sewage treatment plants are designed for this load. Faecal sludge and septage is emptied out of pits or septic tanks and is much more concentrated than sewage; for example, BOD of septage ranges from 1,000 –20,000 mg/l. There appears to be a very thin line between septage and faecal sludge. Septage is limited to septic tanks, and has already undergone partial digestion, whereas faecal sludge includes contents from other onsite technologies, including septic tanks, and may or may not be digested.

National FSSM Policy 2017 defines Faecal Sludge and Septage as follows:

“Faecal Sludge” is raw or partially digested, in slurry or semisolid form, the collection, storage or treatment of combinations of excreta and black water, with or without grey water. It is the solid or settled contents of pit latrines and septic tanks. The physical, chemical and biological qualities of faecal sludge are influenced by the duration of storage, temperature, soil condition, and intrusion of groundwater or surface water in septic tanks or pits, performance of septic tanks, and tank emptying technology and pattern. Faecal sludge is the solid or settled contents of pit latrines and septic tanks. Faecal sludge (FS) comes from onsite sanitation systems. Examples of onsite technologies include pit latrines, non-sewered public ablution blocks, septic tanks, aqua privies, and dry toilets.

“Septage” is the liquid and solid material that is pumped from a septic tank, cesspool, or such onsite treatment facility after it has accumulated over a period of time. Usually, septic tank retains 60% - 70% of the solids, oil, and grease that enter it. The scum accumulates on the top and the sludge settles to the bottom comprising 20% - 50% of the total septic tank volume when pumped. Offensive odour and appearance are the most prominent characteristics of Septage. It is a host of many disease-causing organisms along with the contamination of significant level of grease, grit, hair, and debris.

Septage is the combination of scum, sludge, and liquid that accumulates in septic tanks. The effluent from the septic tank can be collected in a network of drains and/or sewers and treated in a treatment plant designed appropriately. The accumulating sludge at the bottom of the septic tank however, has to be also removed and treated once it has reached the designed depth or at the end of the designed desludging frequency whichever occurs earlier. Such a removal is possible only by trucks. While sucking out the sludge, the liquid in the septic tank will also be sucked out. Such a mixture is referred to as septage.

What is faecal sludge and septage management?

Sanitation often focuses only on provisioning of physical infrastructure – toilets or latrines. In order to provide tangible and sustainable sanitation, there is a need to focus on the entire value chain also known as ‘sanitation chain’ (See Figure 2).

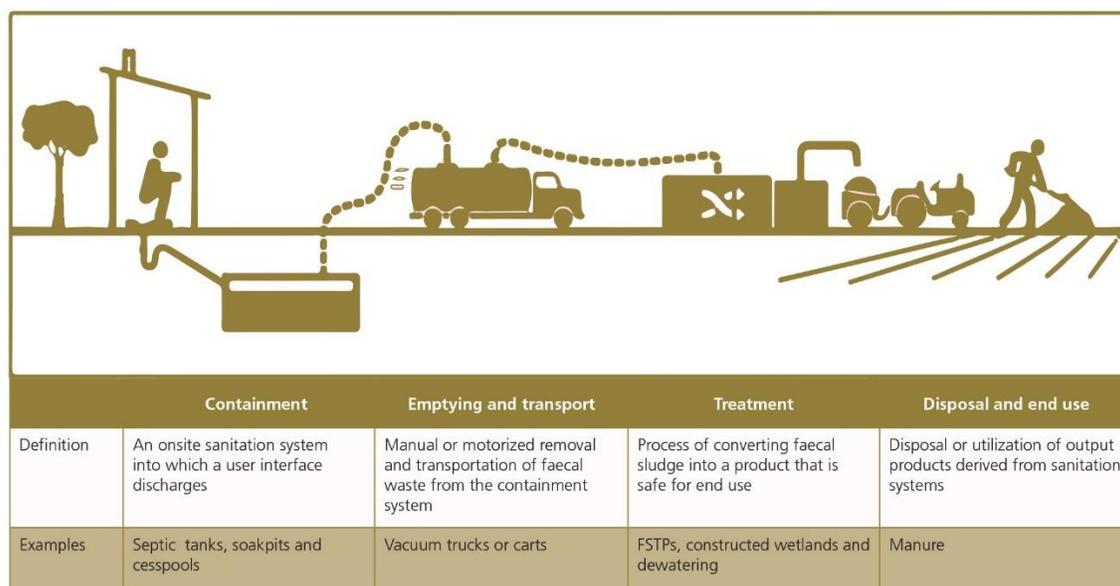


Figure 2: Sanitation chain (Source: CSE, 2017)

It sets out interlinked steps vital to manage faecal sludge and septage and effluent from generation to disposal or end use, there by summarizing the city-level outcomes and current status of the same.

Sanitation planning should be incremental, acknowledging the variation of urban conditions within and between areas and over time, and considering networked and non- networked solutions. Figure 3 explains salient features of both conventional sewerage and septage management.

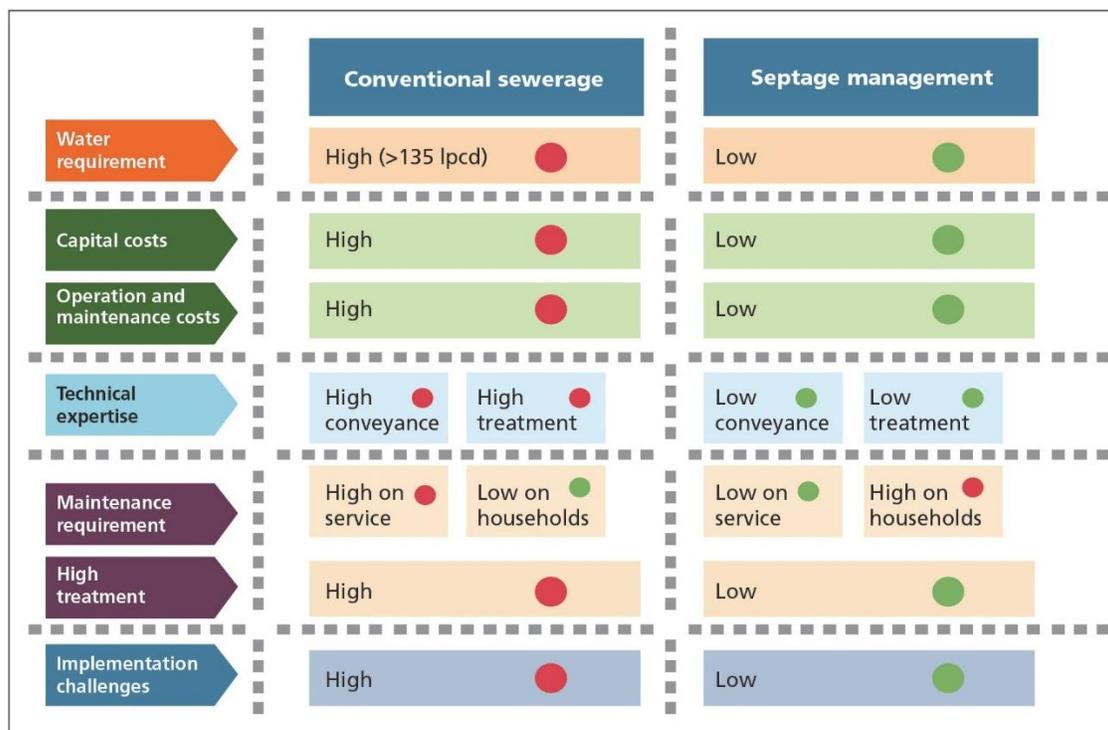


Figure 3: Key features of conventional sewerage and septage management

(Source: SM guideline, Maharashtra, 2016)

The problem of faecal sludge and septage / sewerage must be addressed in a holistic manner, with a strategy that provides for minimum needs and is appropriate for all areas, considering the local situation. It must also address the enablers in the form of suitable regulation and institutional framework, capacity building and education and awareness among all stakeholders. Further need is to address efficiency of systems in place for onsite sanitation whereof the faecal sludge output needs to be managed environmentally safe manner including proper engineering design, construction and maintenance of septic tanks systems, pit latrines and such other systems generating faecal sludge.

1.3 Gaps and issues in effective FSSM in Uttar Pradesh

While onsite sanitation is prevalent in cities across state, there are major gaps in its implementation across sanitation service chain. While the gaps and consequences of lack of access to toilets are well reported, those relating to containment systems, faecal sludge and septage collection, conveyance and treatment remain largely unknown and unaddressed by most, if not all state agencies dealing with sanitation and the urban local bodies. Even in general discourse this major health hazard is not well understood or talked. A study by Centre for Science and Environment on 66 cities (accounting for 60% of urban population) in Uttar Pradesh highlights the key gaps and issues in Faecal Sludge and Septage Management in the State which are as follows:

Access: Issues in access to toilets arise due to households having financial issues and space crunch for constructing individual toilets. There are also significant cultural and social barriers (issues around perceptions of pollution and caste; and others).

Containment: Almost half the population in the State dependent on Onsite Sanitation Systems do not have septic tanks conforming to the Indian Standard (IS) code. These systems are generally constructed by local masons according to space available and financial status of user. The masons make bigger pits than required. Often, the bottom of the tanks is not lined, to decrease the frequency of emptying, which causes contamination of ground water which is also a major source of drinking water supply in the cities;

Even the septic tanks that conform to IS code are connected to open drains instead of soak pits. Most households do not regularly empty the septic tank, i.e. 2 to 3 years as recommended by the IS code, which results makes the effluent from the septic tank pollute the open drains. The typology of containment systems found in cities across Uttar Pradesh is shown below:

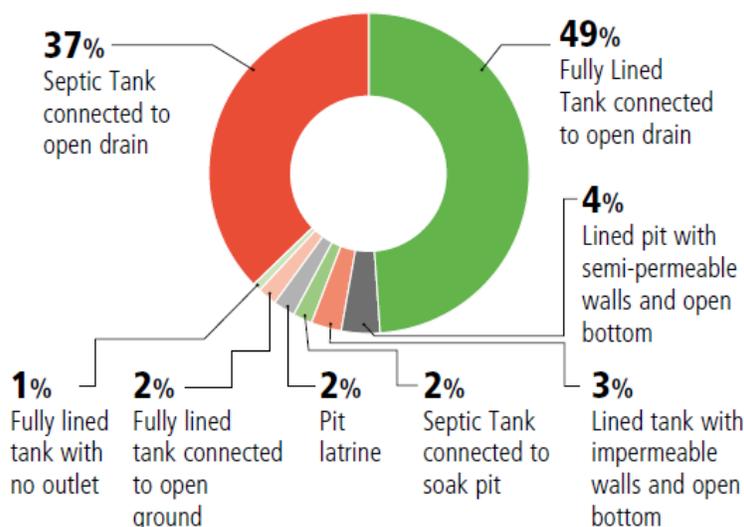


Figure 4: Typology of Containment Systems in Urban U.P. (Source: CSE, 2019)

Emptying and Transportation: The BIS code recommends that septic tanks should be emptied. Following issues create barriers to regular cleaning and collection of faecal sludge and septage:

- Illegal manual scavenging
- No / limited access to containments
- Inappropriate tank sizing and design
- Lack of infrastructure, and a regulated schedule for cleaning
- Lack of registration, licensing and

The services are demand based. This service is majorly provided by private operators but in some cities government trucks also ply. The majority of the personnel involved in the emptying business belong to a particular cast. In many cities Safai Karamcharis, contracted with the government, end up doing manual scavenging to earn quick money. Fee charged vary from Rs 500 to Rs 3000.

Cycle carts are used for transportation of manually emptied Faecal Sludge whereas tractor or truck mounted vehicles are used for mechanized emptying. Summary of the observation is presented below:

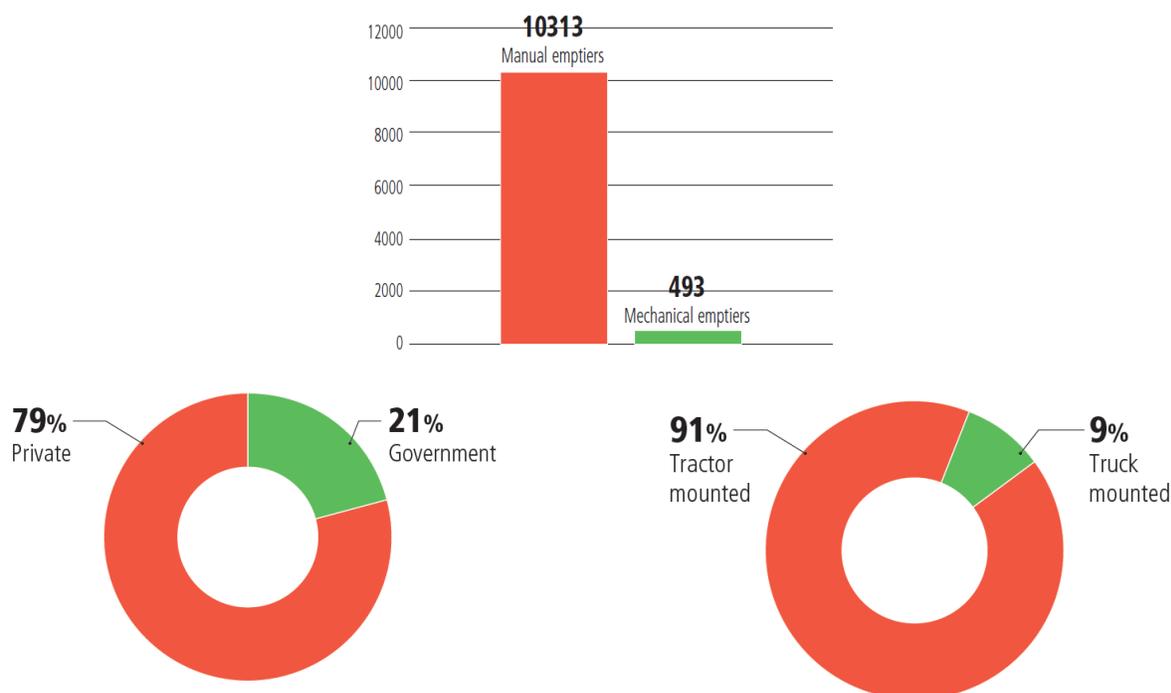


Figure 5 Emptying and Transportation of Faecal Sludge & Septage in Urban U.P. (Source CSE, 2019)

Treatment and Disposal / Reuse: Most small-medium town and cities lack adequate centralized / decentralized facilities and designated sites for sewage and for Faecal Sludge and Septage treatment and disposal / reuse. Although some cities with sewage treatment plant have started the disposal of faecal sludge or septage for co-treatment, majority of the STPs do not accept Faecal Sludge / Septage. Even the Faecal Sludge / Septage which is being Co-Treated is being done unscientifically. Significant amount of untreated faecal waste gets dumped in rivers, lakes and any water body or open land in peri-urban areas at some distance away from the main city.

