



Sanitation Capacity
Building Platform

Training Module Co Treatment of Septage and Sewage

TITLE

Training Module On Co Treatment Of Septage And Sewage

RESEARCH PROJECT

Sanitation Capacity Building Platform,

ANCHORED BY

National Institute Of Urban Affairs, Delhi

CONTENT

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Sanitation Capacity
Building Platform

Training Module Co-Treatment of SEPTAGE AND SEWAGE

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ABOUT TRAINING MODULE

National Institute of Urban Affairs (NIUA) is a national nodal institute that works closely with the Ministry of Housing and Urban Affairs (MoHUA), Government of India. The Sanitation Capacity Building Platform (SCBP) anchored by NIUA aims to build local capacity of for planning, designing and implementing non sewer, decentralized sanitation solutions, with specific focus on Faecal Sludge and Septage Management (FSSM) and wastewater.

ACBP is a partnership of various organizations and non-profit institutions (Ecosan Services Foundation, AILSG, CEPT, CDD, CPR, CSTEP, UMC, CSE, WASHi, iDECK, Dasara). The platform works in partnership with national nodal training institutes working for Atal Mission for Rejuvenation and Urban Transformation (AMRUT) and Swachh Bharat Mission (SBM), with universities and research organizations and all stakeholders in the urban sanitation space. SCBP is supported by a grant from Bill and Melinda Gates Foundation (BMGF)

ABOUT THIS HANDBOOK

This handbook is an initiative of SCBP to build capacities in FSSM for officials of urban local bodies (ULB), para state technical agencies and professionals from the private sector and Non Governmental Organizations. It is meant to be freely used by any organisation (public/private), national and state level training institutes, AMRUT and SBM training institutes for conducting a course on Co Treatment of Sewage and Septage at Sewage Treatment Plant.

The handbook presents the content related to co treatment of sewage and septage in three different sections; (a) Module, (b) Exercises, (c) Case studies and (d) Handouts. The handbook compiles all the facts, figures and information and knowledge one needs to understand co treatment of sewage and septage at sewage treatment plant.

MODULE	Contains section in Scope and Potential of Co treatment of Septage in India followed by Policy and Framework and Technical requirements for Co Treatment of Sewage and Septage at Sewage Treatment Plant.
EXERCISE	Contains exercises on planning and framework development based on Theory of Change and Feasibility of Co Treatment of Septage at Sewage Treatment Plant.
CASE STUDIES	It includes three well documented case studies of co treatment of septage with sewage in India.
HANDOUTS	Contains the policy brief and checklist pertaining to co treatment of septage and sewage under the TNUSSP.

The module has been developed based on the literature available on co treatment of sewage and septage across the globe and experiences of practioners in India. The exercises have been developed with an aim to give the participants hands on training of planning and decision making. The case studies are developed based on the publications made under the National Faecal Sludge and Septage Management Alliance, India. Lastly the handouts were taken from Tamil Nadu Urban Sanitation Support Programme (TNUSSP). Tamil Nadu is the leading state in India which has been practicing co treatment of sewage and septage for years.

ABOUT TRAINING MODULE

Title	Introduction to Co Treatment of Sewage and Septage at Sewage Treatment THE Plant
Purpose	<p>There are centralized and decentralized approaches for managing the liquid waste generated in the an ULB. In India due to rapid urbanization of the cities and towns and slow paced progress of centralised infrastructure for liquid waste management, very few cities are able to manage the liquid waste properly. Thus