Jhansi is the only city to have a Faecal Sludge Treatment Plant in the State. There is no restriction in place to restrict the uncontrolled dumping of Faecal Sludge in and around the city. Some cities like Lucknow, Kanpur, Ghaziabad, Allahabad are discharge Faecal Sludge at Sewage Pumping Station / inlet of the STP. Summary of Wastewater and Faecal Sludge being treated is shown below:



Figure 6 Treatment of Sewage and Faecal Sludge in Urban U.P. (Source: CSE, 2019)

An SFD of the 66 Cities which include all the AMRUT town and select Ganga town is presented below. This SFD represented 60% of the Urban Population of Uttar Pradesh. The SFD highlights that human excreta of 73% of the population of the 66 cities in Uttar Pradesh is not managed safely.

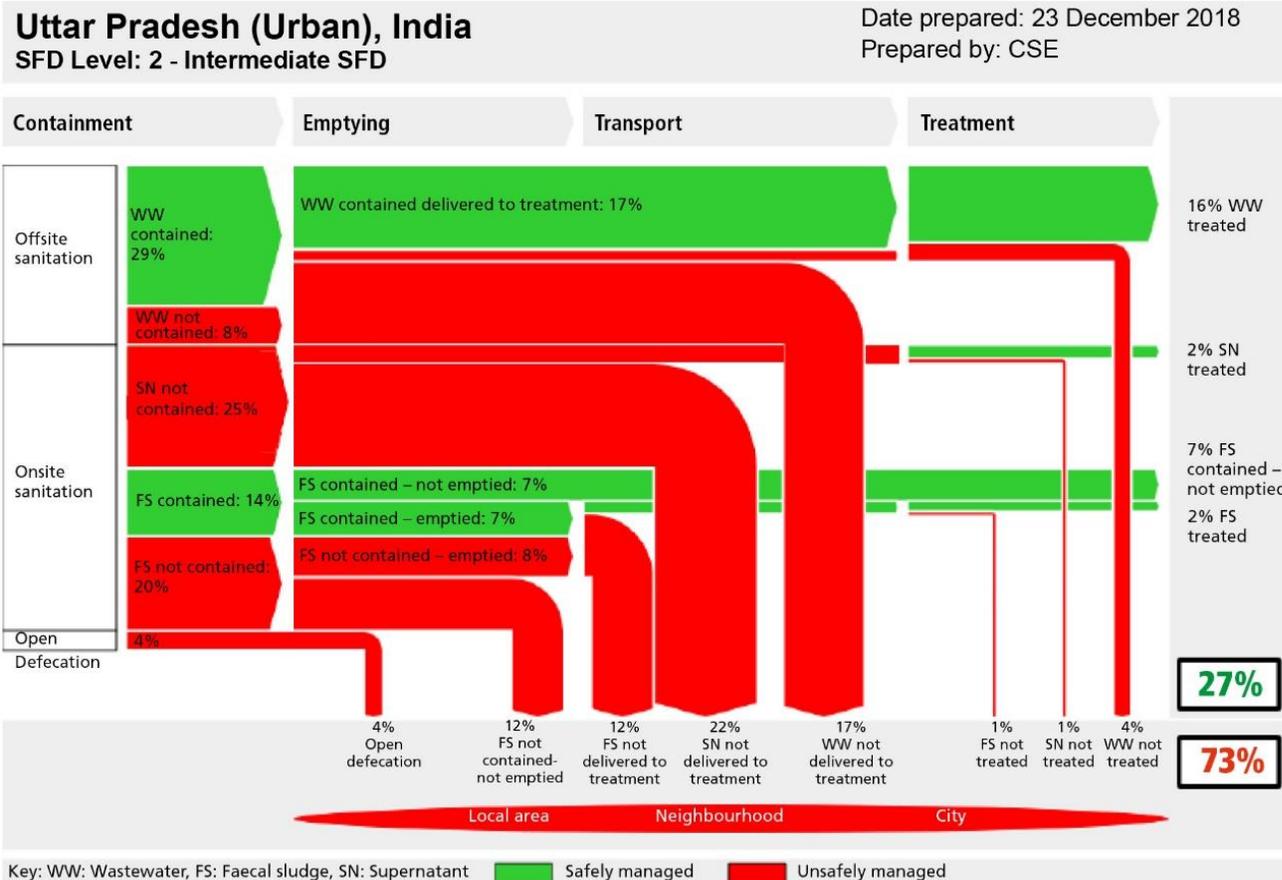


Figure 7 SFD for 66 Cities of Uttar Pradesh (Source: CSE, 2019)

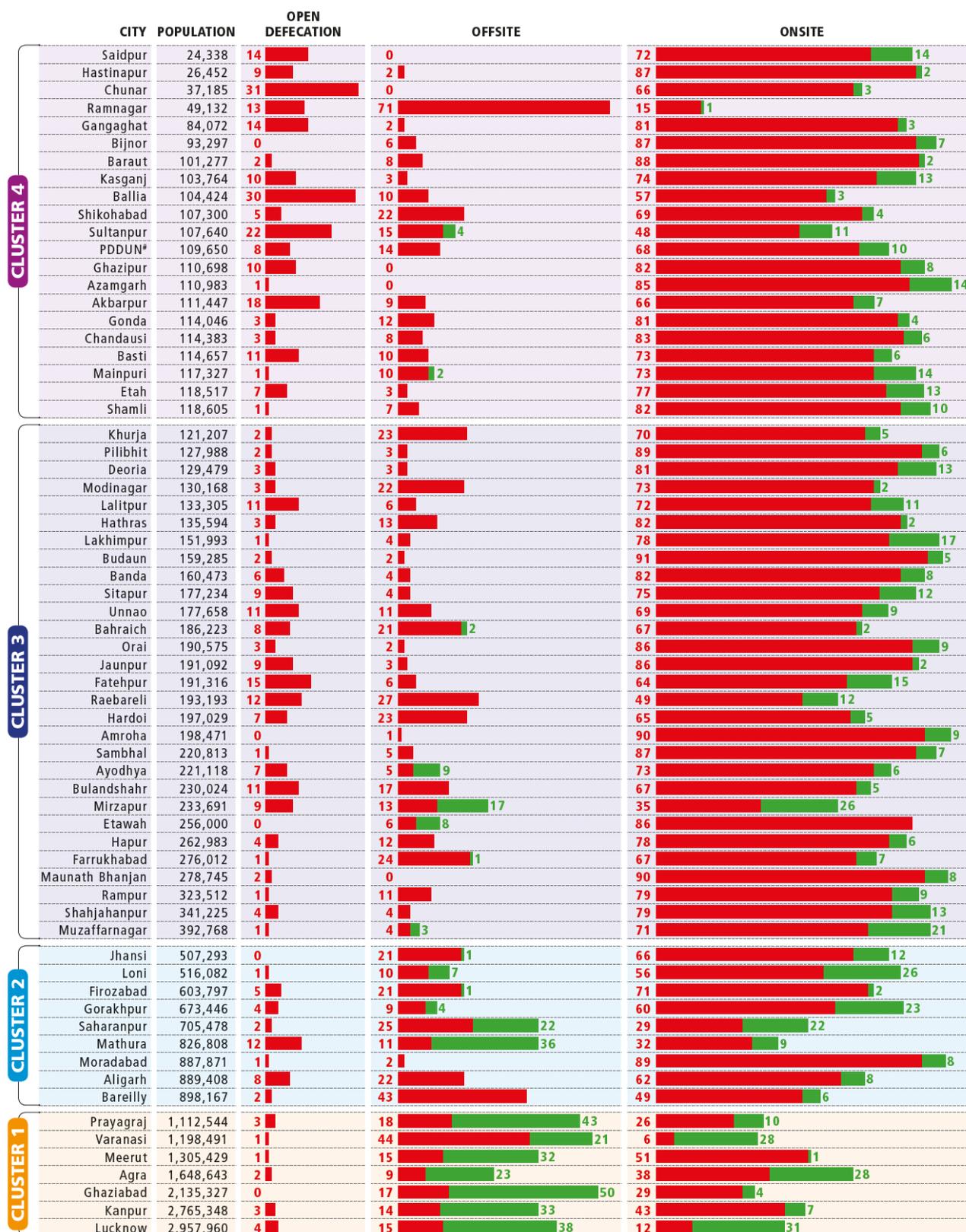
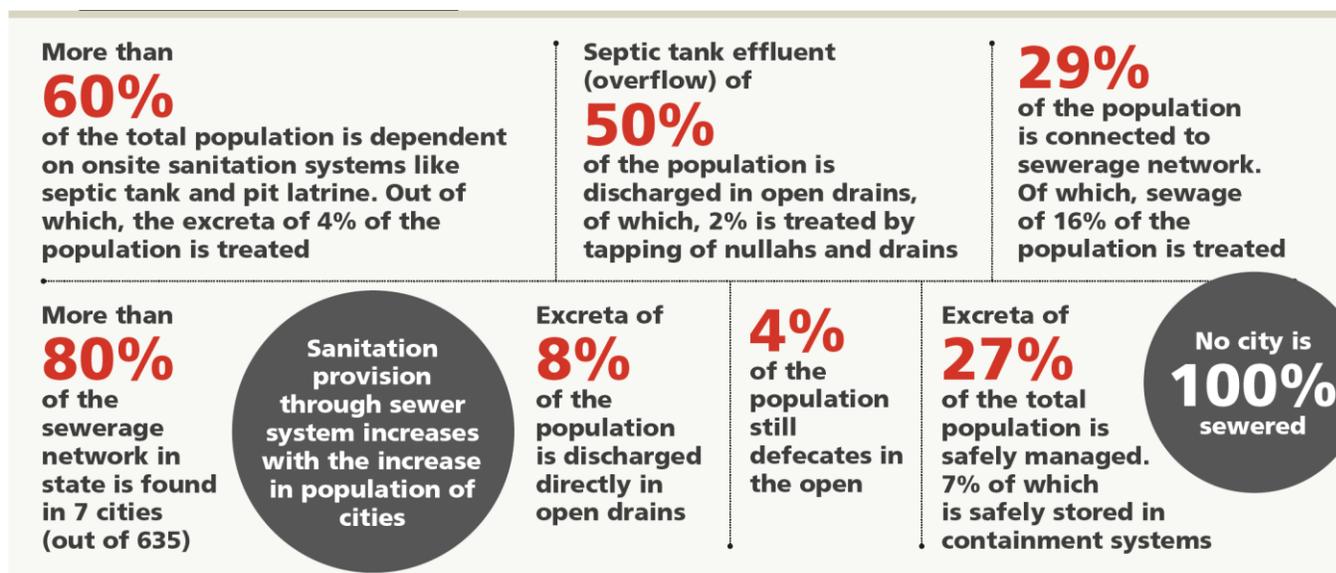


Figure 8 Sanitation Status of 66 Cities in Uttar Pradesh (CSE, 2019)



*This study is done based on data collected by CSE in October, 2018

Figure 9 Key Observations regarding Sanitation in Uttar Pradesh (Source: CSE,2019)

1.4 National Policy on Faecal Sludge and Septage Management (2017)

Ministry of Urban Development (now called Housing and Urban Affairs) aims to achieve considerable progress on containment of human waste under Swachh Bharat Mission (SBM), But ministry, recognizing that the end objectives and corresponding benefits of SBM cannot be achieved without proper management of faecal sludge and septage across value chain – notified a National Policy on Faecal Sludge and Septage Management (FS&SM) in February 2017. The Objective and specific milestones stated in nation FSSM policy for urban India are:

National FSSM policy 2017: Objectives and scope

Key Objective

To set context, priorities, and direction for, and to facilitate, nationwide implementation of FSSM services in all ULBs such that safe and sustainable sanitation becomes a reality for all in each and every household, street, town and city.

Specific Milestones

- Leveraging FSSM to achieve 100% access to safe sanitation
- Achieving integrated citywide sanitation: mainstreaming sanitation
- Sanitary and safe disposal
- Awareness generation and behaviour change

Scope:

Only OSS facilities and areas served by such facilities would be under the purview of this policy. However, it will address synergies between FSSM and sewerage systems or municipal solid waste system e.g. co-treatment of FS and septage at sewage treatment plants (STPs) or with municipal solid waste. Scope of policy extends to:

- All projects, programs and schemes of Central Government and support sanitation services, urban development and improved delivery of services in urban and peri – urban areas of India town/cities.
- Applies to every urban local body, outgrowths in urban agglomerations, census towns, notified areas including industrial townships, special economic zones, defence establishments, places of pilgrimage, religious and historical importance as may be notified by State Government from time to time.
- The State Governments, ULBs and relevant public and private utilities should take necessary steps to ensure that this Policy covers all projects, programs and schemes related to provision of onsite sanitation services in their respective jurisdictions, irrespective of source(s) of funding for these projects, programs and schemes.

Sanitation is a state subject and on-ground implementation and sustenance of public health and environmental outcomes require strong city level institution and stakeholders. Although there are some common elements across urban India, there are a number of factors, constraints and opportunities that are peculiar to specific situation of States and cities with respect to sanitation, climate, physiographic factors, economic, social and political parameters, and institutional variables. Therefore, each state and city needs to formulate its own FSSM strategy and integrate the same in their respective State and city sanitation plans in conformity to the National Policy. Several other stakeholders such as households, civil society organizations, the private sector (small, medium and large), the private sector (small, medium and large), research organizations, too have a critical role to play in achievement of safe and sustainable FSSM services for all.

Role and Responsibilities of State (as defined in NFSSM Policy):

- State specific FSSM Policy be developed by each State
- Develop State Level FSSM Strategy & Implementation Plan
- Develop Operative Guidelines on FSSM
- Training and capacity building of ULB officials and other engaged in provision of FSSM services
- State level awareness and behavior change campaign
- Create enabling environment for participation of NGOs and CSOs in provision of FSSM services including to the poor and marginalized households and areas.
- Funding through specific schemes and plans
- Support Research and Capacity Building in the sector
- State level monitoring and evaluation

In addition, provide technical, financial and administrative support to ULBs; encourage coordination and cooperation among ULBs; regulate and help ULBs set up systems to ensure financial sustainability in provision of FSSM services and

1.5 Applicability of the Policy

The Policy shall be applicable (unless otherwise specified) to all future policies, schemes, programs, projects, plans and guidelines of Government of Uttar Pradesh (relevant ministries, departments, agencies, authorities, SPVs, etc) and urban local bodies in Uttar Pradesh with respect to initiatives such as Urban Development, Urban Sanitation, Tourism Development, Heritage Conservation, Housing Projects, Slum Redevelopment, Economic Development, Livelihood Generation, Industrial / Economic Zones, etc. for Urban Areas (as defined by Census – Statutory Towns, Outgrowths, and Census Towns), peri-urban areas and places of pilgrimage / historic / religious importance as notified by the State of Uttar Pradesh. The provisions shall also be applicable for approved schemes, activities, projects and initiatives by the private sector, including corporates, donor agencies, Non-Government Organizations (NGOs), non-profit organizations, etc. as well as multilateral and bilateral organizations, within the state of Uttar Pradesh.

The Policy would be addressed in a holistic manner with a State Level FSSM Strategy and a City Level FSSM Operative Guidelines which is appropriate and affordable for all areas and population considering the urban situation. The policy would address the enabling provisions in the form of suitable regulation and institutional framework, capacity building, education and awareness among all stakeholders. It also seeks to address the efficiency of systems in place for on-site sanitation whereof the Faecal Sludge / Septage output needs to be managed in an environmentally safe manner including proper engineering design, construction and maintenance of septic tanks, pit latrines and such other systems generating Faecal Sludge / Septage.

2 Policy Vision

“To reaffirm sanitation as the basic right of every citizen and ensuring all Urban Areas in Uttar Pradesh achieve a clean, sanitized and healthy environment through implementation of affordable and safe city-wide FSSM in a sustainable manner with special focus on urban poor, differently abled and women”

2.1 Objective and Scope of the Policy

The objective of the Policy is to support the Urban Local Bodies in the State of Uttar Pradesh in implementation of FSSM plan. The Policy aims to give direction and set priorities for achieving city-wide safe and sustainable sanitation in all the ULBs in the State. More specifically, the Policy will:

- 1) To make all the cities completely sanitized and ensure that all citizens, with special focus on urban poor, differently abled and women, have access to the benefits of the safe sanitation across the value chain.
- 2) Suggest and identify ways and means towards creation of an enabling environment for realizing safe and sustainable FSSM in Uttar Pradesh.
- 3) Define Roles and Responsibilities of key stakeholders such as ULBs, Private Sector, Civil Society Organizations and Citizens of implementation of safe and sustainable FSSM.
- 4) Enable and support synergies and ensure convergence between relevant Central Government and State Government programs such as SBM, AMRUT, Smart Cities Mission, Namami Gange to realize city-wide access to safe, affordable and sustainable sanitation.
- 5) Promote the compliance to environmental discharge standards already set, recognizing the constraints in achieving these standards, adopt an appropriate, affordable and incremental approach towards achieving these standards.
- 6) Promote gender mainstreaming in FSSM, reducing the experience of health burdens, structural violence, and promote involvement of both genders in the planning for and design of sanitation infrastructure.

The Scope of this policy will cover onsite sanitation systems and the areas covered by such facilities. While this policy does not cover the networked system or sewerage system (including treatment plants) for the management of sewage, the Policy recognizes and encourages synergies between FSSM and Sewerage Management & Solid Waste Management, e.g. Co-Treatment of Faecal Sludge in Sewage Treatment Plant and Co-Processing of Faecal Sludge in Solid Waste Management facilities. The policy addresses the entire value chain of FSSM including Containment, Emptying, Transportation, Treatment and Disposal/Reuse.

2.2 Goals of the Policy

The Policy would be implemented across the state and some of the Outcomes include:

1. Entire population of all Urban Areas of Uttar Pradesh have access to safe sanitation facilities, such that no one defecates in the open, with special focus on Urban Poor, Differently Abled and Women.
2. Safe Containment of human waste in 100% of Urban Areas in Uttar Pradesh with all the toilets having some means of safe disposal system (e.g. septic tanks connected with soak pit or twin pits in case of onsite system or sewerage network)
3. Safe and cost-effective solution for Emptying, Collection and Transportation of Faecal Sludge to treatment sites through mechanized transportation system.
4. Scheduled or regular emptying of septic tanks or other containment systems at an interval of 2-3 years as recommended by CPHEEO Manual, BIS code, MoUD advisory on Septage Management (2013) and National FSSM Policy.

5. Safe Disposal through appropriate use of cost effective technology (e.g. Co-Treatment at Sewage Treatment Plant / Faecal Sludge Treatment Plant or Trenching facility) at designated disposal site.
6. Preventing the contamination of water bodies including lakes and rivers and groundwater from Human Waste (faecal matter) in all cities and towns in Uttar Pradesh.
7. Maximize reuse of treated sludge as fertilizer in farmlands, parks and gardens. Source of energy where feasible and reuse of the treated liquid for appropriate non-potable use.
8. Awareness generation about sanitation and its linkages with public and environmental health amongst communities and institutions.
9. Promoting mechanisms to bring about and sustain behavioral changes aimed at adoption of healthy sanitation practices.

These outcomes will be achieved by each ULB through implementation of an FSSM plan. The FSSM Plan will cover safely managing the entire sanitation service chain including Containment, Emptying, Transportation, Treatment and Reuse or Safe Disposal of Faecal Sludge and Septage. FSSM plan will include activities related to asset creation in terms of septic tanks, procurement of desludging vehicles, ensure regular/scheduled cleaning cycle of 2-3 years and establishment of Faecal Sludge and Septage Treatment facilities. Additionally, ULBs will also formulate bye-laws related to onsite sanitation, create database on onsite sanitation arrangements in the city, explore possibilities for private sector involvement in FSSM value chain and levy tax/charges to finance FSSM activities.

3 Strategic Policy Actions

Strategic Policy Actions would outline broad provisions to address the aforementioned issues and layout a roadmap for implementation of effective city-wide FSSM in Urban Areas across the state. The provisions in this Policy are broad based and a detailed FSSM Strategy & Implementation Plan and an Operative Guidelines shall be formulated for aiding the relevant stakeholders in Planning, Designing, Implementing, Managing, Monitoring and Capacity Building of various components under FSSM in Urban Areas of Telangana.

3.1 Legislative and Regulatory Context

The key Central Acts and Policies that provides the legal context for this FSSM Policy is provided in the timeline below:



Central Laws, Rules and Regulations:

Environment (Protection) Act, 1986 and the **Water (Prevention and Control of Pollution) Act, 1974** provide a framework for control of effluent, wastewater and septage discharge. The Environmental (Protection) Act of 1986 is an umbrella Act. The Central Pollution Control Board (CPCB) is the main authority that sets pollution discharge standards while State Pollution Control Boards (SPCB) have the

The Municipal Solid Waste (MSW) Rules, 2016 under the Environment (Protection) Act apply to the final and safe disposal of post-processed residual faecal sludge and septage to prevent contamination of ground water, surface water and ambient air. Further, the MSW Rules 2016 will apply to the final and safe disposal of post-processed residual faecal sludge and septage.

The **Employment of Manual Scavengers and Construction of Dry Latrines (Prohibition) Act, 1993** put a ban on dry latrines, i.e., latrines with no water-seal or flushing mechanism, and the employment of persons for manually carrying human excreta. This was supplemented in 2013 with the **Prohibition of Employment as Manual Scavengers and their Rehabilitation Act, 2013** by which “hazardous cleaning” in relation to sewers and septic tanks was also banned. The law now provides that manual cleaning of sewers and septic tanks, if necessary, may be carried out only in very controlled situations, with adequate safety precautions, and in accordance with specific rules and protocols for the purpose. All public and private sector staff should adhere to safety norms as provided in the Manual on Sewerage and Sewage Treatment published by the Ministry of Urban Development (now Ministry of Housing and Urban Affairs) and such other safeguards under the Prohibition of Employment as Manual Scavengers and their Rehabilitation Act, 2013. Ministry of Housing and Urban Affairs (MoHUA) further released a Standard Operating Procedure for cleaning of Sewers and Septic Tanks (November 2018) which should be adhered.

National Urban Sanitation Policy (2008) was formulated by Ministry of Housing and Urban Affairs (MoHUA) (formerly Ministry of Urban Development) with an objective of clean, sanitized, healthy and liveable cities in the country. NUSP recommended safe and effective FSSM. It stipulates each State to formulate its sanitation strategy and each city to develop a City Sanitation Plan (CSP).

National Policy on Faecal Sludge and Septage Management (2017) was formulated by MoHUA to set context, priorities and give directions for nation-wide implementation of FSSM. The Policy recommends each state to develop a state specific FSSM Policy, FSSM Strategy, Action Plan and an Operative Guidelines for the ULBs.

State Laws, Rules and Regulations:

The Urban Local Bodies in the state are steered by **Uttar Pradesh Municipalities Act, 1916** and **Uttar Pradesh Municipal Corporation Act, 1959**.

Uttar Pradesh Urban Planning and Development Act (1973) provides for the preparation of town planning schemes in respect of all lands within the municipal area to ensure regulated development of towns to secure their present and future amenities and conditions.

The Urban Local Bodies shall notify their own **FSSM Bye-Laws** for ensuring safe and effective city-wide FSSM. In addition, the state and appropriate development authorities would need to review the building regulations to ensure proper construction of adequate on-site sanitation facilities, which in turn need to be disseminated to the construction industry. The Bye-Laws shall address delineation between private (households, housing societies, institution etc) and public responsibilities (Urban Local Body and other Authorities and public agencies), the design, construction, operation & maintenance of sanitation systems along the entire sanitation value chain including methods of approval of building plans, or retro-fitting existing Onsite Sanitation installations, tariffs/cess for sanitation management, penalty clauses for violation of rules, laws, regulations, issuance of permit/licenses to private operators providing services, regular monitoring & record keeping, training, education and awareness generation etc.

3.2 Roles and Responsibility

Successful Operationalization of this Policy would require involvement and participation of all the Stakeholders in the FSSM Value Chain. The roles and responsibilities of different stakeholders are given in the table below:

Agency	Roles and Responsibility
Department of Urban Development, Govt. of U. P.	Constitution of a State Sanitation Task Force with a focus on sanitation related issues including FSSM. The responsibilities of the Task Force would include initializing State FSSM Strategy, prepare Periodic Action Plans, Review various FSSM initiatives and Monitoring & Evaluation of the progress of the ULBs in implementation of the FSSM Action Plans.
	Coordinating and networking among various stakeholders and government agencies such as U. P. Jal Nigam, U. P. State Pollution Control Board, Directorate of Local Bodies, Various State Mission Directorates etc.
	Operationalize and Managing State Sanitation Fund responsible for financial assistance to ULBs in implementing the FSSM Plan
	Building Strategic Partnerships to promote effective FSSM including forward and backward linkages including promoting Reuse of treated by-products.

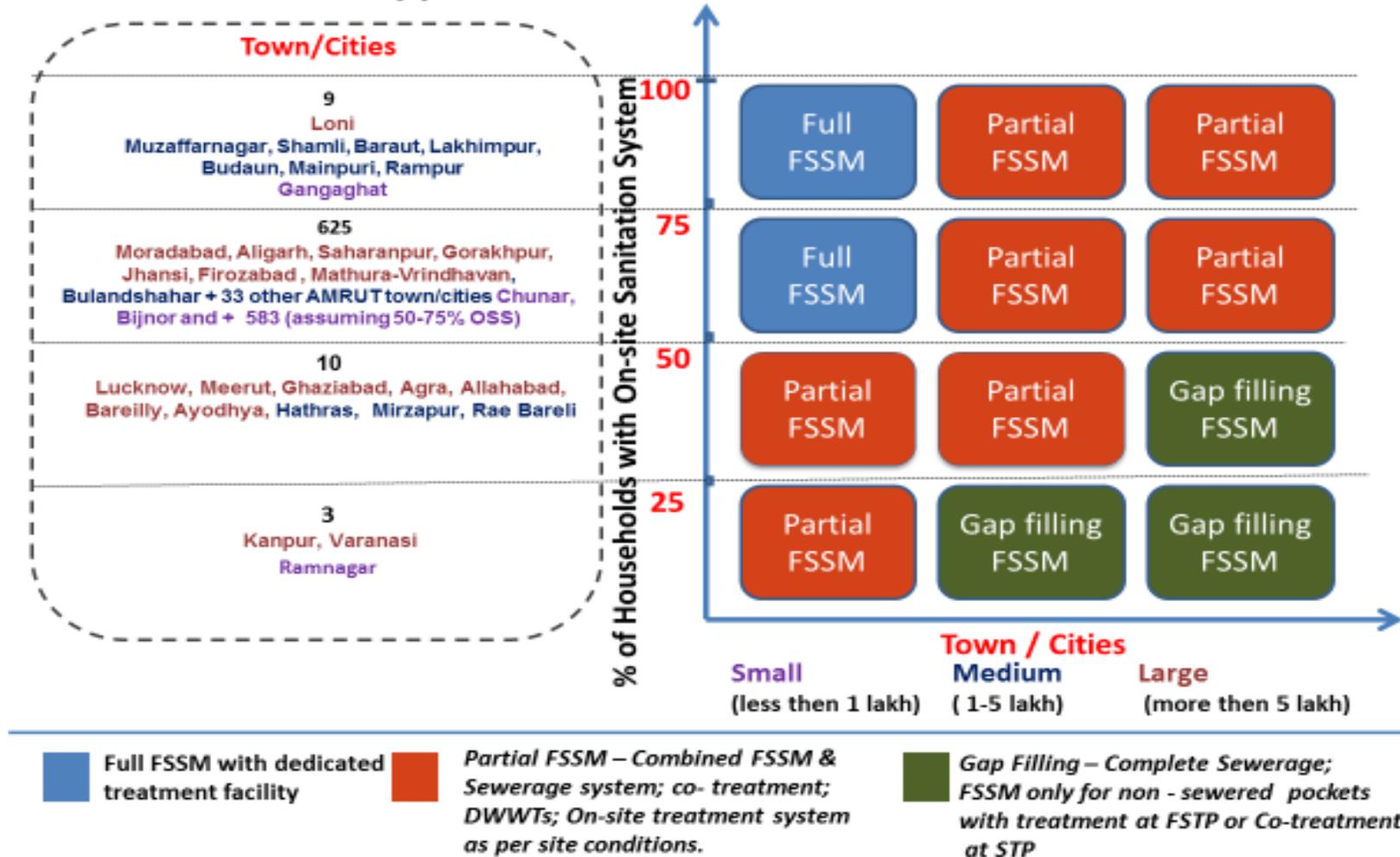
Agency	Roles and Responsibility
Directorate Local Bodies, Govt. of U. P.	Nodal Agency for all FSSM related initiatives at the ULB level
	Guiding all the ULBs for implementing city level FSSM related strategy
	Ensure strict compliance of the provisions under the “The Prohibition of Employment as Manual Scavengers and their Rehabilitation Act, 2013” by the ULBs
Uttar Pradesh Jal Nigam	Proactively plan for Faecal Sludge and Septage Management in coordination with the concerned ULB in the un-sewered areas while implementation of Sewerage Schemes in the ULBs.
	Providing technical support for formulating and initializing State FSSM Strategy and Action Plan.
	Responsible for / Support ULBs in the State for Scaling-up the establishment of Faecal Sludge Treatment Plants in all cities and towns across the state.
	Ensure Co-Treatment of Faecal Sludge in all the existing and proposed STPs through appropriate technical interventions and administrative interventions in coordination with the concerned ULBs.
	Responsible for preparation of various Standard Operating Procedures (SOPs).
Uttar Pradesh State Pollution Control Board	Monitor and enforce compliance of environmental laws and rules applicable for safe and effective FSSM.
	Assist in formulation of advisories, guidelines, SOPs, manuals etc to ensure environmental compliance for FSSM operations.
SPMG / SGRCA (State Nodal Agency for National Mission for Clean Ganga)	Ensure that all the Ganga Priority cities and towns have access to safe sanitation whether through sewerage network or FSSM.
	Ensure Co-Treatment of Faecal Sludge in all the existing and proposed STPs (under its scheme) through appropriate technical interventions and administrative interventions in coordination with the concerned ULBs.
State Mission Directorate for PMAY-Housing for All scheme	Ensure that the new Project have access to safe sanitation which includes safe treatment & disposal either to available sewerage network or properly designed septic tanks which are emptied regularly.
State Mission Management Unit - NULM	Ensure that the Sanitation Works / Service Providers in FSSM are aware and have access to the benefits available to them under the National Urban Livelihood Mission.
Other State Govt. Departments and Agencies	Incorporation of the provisions in the policy in their respective policies, programmes, guidelines, plans and projects etc.
	Provide relevant inputs to the FSSM implementation strategy and action plan.
Urban Local Bodies	Formulating and initializing city-level FSSM strategy and action plan.
	Creating of City Sanitation Cell (as part of the health / sanitation department) whose responsibility would include monitoring of city-wide FSSM operation

Agency	Roles and Responsibility
	<p>Notification of city FSSM bye-laws with appropriate incentives as well as disincentives / penalties for behavioral change and incorporating best practices for effective city-wide FSSM.</p> <p>Ensure sustainable O&M of city-wide FSSM operation</p> <p>Creating enabling environment and explore various business models for Private Sector participation in FSSM.</p> <p>Registration and licensing of all private desludging operators based on predetermined eligibility criteria</p> <p>Devise and initialize strategies for scheduled or regular desludging with active Private Sector Participation.</p> <p>Design and initialize appropriate tariff / user charges / tax / tipping fees for sustainable operation of FSSM and reduce the reliance on Central and State Govt. grants.</p> <p>Incorporation of design and planning of model Septic Tank, effluent disposal and toilet design etc in the building bye-law.</p> <p>Developing training programs for various FSSM service providers like masons, private desludgers etc.</p> <p>Undertake IEC and awareness generation for behavior change for safe and effective FSSM at a city-wide scale.</p>
Ward Councilors	<p>Lead the Ward-level FSSM IEC and awareness generation program.</p> <p>Ensure compliance of FSSM Bye-laws and ensure scheduled / regular desludging.</p> <p>Assign community representative for community-level monitoring</p>
Households	<p>Periodic cleaning and desludging of Septic Tank in compliance of the ULB Bye-law / FSSM Plan</p> <p>Timely payment of service charges/user fees/ taxes, if any, towards FSSM services.</p> <p>Regular maintenance and monitoring of septic tanks</p>
Desludging Operators	<p>Timely collection of waste from households as per a schedule /or as per demand from household and disposing waste at designated location only</p> <p>Strict adherence to the Laws and Regulation including Standard Operating Procedures, ULB Level Bye-Laws applicable for effective and safe FSSM.</p> <p>Regular maintenance of equipment and vehicles</p> <p>Maintenance of up to date records and logbook of details related to the desludging operations.</p>
Service Provides: Masons, Engineers	<p>Acquire requisite skills through training and capacity building to design and construct quality septic tanks as per ISO / BIS norms</p> <p>Discourage cost-cutting by employers/house owners from cheap and sub-par construction of toilets, septic tanks soak pits etc.</p>

Agency	Roles and Responsibility
Private Sector Agencies	Active participation in FSSM initiatives at state and city level
Financial Institutions	Provide financial assistance to desludging operator for purchasing of new or upgradation of existing equipment / vehicles.
	Extend concessional loans to households in the state for building toilets, retrofitting unsanitary toilets / non-conforming septic tanks or repair and maintenance of these facilities.
	Provide financial assistance for city/community level assets needed for safe and effective FSSM.
Academia, Research and Civil Society Organizations	Undertake primary research to further safe and sustainable sanitation
	Develop models for safe and sustainable delivery of FSSM services to all
	Supporting implementation of FSSM activities at the ground level
	Raising awareness and sensitization regarding the importance of safe city-wide FSSM to all the stakeholders.
	Providing monitoring support to the ULBs on any unsafe practices that impact safe and effective FSSM
	Set-up regular interactions with the ULB to discuss issues and be a part of the solution

3.3 Implementation Approach and Action Plan

FSSM approach for urban areas in Uttar Pradesh



Note: To optimize the cost of implementing FSSM, cluster approach (desludging and treatment services can be shared among two smaller cities or small cities can make use of infrastructure at larger cities) should be adopted

Category	Actions	Year 1				Year 2				Year 3				Year 4				Year 5				
		Q1	Q2	Q3	Q4																	
CLUSTER 1 > 10 Lakh population	A1																					
	A2																					
	A4																					
	A3 + A6 + A13																					
	A7 + A9																					
	A8																					
	A10 + A15																					
	A11																					
A12 + A14																						
CLUSTER 2 & 3 1.2 - 5 Lakh population and 5 - 10 Lakh population	A1																					
	A2																					
	A4																					
	A3 + A5 + A6 + A13																					
	A7 + A9																					
	A8																					
	A10 + A15 + A16																					
	A11																					
A12 + A14																						
CLUSTER 4 < 1.2 Lakh population	A1																					
	A2																					
	A4																					
	A3 + A5 + A13																					
	A7 + A9																					
	A8																					
	A10 + A15 + A16																					
	A11																					
A12 + A14																						

A1: Baseline data collection and formation of City Sanitation Task Force

A2: Preparation of city - level strategy on Faecal Sludge and Septage Management including decentralised liquid waste management

A3: Regulating & licensing of private desludgers and installation of GPS devices in each vacuum tanker (ULB-owned and private)

A4: Preparation of Citywide Sanitation Plan

A5: Identification, construction and designation of trenching sites for safe disposal of faecal sludge, till the time scientifically - designed treatment plant is in place

A6: Operationalising co-treatment at existing STP and/or co-composting with municipal solid waste wherever feasible for safe treatment of collected FSS

A7: Construction and commissioning of faecal sludge treatment plants with effective reuse of by-products (wherever feasible) for safe management of all the collected FSS

A8: Capacity building programme for ULB, service providers, masons, operators etc.

A9: Ensure adequate manpower and efficient equipment for collection and transport of FSS

A10: Implement scheduled desludging, initially on a pilot-scale and eventually extending across the city

A11: Operationalise decentralised wastewater treatment systems for the effluent generated from onsite sanitation systems and greywater

A12: All households with individual toilet in non - sewerage areas to have safe onsite sanitation system

A13: Incorporate FSS co-treatment modules in the STPs which are in planning/designing/construction phase

A14: Conduct GIS survey for geo-tagging of all properties in the city

A15: Ensure enforcement of 'The Prohibition of Employment as Manual Scavengers and their Rehabilitation Act, 2013' and provisions for penalising the defaulters

A16: Gap analysis and construction & commissioning of FSTP(s) for safe management of all the generated FSS , in conjunction with the implementation of scheduled desludging

3.4 Private Sector Participation

For effective operationalization of Scheduled / Regular Emptying and Transportation of Faecal Sludge from Containment Systems and its Treatment and safe Reuse, Private Sector Participation needs to be explored by the Urban Local Bodies.

ULBs would assess the viability and affordability of Public Private Partnership (PPP) in the delivery of safe and effective city-wide FSSM. The ULBs should explore various PPP options for Private Sector Investments in FSSM including options like Viability Gap Funding (VGF), Annuity Contracts etc. with suitable cost recovery mechanism. Options for cost recovery, may include but not limited, to either one or a combination of collection of User Fee (through property tax or water charges) / sale of by-product / Tipping Fee paid by ULB / Discharge Fee paid by Desludging Operator or through an Annuity.

ULBs would be encouraged to use Performance Based Contract where the payment to the Private Agency is linked to the performance in providing FSSM services.

3.5 Financing FSSM

The capital expenditure needed for safe and effective city-wide FSSM across the value chain will have to be provided by the joint effort of the central and state government primarily through the allied programme funding like Swachh Bharat Mission, Smart City or AMRUT of Central Government or programme like *Naya Savera* of the State Government. An effective convergence mechanism would be needed to create synergies among various Central and State Govt. schemes for effective FSSM.

The ULB would be encouraged to use their own sources of income including funds devolved from Centre / State and explore other innovative means of finance like CSR funding, Concessional Loans from Development Banks, Municipal Bonds, Commercial Lending or Private Sector investment through PPP mode etc.

During the operation and maintenance stage, sufficient funds would be needed by the ULB for sustaining a safe and sustainable city-wide FSSM. The ULBs would be required to allocate sufficient funds of FSSM in their budget. In order to reduce the budgetary constraints on effective FSSM, the following revenue options may be used by the ULB for sustaining FSSM operations:

1. Sanitation Tax / User Fee as part of the property tax / Water Bill etc
2. Fee paid by Licensed Desludging Operators to the ULB.
3. Fine for faulty containment system construction and illegal disposal of faecal sludge.
4. Sale of end products (For e.g. dried faecal sludge, water)

The ULBs would be encouraged to promote micro-finance / concession loan schemes or initiate a grant subsidy schemes with involvement of Self Help Groups (SHG) / Community Based Organizations (CBO) for poor households in order to achieve access to toilets and safe containment systems / retrofitting containment system not conforming to BIS specifications.

While planning to mobilizing revenue for sustainable FSSM, ULB shall be encouraged to explore the following enabling provisions:

- a. As per the Uttar Pradesh Municipal Corporation Act, 1959, Chapter IX: Corporation taxation, Section 173(d), **Conservancy tax** can be levied on all the properties by the Corporation where city undertakes the collection, removal and disposal of excrementitiously and polluted matter from privies, urinals and cesspools.
- b. If ULB explore the possibility of private sector involvement in FSSM, then an **escrow account** can be set up where revenues from the sanitation tax/ charge are transferred. The contractual amount for FSM services to the private party can be paid from this escrow account to avoid delays.
- c. **Periodic revisions for the taxes/ charges** to be effected based on revisions in costs involved
- d. To the extent possible, revenues should be generated from **sale of treated Faecal Sludge / Septage** for agriculture/horticulture or other purposes including local reuse of treated water to meet various non potable requirements
- e. The ULBs would be encouraged to look at cross-subsidies from other remunerative programmes or initiatives.

Out of the 647 towns and cities in Urban Uttar Pradesh, 60 cities are eligible for funding under the AMRUT scheme. The State Government and the Urban Local Bodies would be encouraged to explore other sources of funding for the balance towns which can include NMCG, SBM etc.

An investment plan suited to the local capacities will be needed by the municipality for asset creation. In order to lower the financial burden on public investments, innovative private sector funding ideas will have to be evolved and a revenue model to determine the user charges will have to be worked out for collection and conveyance.

The table below provides alternate funding models which can be used for funding FSSM interventions in the state.

Table 2: Alternate funding models

	Public sector	Outsourcing	Hybrid annuity Model	Private sector
CAPEX	State Government / ULB / grant from funding agency (100%)		Government 20-50% Private sector 50-80% Use of land for FSTP on leasehold	Private sector
O&M	ULB operates and maintains the facility	Operation carried out by private sector with service level agreements		Complete private sector with monitoring mechanism
Capital Recovery	Tax from polluters/ cross subsidization/ Expenditure Budget		Tax from polluters, Revenue from services	Revenue from services
Role of ULB	Ownership of assets and operations	Contract management and monitoring	Monitoring for service level agreements	Regulatory

3.6 Partnership Building for Safe Sanitation across the State

A strong network of partners in various sectors and of various backgrounds would be established, including renowned specialists/experts, corporates, research/academic institutions, civil society groups/CBOs/NGOs, private service providers, donor agencies, bilateral/multilateral agencies, etc. for bolstering capacities and knowledge in the sector.

There is an increased need to encourage greater private sector participation in service delivery and financing of FSSM activities by creating an enabling regulatory environment and creating opportunities.

Backward and Forward linkages shall be established with private players, other government departments, trade and farmer associations, etc. for optimum reuse of treated sludge and wastewater. Possibility shall be explored on whether treated and stabilized sludge can be used as organic fertilizer for farming and gardening, bio-gas recovered can be locally distributed for cooking or production of electricity, while treated wastewater could be reused by industries /power plants/ irrigation, etc.

Necessary platforms shall be established such as periodic conferences, workshops, summits, meetings, events, forming groups/associations, and others for regular interaction among various stakeholders and partners for knowledge sharing, peer-learning, progress review, information dissemination, etc.

3.7 Monitoring and Evaluation Framework for FSSM

The state will evaluate FSSM operations through dedicated service level benchmarks (such as San – Benchmark framework suggested in National FSSM policy) for all ULBs. Each ULB will set yearly targets in their City-level FSSM plan on progress and service improvement with respect to these benchmarks with the goal of achieving the benchmarks by the end of the period.

A performance-linked system of incentives and penalties may be devised for rewarding high performing ULBs and encouraging ULBs with poor performance to improve, as they will be scored annually as per the service level benchmarks for FSSM.

ULBs will be responsible for monitoring and evaluating its performance related to FSSM activities across sanitation service chain. ULBs will have to develop a database related to on-site sanitation system viz. data on HHs attached to onsite disposal systems, septic tank emptying details, related complaints as well as service provider details for FSSM related activities. The ULBs would be encouraged to use GIS / GPS aided system to monitor the FSSM implementation in the city.

ULBs should develop a robust grievance redressal mechanism for complaints relating to FSSM services in the city. This can include a dedicate Call Centre for all issues related to sanitation including FSSM. In addition to this a Sanitation Cell within the Health Department can be formed which would be dedicated for monitoring and grievance redressal of issues related to sanitation including FSSM.

3.8 Community Engagement, Stakeholder Involvement and Capacity Building

A rigorous awareness campaign, using multiple channels & media, should be undertaken to educate various stakeholders about FSSM. The campaigns should include spreading awareness among residents about Government schemes, benefits of scheduled desludging, various incentives for the same, good sanitation practices and monitoring of FSSM operations. This should be done with the involvement of ward councilors, community leaders, CBOs, etc. Various neighborhood and city level institutions such as schools, colleges, CBOs, etc. would be actively engaged as volunteers in these campaigns

The awareness campaigns should also involve members of Resident Welfare Associations, Community Organizers, Self-Help Groups and general public who should be sensitized periodically regarding the need for a safe Faecal Sludge and Septage Management. The health hazards associated with improper collection and treatment of waste, and the ill-effects of sewage discharge into fresh water/ storm water drains should be explained and emphasized. Awareness generation activities should be carried out at the beginning of introducing a scheduled service in all wards and then repeated periodically over the three-year cycle. Sample material for awareness generation is shared in Annexure 9.

ULBs should address the issue of Gender Inclusivity during stakeholder involvement and ensure equitable involvement of women (may consider atleast 1/3rd participation) any committee formed for the purpose of initializing and planning of FSSM interventions, formation of City Sanitation Task Force, notification of FSSM Bye-Laws etc.

All the Officials, Staff and Service Providers involved in the Sanitation Value Chain, including Commissioners, ULB Executives, Engineering, Sanitary Officers & Inspectors, Private Agencies involved in FSSM service provision, should be well trained in every aspect related to safe FSSM and the best practices related to it. ULBs should ensure Service Providers in FSSM including masons involved in Toilet / Septic Tank construction, Emptying and Transportation and Treatment of Faecal Sludge are trained about all the safety norms, use of PPE and safe disposal and reuse of standards for treated Faecal Sludge.

The State / ULB can enter into Agreements (or MoUs) with prominent partners having a common agenda for capacitating municipal functionaries and service providers involved in providing city-wide safe FSSM. The State can explore agencies working in this area and having expertise in FSSM which may include Centres of Excellence setup by MoHUA, agencies empaneled under Integrated Capacity Building for all missions by MoHUA, National Skill Development Corporation, prominent institutions like NIUA-SCBP, CEPT University-CWAS, other Universities offering full time or online courses in Non Network Sanitation etc.

4 Faecal Sludge and Septage Management: how to start?

Faecal sludge and septage management is a process and requires attention in every stage of the entire sanitation chain. It needs to be comprehensive and requires step wise approach beginning from systematic planning to ensuring infrastructure and human resource for transportation and treatment of faecal sludge and septage (refer Figure 4). It has to be sustainable and requires consideration of socio-economic aspects of region. The safe disposal/reuse of faecal sludge, septage and effluent in scientific manner for pollution abatement is the main goal of the FSSM.



Figure 10: Steps for planning FSSM (Source: CSE, 2016)

4.1 Stakeholder identification and engagement

All interested parties, be they individuals, groups, organisations or entities, are stakeholders. Relevant stakeholders like representative from ULBs, PHEDS, Pollution Control Board, sanitary inspector, mason, vacuum truck operator, media, farmers etc. should be identified for the target area. Once identified, stakeholders are supposed to be analyzed based on the interest and influence chart, as shown in Figure 5. The analysis includes understanding their profile, their interests, their position (for or against), and their ability to influence FSSM practices. Stakeholders are then engaged through different strategies.

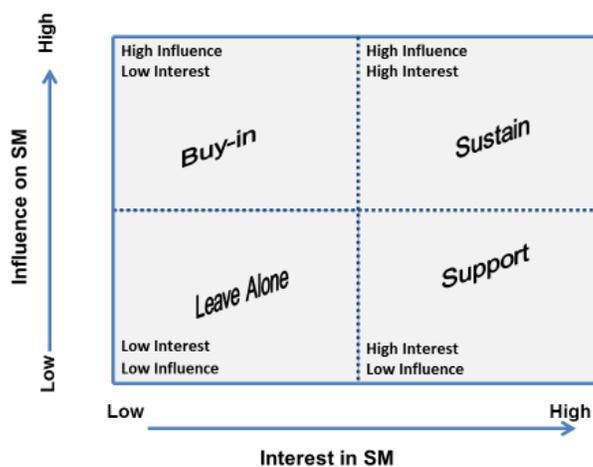


Figure 11: Stakeholder engagement strategy (Source: CSE, 2016)

Stakeholder engagement is a key pre-requisite for successful implementation of FSSM. If the city already has a city sanitation task-force, as notified in NUSP, then the same team should deliberate about FSSM starting with collection and analysis of baseline data.

4.2 Assessment of baseline information

The next stage of FSSM is collection of baseline data from secondary sources like Census, state surveys, Detailed Project Reports (DPRs) of previous projects etc. and primary surveys wherever necessary for spatial information. It is important to understand how many households are using OSS. Spatial distribution of the houses in area should be qualitatively mapped. Preliminary surveys of households that are depended on the onsite sanitation system must be done to prepare comprehensive management plans. Following table provides basic but very crucial information to understand the situation for target area to plan FSSM.

Table 3: Essential baseline data to plan FSSM

Baseline data	Details and possible source of data
Base maps of the target area	Available with government agency. Can also be prepared using Google earth
Spatial distribution of households depended on the OSS	Secondary data sources like Census, primary survey by NGOs, published reports. This might not be available for small/medium town cities and therefore primary surveys are essential
Containment: types of onsite sanitation system	Septic tank with or without soak pit/ pit latrine etc with their average capacity, desludging frequency, fate of liquid waste (effluent) that is overflowing from the OSS is to be understood
Emptying and transportation: mode of emptying the OSS	Whether emptying service is provided by the government or by private operators. Number of service providers, infrastructure like no. Of trucks, laborers etc. Should be assessed
Treatment and disposal of FS	Whether there is any treatment of FS collected, where is it disposed.

Source: Compiled by CSE, 2016

Once the baseline data is in place, next step is assessment of initial situation of target area i.e. community, ward, zone or city. There are several tools available to help the ULBs analyze the collected data. One such tool is called faecal waste flow diagram (also known as SFD). It is an easy to understand advocacy and decision-support tool that summarizes and presents what happens to the excreta of the whole city/town through the sanitation chain. To learn how to make an SFD visit www.sfd.susana.org. An SFD of UP state is shown in Figure 1 and SFD of a sample city is shown in Appendix 1. Another method to identify the gaps is to compare the existing services with the revised service level benchmarks proposed in NFSSM policy, refer Appendix 2.

4.3 Suggested institutional framework

Under the National Urban FSSM policy, the roles and responsibility of each level of institution including the City-level has been mentioned in Appendix 3. Keeping this and the aforementioned

Roles and Responsibility of the state specific stakeholders, the ULBs are encouraged to operationalize the Strategic Action Points of this Policy.

The State Sanitation Task Force at the DoUD (Govt. of U.P.) would be responsible for preparation of State Level FSSM Strategy and guide the ULBs in preparation of FSSM Action Plan. The Task Force shall be responsible for Monitoring and Evaluation of the ULB's progress.

Each ULB is expected to establish a Sanitation Cell under its Health Department who would be dedicated towards FSSM specific interventions. They would be responsible for overseeing the FSSM related interventions at city & ward level.

The respective Ward Councilors would be responsible for leading the ward / community level FSSM related initiatives. Involvement of neighborhood level representatives in such initiative would be encouraged.

Uttar Pradesh Jal Nigam (UPJN) (State Level Parastatal body) would be responsible for creation of infrastructure needed for safe and effective FSSM. UPJN would actively plan for synergies in their master plan to include FSSM for non-sewered areas in the Sewerage Schemes of various cities. Provide technical support to ULBs in FSSM interventions. In addition to this UPJN would have a dedicated FSSM Cell responsible for monitoring the progress of FSSM interventions in the State.

The State Pollution Control Board would be responsible for monitoring the compliances related to environmental laws and standards.

4.4 Current economics and business models for FSSM

In the present scenario, the FSSM is majorly in the hands of private operators. The operators charge a Desludging Fee for emptying service provided to different stakeholders. Emptying points can be from individual households, residential colonies, commercial establishments, institutions, toilet complexes, offices etc. Generally, the operators are called for emptying only when the containment is full. The Desludging Fee for emptying of Containment varies significantly and is market driven. Due to absence of a dedicated disposal sites, private emptiers practice illegal dumping of Faecal Sludge / Septage into water bodies, utterly disregarding the threat posed to health and environment. They run their business without paying any fees to government authorities which means that despite high charges collected from customers, no revenue is generated by government authorities from emptying business. Farmers in whose fields the collected Septage or Faecal Sludge is disposed of also pay the private operators.

Business models for FSSM

Business Models for Emptying & Transportation and Treatment part of the FSSM Value Chain would include:

1. Integrated FSSM models wherein the Emptying & Transportation as well as Faecal Sludge Treatment Plant is being managed by a single entity contracted either by the ULB or State Parastatal.
2. Discrete Model wherein separate agencies would be contracted or licensed for Emptying & Transportation and Treatment & safe Disposal / Reuse of Faecal Sludge.

Different contracting structures include:

- a. **PPP mode:** wherein the initial Capex is funded by the Private Operator. The Operator recovers the investment either through or combination of collection of User Fee / sale of by-products / Tipping Fee paid by ULB / Discharge Fee paid by Desludging Operator or through an Annuity from the ULB / State Parastatal.
- b. **DBOT:** wherein the ULB / State Parastatal would fund Capital and well as O&M expenditure for the project. These are medium to long term contracts in which the Construction as well as Operations & Maintenance is the responsibility of the Private Operator. The ULB / State Parastatal is responsible for monitoring of the Service Level Parameters and make payments as per the contract.

Government could charge the private operators or / and septic tank owners to generate revenue for sustainably run FSSM programme in the ULB:

- a. Levying Sanitation Tax / User Charges
- b. Permits and their renewal for private operator through registration & licensing process
- c. Charges to repair the faulty design through registered mason / plumbers.
- d. Fine to defaulters (private operator / containment owner) for not following instructions given by government agencies.

ULBs could also look at Incentives like rebate in taxes, monetary incentives etc to Households / Stakeholders / Service Providers for behavioral change and adopting best practices in FSSM.

The ULBs can study various case studies of operational FSSM Models for applicability and replication. Examples of some National as well as International Case Studies include:

- a. **Integrated FSSM in Leh (J&K) in PPP mode:** The Private Agency was responsible of financing, construction and O&M of the FSTP as well as Emptying & Transportation of Faecal Sludge using vehicles provided by the ULB. The Authority is responsible for collection of User Charges from the Customers and paying an agreed portion of the User Charges to the Private Agency.
- b. **Scheduled Desludging in Wai (Maharashtra):** The Private Agency is responsible for capital expenditure needed for equipment and vehicles for Emptying and Transportation of Faecal Sludge and undertake Emptying and Transportation of the Faecal Sludge as per an approved schedule. The ULB collects Sanitation Tax from the Households which is put into an escrow account. This account is used to pay Annuity payment to the Private Agency which is subject to achieving the service level parameters defined in the Contract.
- c. **Indah Water Konsortium (IWK), Malaysia:** Malaysia has federalized the sewerage services and signed a 28-year concession agreement with a company called Indah Water Konsortium (IWK). The company is responsible for operations and maintenance of sewerage as well as septage management for major portion of the country. IWK is also responsible for collection of the User Charges from households and commercial establishments. Monitoring is done by 2 agencies which includes SPAN, is responsible for regulating the Sewerage Services, and JAS which is responsible for regulating effluent discharge.

- d. **Dakar (Senegal) FSTPs in PPP mode:** The Authority responsible for implementation of FSSM in Senegal is ONAS. ONAS has constructed 3 FSTP in Dakar. ONAS has delegated the O&M of the 3 FSTPs to Private Agency. The Private Agency is responsible for Operation & Maintenance of the facilities as per defined parameters and has the right to collect Discharge Fee from the Private Emptying Operators as well as selling the by-products from the FSTP. ONAS is responsible for monitoring the performance of the plant and has the ultimate responsibility for management and maintenance of the facility.
- e. **Dumaguete, Phillipines:** The fecal sludge management program in Dumaguete City utilizes a business model, which is a partnership between the local government and the local water utility (Dumaguete City Water District). Under this arrangement, the city owns and operates the treatment plant and the local water utility conducts the desludging program. A tariff is attached to the water bill that covers the debt service on the plant and trucks and enables septic tank desludging on a rotating five-year cycle. The city government and Water District financed the program's start-up costs, including construction of the treatment plant and access roads, and purchase of desludging vehicles using their own resources. The city government and Water District also co-manage the program.

The ULB should explore alternate business models across the FSSM Value Chain. Depending on the value proposition offered by the business in the Sanitation Value Chain many business models can be developed. A generic business model canvas is described in Appendix 4.

4.5 Monitoring and grievance redressal systems at ULB level

In addition to the aforementioned At each stage of sanitation chain i.e. from containment till end-use, monitoring is essential. Any lapse in monitoring means avoidable delays in achieving the goals of the programme (Refer Appendix 5). Format for issuing license and information collection by operator is shared in Appendix 6, 7 and 8.

When any services are offered, there are always some issues and challenges associated with them. Customer satisfaction should be main objective of service provider. In FSSM many stakeholders/beneficiaries are involved. It may not be possible that each beneficiary is satisfied with services. Therefore, for appropriate disposal of the complaints with FSSM, a complaint redressal system must be put in place before services are offered. The mode of the redressal system should vary according to the size of the target area, from simple register to complex information technology based system. Nodal officers must be appointed as part of a dedicated Sanitation Cell (in the Health Department of the ULB) to dispose of the complaints for each stage of FSSM.

Nodal officer should review the complaint and dispose it. However, in case the complaint is not addressed or user is not satisfied, there should be provision to take the complaint to higher authorities or institutions (e.g. pollution control board) for appropriate action. Figure 6 explains the complaint redressal system.

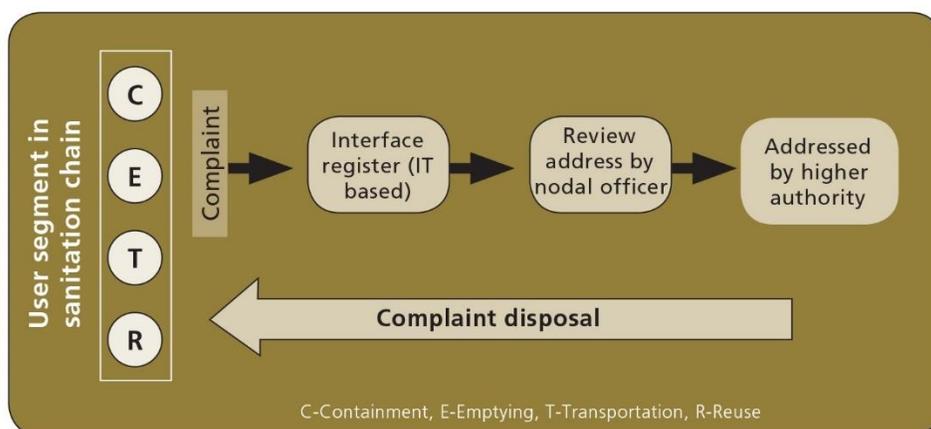


Figure 12: Flowchart of complaint redressal system for FSSM (Source: CSE, 2017)

The Sanitation Cell in the ULB would be required to create and manage a database of information related to the sanitation systems of the households in the city as well as service providers in the Sanitation Value Chain active in the city. Appropriate GIS / GPS based tools should be used to aid such initiative.

5 Technological options for FSSM

5.1 Containment system

In practice the septic tanks are not constructed according to the IS code and hence the efficiency of the system is not up to the mark, it further affects the emptying frequency and the quality of effluent and FS/septage recovered from these tanks. These systems are constructed by local masons generally based on the space available and financial status of the user. The masons often create bigger systems than required. Often, the bottom of the tank is not lined, to decrease the frequency of emptying. See Table 3 for an overview of the ongoing containment practices in UP. Refer Appendix 10 for a brief description of containment systems prevalent in UP and also the output expected out of such systems. The septic tank design prescribed by IS code is described in Appendix 11.

Table 4: OSS in urban India

Type of systems	Containment type	Prevalent OSS	OSS as per Census of India, 2011	Standards for OSS
Onsite sanitation systems	Lined containment	Septic tank with soak pit	Septic tank	Bureau of Indian standards
		Septic tank without soak pit		
		Collection tank		
		Bio-toilet	Other technology	DRDO and SBM

		Bio-digester		
	Unlined containment	Pit latrine/ VIP	Pit latrine	SBM containment guidelines
		Twin pit latrine		

Source: Compiled by CSE, 2017

5.2 Emptying and transportation

Emptying of containment system is done both mechanically and manually. At the end of a fixed time period, ideally two-three years, containment system should be emptied of FS/septage. The scheduled emptying should be done in order to facilitate treatment of faecal matter in the onsite sanitation system. There are many benefits of regular desludging including increased efficiency of OSS and better discharge quality of effluent.

The Prohibition of Employment of Manual Scavengers and their Rehabilitation Act, 2013 prohibits employment or engagement of manual scavengers, however many locations which are inaccessible to mechanical emptying continue to employ manual scavengers. Other than manual emptying, mechanised methods include use of vacuum tanker or tractor mounted vacuum tankers, these are used for emptying of containment systems. Mechanised systems are usually accompanied with a driver and a helper (which may be 2 in some cases). Vehicles that carry FS/septage act as a mobile sewer network for OSS. Ideally ultimate discharge point of collected FS/septage is STP or faecal sludge treatment facility if it exists. No Personal Protective Equipment (PPE) is used by the operators while emptying the tanks or pits posing risk to health.

Precautions to be taken during emptying

- Proper Personal Protective Equipment (PPE) should be used to avoid any transmission of pathogens to the operator providing de-sludging service
- Some amount of septage/sludge should be left in the septic tank to ensure retention of necessary microorganisms responsible for anaerobic digestion in the tank
- Due to anaerobic digestion processes, flammable gases are formed in septic tanks. While opening the chambers for de-sludging they escape into atmosphere. Hence, it is recommended not to light fire nearby it. (e. g. use of match stick for smoking) during that period
- Because of the sensitivity of septic systems due to presence of bacteria that speeds up anaerobic digestion process, care should be taken not to scrub the septic tank, clean using strong chemicals etc. so that bacteria do not die.

The two main types of vehicles used in India are:

1. Truck mounted vacuum tanker (Vacuum tanker)
2. Tractor mounted tanker

Truck mounted vacuum tankers (Vacuum trucks)

These trucks have vacuum pumps, whose sizes are based on lift elevation, pumping distance, volume of sludge to be removed, and volume of the tank. Their capacity varies from 3000 liters-10,000 liters.

Tractor mounted vacuum tankers

These vehicles are locally made across India, but capacity is similar to the vacuum trucks. The motor, the tank and the tractor are joined together according to the complimenting capacity of each module.

A truck-mounted vacuum tanker



Tractor-mounted vacuum tanker

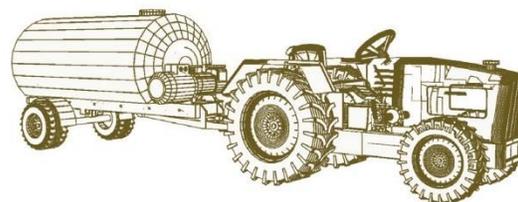


Figure 13: Two types of vehicles commonly used in UP

5.3 Faecal sludge and septage treatment

The characteristics of FS/septage show that it is harmful for environment and health of living beings if it is disposed without treatment. Therefore, it is necessary that FS/septage collected from various points in the city needs to be disposed at an appropriate treatment facility. Both FS/septage and effluent needs to be treated. Small bore systems can be used to convey effluent to small distances and then treat it at decentralized scale, refer Appendix 12 for more details. To choose the best combination of technologies the existing scenario of the city has to be discussed among the stakeholders. Things like population density, water usage, type of onsite system prevalent in city, soil strata, ground water table, land available, topography of the city, and characteristics of the FS/septage, demand of the end product, capital cost and operation cost should be considered before deciding on the technology combination. The treatment can be achieved in three ways

- 1) Co-treatment with wastewater at sewage treatment plant
- 2) Co-composting with municipal solid waste
- 3) FS/Septage treatment plant

The four main functions of FS/septage treatment are: the solid-liquid separation, stabilization, dewatering or drying, and pathogen reduction. Figure 8 shows the different technologies based on their functions. Comparison of various technologies with respect to various parameters is shown in Appendix 13. Refer Figure 9 for understanding the selection of best suitable effluent disposal method.



Figure 14: Different treatment technologies based on their function (Source: Tilley et al, 2014)

5.4 End-use and resource recovery

End-use of FS/septage refers to the safe, beneficial use of human excreta, i.e. faeces and the wastewater from onsite sanitation technologies. The type of end-use should decide the level of treatment. Considering the nutrients, organic matter and energy contained in FS/septage, it can be used as soil conditioner or fertilizer in agriculture, gardening, aquaculture or horticultural activities (See Figure 10). Other uses include use as a fuel source, building material or for protein food production. Closing the loop would not only help in reducing fresh water demand and chemical fertilizer demand but also prove to be a source of revenue, in other words can help improve the business model. Appendix 14 and 15 details out the permissible standards for the compost to be used in food crops and the discharge standards for effluent respectively.

ULB should carry out primary assessment for availability of market and demand of re-use.

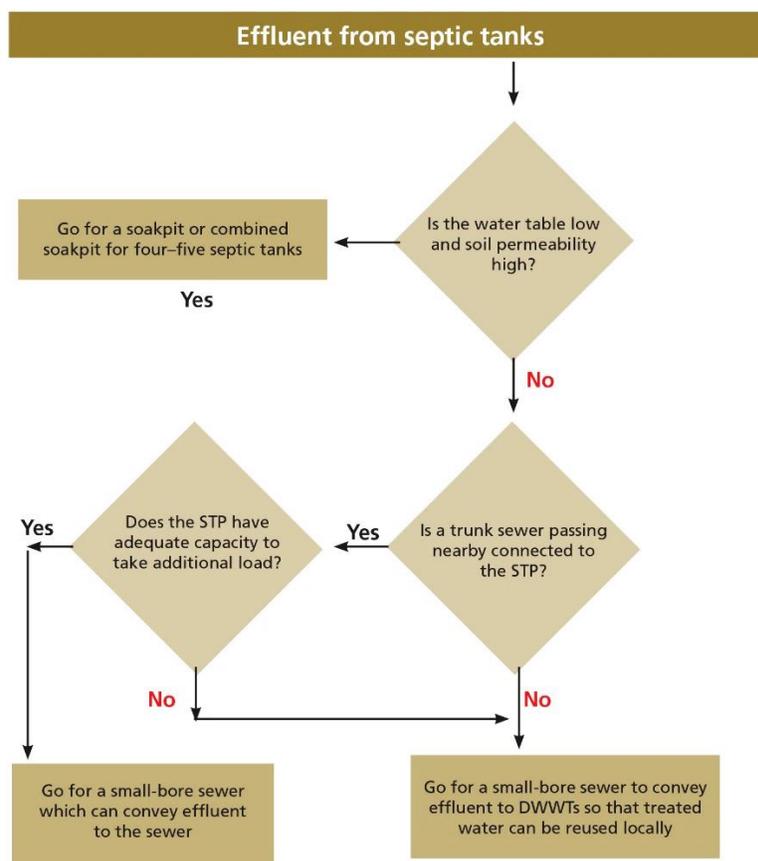


Figure 15: Flowchart to select suitable effluent disposal method (Source: CSE, 2017)

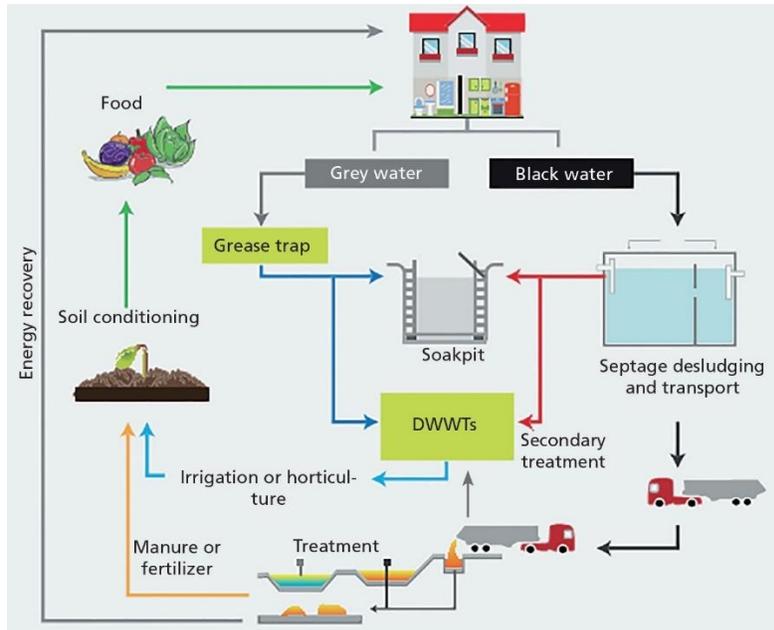
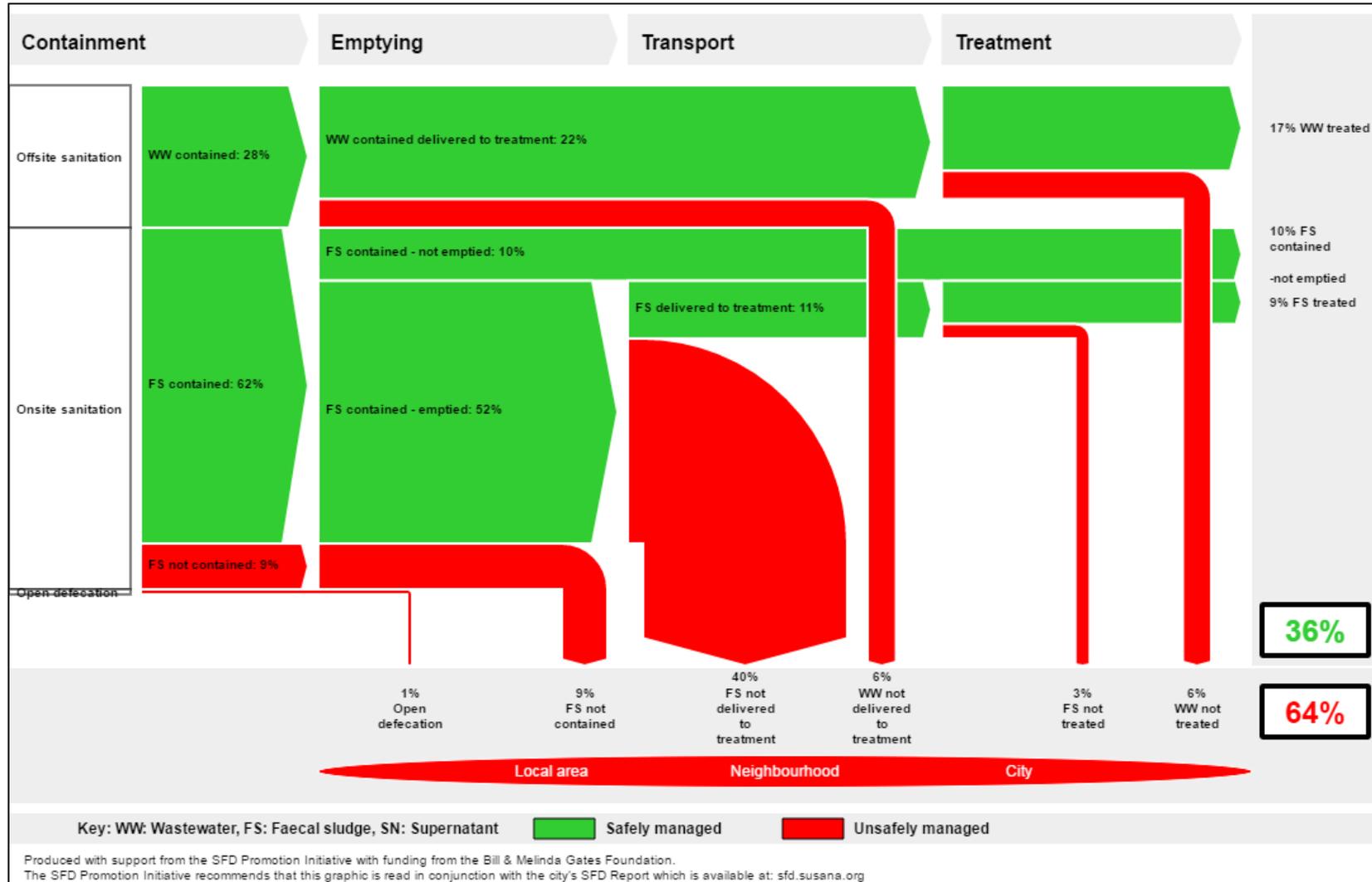


Figure 16: Closing the loop (Source: GIZ-CSE, 2016)

Appendix

Appendix 1: Faecal waste flow diagram of a sample city



Source: sfd.susana.org

Appendix 2: Revised service level benchmarks for sanitation

Current SLB indicators (Sewerage System)	Proposed Sanitation Benchmark (Sewerage + Onsite systems)
1. Coverage of sewerage network services	1. Coverage of adequate sanitation system
Total number of properties with individual connections to sewerage network as a percentage of total number of properties in the city.	Percentage of households with individual or group toilets connected with adequate sanitation systems (sewer network/ septic tank / double pit system) to total households in the city
2. Collection efficiency of sewerage network	2. Collection efficiency of sanitation system
Quantum of sewage collected at the intake of the treatment plant to the quantity of sewage generated (as per CPHEEO, 80% of water consumed is generated as sewage)	Weighted average of collection efficiency of each sanitation system, weighted by share of households dependent on each sanitation system
3. Adequacy of sewage treatment capacity	3. Adequacy of treatment capacity of Sanitation System
Adequacy is expressed as secondary treatment capacity available as a percentage of normative wastewater generation.	Weighted average of adequacy of treatment plant capacity available for each sanitation system, weighted by share of households dependent on each sanitation system.
4. Quality of sewage treatment	4. Quality of treatment of sanitation system
Quality of treatment is measured as a percentage of WW samples that pass the specified secondary treatment standards, that is, treated water samples from the outlet of STPs are equal to or better than the standards lay down by the Gol agencies for secondary treatment of sewage.	Weighted average of quality of treatment of each sanitation system, weighted by share of households dependent on each sanitation system.
5. Extent of reuse and recycling of sewage	5. Extent of reuse and recycling in sanitation system
Quantity of sewage that is recycled or reused after secondary treatment as a percentage of quantity of sewage received at the treatment plant.	Weighted average of extent of reuse of treated wastewater and sludge after adequate treatment as a percentage of sewage and sludge received at the treatment plant, weighted by share of household dependent on each sanitation system.

Source: National Policy on FSSM, MoHUA, 2017

Appendix 3: Roles and responsibilities of institutions

Agency	Role	Responsibility
Ministry of Urban Development	<ul style="list-style-type: none"> • Technical and planning support to states and ULBs • Training and capacity-building of state level officials and those from select ULBs • Funding through specific schemes and plans • National level awareness and behaviour change campaign • Support research and capacity building in the sector • Create enabling environment for participation of the private sector, NGOs and CBOs in provision of FSSM services including to the poor and marginalized households and areas • National-level monitoring and evaluation 	Formulation of state- and city-level FSSM strategies and implementation plans
Ministry of Environment, Forest and Climate Change	Enforce compliance of the relevant environmental laws and rules during the collection, transport, treatment and disposal of faecal sludge and septage	Support and build capacity of state pollution control towards enforcement of relevant laws and rules
Ministry of Social Justice and Empowerment	<ul style="list-style-type: none"> • Elimination of manual scavenging and rehabilitation of manual scavengers • Monitor and evaluate progress at the national level • National-level awareness campaign 	Help states and ULBs eliminate manual scavenging and rehabilitate manual scavengers
Ministry of Women and Child Development		Gender mainstreaming in IEC material for FSSM across the country
State Governments	<ul style="list-style-type: none"> • Develop state-level FSSM strategies and implementation plans • Develop operative guidelines on FSSM • Training and capacity-building of ULB officials and others engaged in provision of FSSM services • State-level awareness and behaviour change campaign • Create enabling environment for participation of the private sector, NGOs and CSOs in provision of FSSM services including to the poor and marginalized households and areas • Funding through specific schemes and plans • Support research and capacity-building in the sector • State level monitoring and evaluation 	<ul style="list-style-type: none"> • Technical, financial and administrative support to ULBs • Encourage coordination and cooperation among ULBs • Regulate and help ULBs set up systems to ensure financial sustainability in provision of FSSM services • Implement municipal by-laws.
Urban local bodies	<ul style="list-style-type: none"> • Design, develop, plan and implement ULB-level FSSM strategies • Set up and ensure operation of systems for 100 per cent safe and sustainable collection, transport, treatment and disposal of faecal sludge and septage • Develop expertise, in-house and outsourced, to provide safe and effective FSSM services • Awareness and behaviour change campaigns to engage diverse stakeholders • Develop training programmes for masons to build requisite skills in the construction of quality septic tanks as per IS codes • Set up systems to ensure financial sustainability in provision of FSSM services • Achieve objectives of FSSM policy in a time-bound manner • Design and implement plans to eliminate manual scavenging and rehabilitate manual scavengers • Funding through specific schemes and plans • Monitor and evaluate FSSM strategies and implementation plans • Implement municipal by-laws 	Create enabling environment for NGOs and private initiatives to achieve safe and sustainable FSSM
Households	<ul style="list-style-type: none"> • Timely and regular emptying of septic tanks through approved entities • Regular maintenance and monitoring of septic tanks • Timely payment of user fee and charges, if any, towards FSSM services • Practice building by-laws for construction of OSS 	Engage with decision-makers at the state- and ULB-level to ensure they receive good quality FSSM services

Source: National Policy on FSSM, MoHUA, 2017

Appendix 4: Generic business model for FSSM

Key partners	Key activities	Value propositions	Customer relationships	Customer segments
<ul style="list-style-type: none"> • Municipal corporation and local authorities • Technology suppliers • Financial institutions • Community-based organizations • Research and development institutions (e.g., local university) 	<ul style="list-style-type: none"> • Toilet provision • Waste collection 	<ul style="list-style-type: none"> • VP1: Access to toilet and increased revenue from end use 	<ul style="list-style-type: none"> • Direct sale of toilet 	<ul style="list-style-type: none"> • Community • Businesses
	<ul style="list-style-type: none"> • FS collection 	<ul style="list-style-type: none"> • VP2: Timely emptying and transportation of FS 	<ul style="list-style-type: none"> • One-on-one service provision • Contracts with municipality • Direct or through contracts 	<ul style="list-style-type: none"> • Households • Businesses
	<ul style="list-style-type: none"> • FS treatment 	<ul style="list-style-type: none"> • VP3: FS treatment for healthy and safe environment 	<ul style="list-style-type: none"> • Direct compost sales 	<ul style="list-style-type: none"> • Municipality
	<ul style="list-style-type: none"> • Organic waste and FS collection • Compost production • Compost – Sales & marketing 	<ul style="list-style-type: none"> • VP4: High-quality compost (soil ameliorant) 	<ul style="list-style-type: none"> • Distributors • Direct energy sale 	<ul style="list-style-type: none"> • Farmers • Municipal park department • Agriculture department • Agroforestry • Fertilizer industry
	<ul style="list-style-type: none"> • Biogas production • Biogas sale 	<ul style="list-style-type: none"> • VP5: Reliable and renewable energy service 	<ul style="list-style-type: none"> • Power purchase agreement 	<ul style="list-style-type: none"> • Households • Community • Small businesses
	<ul style="list-style-type: none"> • Customer relationship management 			<ul style="list-style-type: none"> • Public sector (e.g., municipality, ministry, etc.) • Institutions
	<ul style="list-style-type: none"> • Key resources • Appropriate technology and equipment • Labor • Finance • License and contracts for collecting waste 		<ul style="list-style-type: none"> • Channels • Direct • Municipality • Word-of-mouth • Brochures and other media communications • Distributors and extension agents 	
Cost structure		Revenue streams		
<ul style="list-style-type: none"> • Fixed investment cost (construction, trucks, equipment, etc.) • Operation and maintenance cost (labour, raw material input, utilities, sales and marketing, license, etc.) • Interest payments 			<ul style="list-style-type: none"> • Sale of toilet and end use products • Sale of compost 	<ul style="list-style-type: none"> • FS disposal fees, sanitation tax and O&M budget support
	<ul style="list-style-type: none"> • Emptying fees and, in some instances, FS delivery fees 			
		<ul style="list-style-type: none"> • Sale of Energy 		
Social and environmental costs			Social and environmental benefits	
<ul style="list-style-type: none"> • Potential health risk for those in direct contact with FS (can be mitigated with the use of protective equipment) • Improper FS treatment and disposal causing environmental and health risks for citizens • Improved energy security 			<ul style="list-style-type: none"> • Reduced pollution of water bodies and soils • Reduced human exposure to untreated faecal sludge • Job creation 	<ul style="list-style-type: none"> • Improved soil and agricultural productivity

Source: Krishna C. Rao, 2016, Business models for fecal sludge management, IWMI

Appendix 5: Monitoring FSSM programme

Stage	Monitoring
Containment	<p>Construction as per prescribed standards by BIS or CPHEEO</p> <p>Construction of the containment by licensed masons and plumbers</p> <p>Overflow from containment is not diverted in open areas/drains</p> <p>Census of the OSS and retrofitting of the faulty containment is done. If not done within timeline, defaulters should be charged</p>
Emptying	<p>Safety standards are followed</p> <p>Legislative provisions like Manual Scavenging Act 2013</p> <p>Fixed charges are collected by private or government operators</p>
Transportation	<p>Vehicles are registered with ULB with transparency</p> <p>Vehicles are well maintained</p> <p>All vehicles are GIS enabled, so that disposal can be monitored</p> <p>FS/septage is disposed in designated disposal/treatment sites</p>
Treatment	<p>FS/septage characteristics are determined to design the treatment system</p> <p>In case of co-treatment at STP, design parameters to take additional FS/septage load is checked</p> <p>Effluent resulting from dewatering is treated to discharge standards</p> <p>Independent FS/septage treatment plant has adequate provisions for vehicles parking places without disturbance to surrounding</p> <p>Sludge drying beds are emptied regularly</p>
Disposal/ End-use	<p>Legislative provisions like water pollution and environment protection acts are followed</p> <p>Defaulters are charged/fined as per the provisions</p> <p>Quality checks of end product is done before reuse</p> <p>Rates of end product are affordable</p> <p>Treated waste water overflowing from containment meets prescribed standards of reuse for designated purpose</p>

Source: Compiled by CSE, 2017

Appendix 6: Form of application for the license of collection, transportation and disposal of FS/septage

Paste Self-Attested Recent Passport Size Photograph

1. Name of the applicant: Shri/Ms _____
2. Nationality: Indian _____ Other _____
3. Address: Regd. Office: _____
Head office: _____
4. Telephone No.: (O) _____ Mobile No. _____ Email ID _____
5. Registration No. of Vehicle : _____
6. Pollution certificate of the vehicle valid up to: _____
7. Insurance of the vehicle valid up to: _____
8. Fitness of the vehicle valid up to: _____
9. Vehicle, whether fitted with GPS: _____
- 10 Details of the vehicles indicating model, type, capacity, leak proof, odour and spill proof having proper vacuum/ suction and discharging arrangement (Document proof of any may be enclosed).
- 11 Processing fee for license Rs. 1000/- (Non-refundable)
D.D. No. _____ Date _____ Bank _____

I/We certify that information given by me/us in column 1 to 11 are true to the best of my knowledge and belief. I also certify that I have read and understood the attached terms and conditions 1 to 13 and agree to abide by them. I agree that if any information given by me is found wrong the application for license will be liable for cancellation at any time.

Signature(s) of
applicant(s)

Date:

No. of document attached: _____

Annexure 7: License for collection and transportation of FS/Septage

In accordance with all the terms and conditions of the By-laws/ Regulations, Municipal Corporation Act rules, the special license conditions accompanying this license and applicable rules and laws of Government of Uttar Pradesh, the permission is hereby granted to:

NAME OF
LICENSEE.....

ADDRESS.....
.....
.....

For the disposal of FS/septage from septic tanks in city

This license is based on information provided in the FS/Septage Collection and Transportation License Application. This license is effective for a period of five years from date of issue, set forth below.

EFFECTIVE DATE

EXPIRATION DATE

The license may be suspended or revoked for condition of Non-Compliance and is not transferable. The original license shall be kept on file in the Licensee's office. A copy of this license shall be carried in every registered vehicle used by the Licensee.

Annexure 8: Format for record keeping by operator

S. No	Name of the customer	Area and location	Date of request for desludging	Date of completed desludging	Type of septic tank	Age of septic tank	Quantity of FS/septage desludged	User charge	Any accident /slippage	Next date of desludging

Annexure 9: Sample IEC material

Proper Design and Cleaning of your Septic Tank!

Wrong **Right**

Wrong **Right**

Proper Design

- Septic tank base should always be sealed and it should have proper vent pipes
- Proper access manhole should be provided for easy emptying

Home **Nagar Palika** **Pumping Truck**

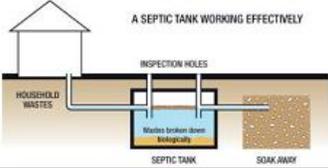
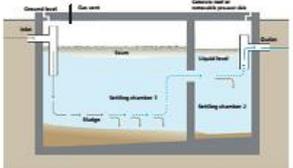
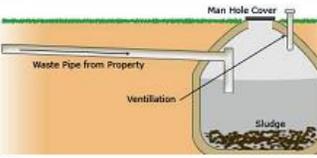
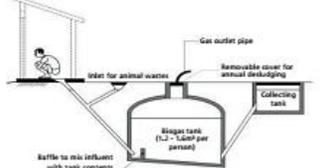
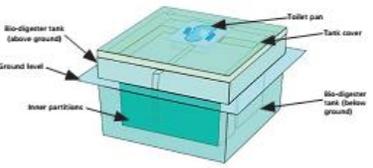
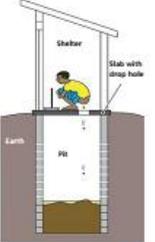
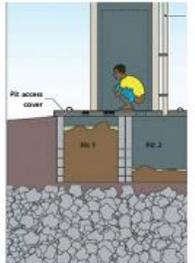
Services provided by ___ Nagar Parishad

Cleaning your Septic Tank

- Clean your septic tanks regularly once in 3 years
- Do not wait for it to overflow. This will adversely affect your health and your environment

Source: SM guidelines, Maharashtra, 2016

Appendix 10: Type of containment systems

Containment system	Description	Output
	<p>A septic tank with soak pit, is a decentralized wastewater treatment system. It is basically a sedimentation tank with chambers, which has settling and anaerobic processes to reduce solids to organics, which lets out the effluent content to flow into a soak pit, from where it infiltrates into water. (EAWAG, 2014)</p>	<p>Septage found within the septic tank</p>
	<p>A septic tank without soak pit has a same function as a septic tank with a soak pit. The only difference between the two is that effluent is let out on ground/water body or open drains. (EAWAG, 2014)</p>	<p>Septage found within the septic tank and effluent let out in the open drains</p>
	<p>A reservoir or a closed tank for collection of wastewater, with no intent to treat or discharge any of its components. (WTE, 2014)</p>	<p>Slurry from mixture of faeces and water</p>
	<p>Bio-digester is a decomposition mechanical toilet which decomposes waste water in the digester tank using specific high graded bacteria further converting it into methane and water, discharged further to the desired surface. (CSE, 2013)</p>	<p>Pathogen-free water which can be used for agriculture purposes</p>
	<p>This technology is evolved around aerobic digestion - which involves a different multi-strain of bacteria which breaks down the waste matter through oxidation.</p>	<p>Digested septage</p>
	<p>Defecation into pits dug into ground for the reception of night soil directly without flushing are reckoned as pit latrines. (Census of India, 2011)</p>	<p>Faecal sludge</p>
	<p>This type of system may be lined or unlined. It consists of two identical pits, which are used alternatively, where pit is closed upon the filling up, where anaerobic digestion of the faecal waste takes place. (Ministry of Urban Development, 1992)</p>	<p>Faecal sludge</p>

Source: Compiled by CSE, 2017

Appendix 11: Design of septic tank

BIS provides code of practice for installation of septic tanks (IS 2470 [part 1] 1985). It illustrates design criteria to construct the septic tank based on certain assumptions. It provides details to design installations for small and large areas considering the population. Comprehensive design standards on OSS are provided in the part A of manual on sewerage and sewage treatment published by Central Public Health and Environmental Engineering Organization, the research wing of MoHUA. The standard designs for prevalent and safe onsite sanitation technologies have been stated in this section. Also, to highlight septic tanks in India are generally meant for black water only.

Specifications of a septic tank

- Rectangular: length to breadth ratio: 3 to 1
- Depth: between 1.0 to 2.5m
- Two chambered: first chamber 2/3 of total length
- Three chambered: first chamber half of total length
- Manholes above each chamber
- Watertight, durable and stable tank

Recommended sizes of septic tank

No. of users	Length (m)	Breadth (m)	Liquid depth (m) (cleaning interval of)	
			1 year	2 year
5	1.5	0.75	1.0	1.05
10	2.0	0.90	1.0	1.40
15	2.0	0.90	1.3	2.00
20	2.3	1.10	1.3	1.80
Note 1— the sizes of septic tank are based on certain assumptions (liquid discharge), while choosing the size of septic tank exact calculations shall be made. information on the same please refer to BIS: 2470 (part 1) – 1985)				
Note 2—a provision of 300 mm should be made for free board.				

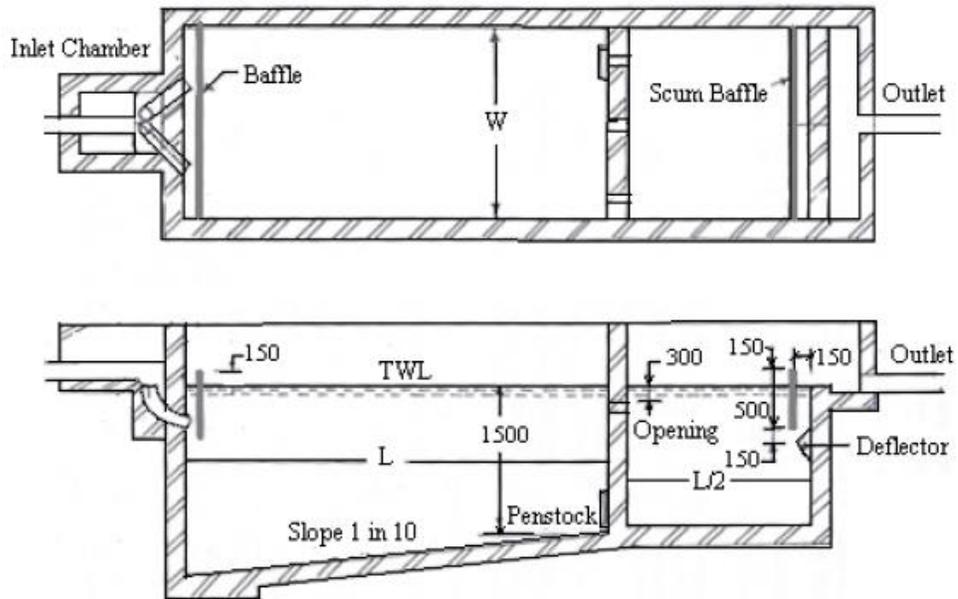
Source: Manual on Sewerage and Sewage Treatment Part A: Engineering. CPHEEO; 2012.

Capacity of a septic tank

The capacity of the tank is useful to understand the durations for desludging, following are key points useful to measure the capacity of a septic tank:

- **Sedimentation:** An area of 0.92 m² is required for every 10 l. /min. peak flow rate to support adequate sedimentation of suspended solids. Generally, depth of sedimentation zone is 0.3 m.
- **Sludge digestion:** Capacity of digestion zone works out to be 0.032 m³/capita.
- **Sludge and scum storage:** For interval of 1 year of sludge cleaning, a sludge storage capacity of **0.0002*365 = 0.073 m³/capita** is required
- **Free board:** At least 0.3m

Standard septic tank design



Source: Manual on Sewerage and Sewage Treatment Part A : Engineering. CPHEEO; 2012

Appendix 12: Small bore sewers

Conventional vs small-bore sewers

S. No.	Parameter	Conventional sewers	Solids-free sewers	Effect
1	Excavation	Deep	Shallow	+ ve for solids-free
2	Water supply	More (125–135 per capita LPD) required for self-cleansing	Less (40 per capital LPD) is sufficient	+ ve for solids-free
3	Capital cost	High	Low	+ ve for solids-free
4	Individual septic tanks	Not required	Required	+ ve for conventional
5	Operation and maintenance cost	Very high	Very low	+ ve for solids-free
6	People's perception	Preferred	Less preferred	+ ve for conventional

Source: Innovation for scaling up to citywide sanitation, CEPT, 2012

Cost of installing small-bore sewer

S. No	Sewerage scheme	Cost (in lakh Rs)				Population		Cost per capita	
		Pipe sewer	STP	Maintenance cost	Total	Present (2012)	Prospective (2027)	Total (2012)	Sewer (2012)
1	Abiana Kalan and Abiana Khurd, Ropar	123.5	73.16	19.75	216.41	2,131	2,557	9,232	5,798
2	Boje Majra, Ropar	91.8	59.28	17.30	168.38	1,166	1,399	12,959	7,872
3	Chitamali, Ropar	127.5	82.56	19.57	229.63	1,415	1,699	14,838	9,008
4	Bhajouli, Mohali	61.5	61.49	15.20	138.19	1,161	1,393	10,808	5,295
5	Singhpura, Mohali	88.0	55.85	15.14	158.99	822	986	17,497	10,703
6	Jaula Kalan, Mohali	127.0	59.80	17.59	204.39	1,852	2,223	10,083	6,854

Source: Innovation for scaling up to citywide sanitation, CEPT, 2012

Appendix 13: Comparisons of systems with respect to various parameters

System number	System name	Type of system	System Life time	Applicability of system	Land availability	Performance of the system	Energy requirement	CAPEX	OPEX
System 1	Twin-pit system	Onsite system	Twin-pit, 10 years	Household level	5 m ² per household for pit + toilet	-	Not required	Rs 4,500 per household for pit	Rs 400 per household per year
System 2A	UDB + WSP + co-composting + chlorination	Decentralized system	Septic tank, 50 years; soakpit, three-five years, UDB or WSP, 50 years	Ward-, city-, or cluster-level	7 m ² per household for storage + toilet; WSP, 6,000 m ² /MLD	BOD, 75–85 per cent; COD, 74–78 per cent; TSS, 75–80 per cent; TN, 70–90 per cent; TP, 30–45 per cent; coliform, 60– 99.9 per cent	WSP, 5.7 kWh/d/MLD	IST, Rs 75,000 per household; WSP: Rs 23,00,000/MLD; UDB: 3,00,00,000/MLD	IST, Rs 1,500 per household year; UDB, Rs 50,00,000/MLD/year; WSP, Rs 2,00,000/MLD/year
System 2B	AD + co-composting + chlorination	Decentralized system	Septic tank, 50 years; soakpit, three-five years, AD, 50 years	Ward-, city-, or cluster-level	7 m ² per household for storage + toilet; AD, 600 m ² /MLD	BOD, 60–90 per cent; COD, 60–80 per cent; TSS, 60–85 per cent	AD, 60 kWh/d/MLD	IST, INR 75,000/HH; AD, INR 5,00,00,000/MLD	IST, INR 1,500/HH/year; AD, INR 30,00,000/MLD/year
System 2C	Centrifugation + ASP + vermicomposting + ozonation	Decentralized system	Septic tank, 50 years; soakpit, three-five years, UDB or WSP, 50 years	Ward-, city-, or cluster-level	7 m ² per household for storage + toilet; ASP, 900 m ² /MLD	BOD, 85–92 per cent; COD, 93–94 per cent; TSS, 75–80 per cent; TN, > 90 per cent; TP, > 90 per cent; coliform, 60– 90 per cent	ASP, 185.7 kWh/d/MLD; Centrifugation: 20–300 kWh per metric tonne of solid	IST, INR 75,000/HH; ASP, 68,00,000/MLD	IST, INR 1,500/HH/year; ASP, INR 7,00,000/MLD/year
System 2D	Centrifugation + SBR + co-composting + chlorination	Decentralized system	Septic tank, 50 years; soakpit, three-five years, SBR, 50 years	Ward-, city-, or cluster-level	7 m ² per household for storage + toilet; SBR, 450 m ² /MLD	BOD, 95 per cent; COD, 90 per cent; TSS, 95 per cent; TN, 70–80 per cent	SBR, 153.7 kWh/d/MLD; Centrifugation: 20–300 kWh per metric tonne of solid	IST, INR 75,000/HH; SBR, INR 75,00,000/MLD	IST, INR 1,500/HH/year; SBR, INR 6,00,000/MLD/year
System 2E	Centrifugation + MBR + co-composting + ozonation	Decentralized system	Septic tank, 50 years; soakpit, three-five years, MBR, 50 years	Ward-, city-, or cluster-level	7 m ² per household for storage + toilet; MBR, 450 m ² /MLD	BOD, 95 per cent; COD, >90per cent; TSS, >90 per cent; TN, >90 per cent; TP, >90per cent	MBR, 302.5 kWh/d/MLD; Centrifugation: 20–300 kWh per metric tonne of solid	IST, INR 75,000/HH; MBR, INR 30,00,000 /MLD	IST, INR 1,500/HH/year; MBR, INR 9,00,000 /MLD/year

System number	System name	Type of system	System lifetime	Applicability of system	Land availability	Performance of the system	Energy Requirement	CAPEX	OPEX
System 3A	MD + AF + CW + co-composting + chlorination	Decentralized system	Treatment plant life, 50 years	Ward-, city-, or cluster-level	7 m ² per household for storage + toilet	BOD, 50–90 per cent; TSS, 50–80 per cent	AF, 34 kWh/d/MLD	BD, INR 60,000/HH	BD, INR 1,400/HH/year
System 3B	MD + WSP + co-composting + chlorination	Decentralized system	Treatment plant life, 50 years	Ward-, city-, or cluster-level	7 m ² per household for storage + toilet	BOD, 75–85 per cent; COD, 74–78 per cent; TSS, 75–80 per cent; TN, 70–90 per cent; TP, 30–45 per cent; coliform, 60–99.9 per cent	WSP, 5.7 kWh/d/MLD	IST, INR 75,000/HH; WSP, INR 23,00,000/MLD	IST, INR 1,500/HH/year; WSP, INR 2,00,000/MLD/year
System 4	ASP + reed bed + sludge drying bed + co-composting	Networked system	Sewer and treatment plant life, 50 year	Ward-, city-, or cluster-level	ASP, 900 m ² /MLD	BOD, 90–95 per cent ; COD, 85–90 per cent; TSS, >90 per cent; TN, >60 per cent; coliform, 90–99.9 per cent	ASP: 185.7 kWh/d/MLD	ASP, INR 68,00,000/MLD	ASP, INR 7,00,000/MLD/year
System 5	IT + CW + sludge drying bed + co-composting + chlorination	Decentralized system	Septic tanks, 50 years; Individual toilet, 50 years	Ward-, city-, or cluster-level	7 m ² per household for storage + toilet; IT, 900 m ² /MLD	BOD, 30–50 per cent; TSS, 50–70 per cent.	IT, 45 kWh/d/MLD	IST, INR 75,000/HH; IT, INR 5,00,00,000/MLD	IST, INR 1,500/HH/year; IT, INR 30,00,000/MLD/year

System number	System name	Type of System	System Lifetime	Applicability of system	Land availability	Performance of the System	Energy Requirement	CAPEX	OPEX
System 6A	ABR+ sludge drying bed + co-composting	Networked system	Treatment plant life, 50 years	Ward-, city-, or cluster-level	ABR, 1,000 m ² /MLD	BOD, 70–95 per cent; TSS, 80–90 per cent; coliform, 20–30 per cent	ABR, 34 kWh/d/MLD	ABR, INR 5,00,00,000 INR/MLD	ABR, INR 30,00,000/MLD/year
System 6B	AF+ sludge drying bed + co-composting	Networked system	Treatment plant life, 50 years	Ward-, city-, or cluster-level	-	BOD, 50–90 per cent; TSS, 50–80 per cent	AF, 34 kWh/d/MLD	AF, US\$350 to US\$500 per cu.m for a treatment capacity of 10 cu.m, if the AF is used in combination with other treatment modules (e.g., in DEWATS) [39]	-
System 7	Belt filter press + CW + lime stabilization + chlorination	Decentralized system	Septic tank, 50 years	Ward-, city-, or cluster-level	7 m ² per household for storage + toilet	-	22 kWh/d/MLD	-	-
System 8	UASB + sludge drying bed + co-composting	Networked system	> 50 years	Ward-, city-, or cluster-level	UASB, 1,000 m ² /MLD	BOD, 75–85 per cent; COD, 60–80 per cent; TSS, 75–80 per cent; TN, 10–20 per cent.	UASB, 34 kWh/d/MLD	UASB, INR 68,00,000 /MLD;	UASB, INR 6,00,000/MLD/year
System 9	MD + WSP + solar drying + chlorination	Decentralized system	Septic tank, 50 years; WSP, 50 years	Ward-, city-, or cluster-level	7 m ² per household for storage + toilet; WSP, 6,000 m ² /MLD	BOD, 75–85 per cent; COD, 74–78 per cent; TSS, 75–80 per cent; TN, 70–90 per cent; TP, 30–45 per cent; coliform, 60–99.9 per cent	WSP, 5.7 kWh/d/MLD	IST, INR 75,000/HH; WSP, INR 23,00,000MLD	IST, INR 1,500/HH/year; WSP, INR 2,00,000/MLD/year

System number	System name	Type of system	System lifetime	Applicability of system	Land availability	Performance of the System	Energy Requirement	CAPEX	OPEX
System 10	PDB + CW + shallow trenches + chlorination	Decentralized system	Septic tank, 50 years; trenching site, five–10 years	Ward-, city-, or cluster-level	7 m ² per household for storage + toilet	-	-	IST, INR 75,000/HH	IST, INR 1,500/HH/year
System 11	Geo-bags + WSP+ chlorination	Decentralized system	Septic tank, 50 years; geo-bag, six–12 months	Ward-, city-, or cluster-level	7 m ² per household for storage + toilet; WSP: 6,000 m ² /MLD	BOD, 75–85 per cent; COD, 74–78 per cent; TSS, 75–80 per cent; TN, 70–90 per cent; TP, 30–45 per cent; coliform, 60– 99.9 per cent	WSP, 5.7 kWh/d/MLD	IST, INR 75,000/HH; WSP, INR 23,00,000/MLD	IST, INR 1,500/HH/year; WSP, INR 2,00,000/MLD/year
System 12	ABR + CW + sludge drying bed + co-composting + chlorination	Decentralized system	> 50 years	Ward-, city-, or cluster-level	ABR, 1,000 m ² /MLD	BOD, 70–95 per cent; TSS, 80–90 per cent ; coliform, 20– 30%	ABR, 34 kWh/d/MLD	IST, INR 75,000/HH; ABR, INR 5,00,00,000 /MLD;	IST, INR 1,500/HH/year; ABR, INR 30,00,000/MLD/year

ABR = Anaerobic baffled reactor, AD = Anaerobic digester, AF = Anaerobic filter, ASP = Activated sludge process, BD = Biogas digester, BOD = Biological oxygen demand, COD = Chemical oxygen demand, CW = Constructed wetland, HH = Household, INR = Indian rupee, IST = Improved septic tank, IT = Imhoff tank, kWh = Kilowatt hour, MBR = Membrane bio-reactor, MD = Mechanical dewatering, MLD = Million litres per day, PDB = Planted drying bed, SBR = Sequence batch reactor, ST = Septic tank, TN = Total nitrogen, TP = Total Phosphorous, TSS = Total suspended solid, UASB = Upflow Anaerobic sludge blanket, UDB = Unplanted drying bed, WSP = Waste stabilization pond

Source: Technology options for the sanitation value chain, CStep, 2016

Appendix 14: Standards for composting

Parameters	Organic Compost (FCO 2009)	Phosphate Rich Organic Manure (FCO 2013)
(1)	(2)	(3)
Arsenic (mg/Kg)	10.00	10.00
Cadmium (mg/Kg)	5.00	5.00
Chromium (mg/Kg)	50.00	50.00
Copper (mg/Kg)	300.00	300.00
Lead (mg/Kg)	100.00	100.00
Mercury (mg/Kg)	0.15	0.15
Nickel (mg/Kg)	50.00	50.00
Zinc (mg/Kg)	1000.00	1000.00
C/N ratio	<20	Less than 20:1
pH	6.5-7.5	(1:5 solution) maximum 6.7
Moisture, percent by weight, maximum	15.0-25.0	25.0
Bulk density (g/cm ³)	<1.0	Less than 1.6
Total Organic Carbon, per cent by weight, minimum	12.0	7.9

Total Nitrogen (as N), per cent by weight, minimum	0.8	0.4
Total Phosphate (as P ₂ O ₅) percent by weight, minimum	0.4	10.4
Total Potassium (as K ₂ O), percent by weight, minimum	0.4	-
Colour	Dark brown to black	-
Odour	Absence of foul Odor	-
Particle size	Minimum 90% material should pass through 4.0 mm IS sieve	Minimum 90% material should pass through 4.0 mm IS sieve
Conductivity (as dsm-1), not more than	4.0	8.2

Note: Compost (final product) exceeding the above stated concentration limits shall not be used for food crops. However, it may be utilized for purposes other than growing food crops.

Source: Solid Waste Management Rules, 2016

Appendix 15: General standards for discharge of environmental pollutants

Parameter	Standards
Odour and colour	All efforts should be made to remove colour and unpleasant odour as far as practicable
Suspended solids mg/l, Max.	200
pH value	5.5 to 9.0
Oil and grease (mg/l, max.)	10
Biochemical oxygen demand [3 days at 27 °C] mg/l max.	100
Arsenic (as As), mg/l, max.	0.2
Cyanide (as CN) mg/l Max.	0.2
(a) Alpha emitter micro curie/ml.	10 ⁻⁸
(b) Beta emitter micro curie/ml.	10 ⁻⁷
Bio-assay test	90% survival of fish after 96 hours in 100% effluent

Source: General standards for discharge of environmental pollutants Part A: Effluents, 1993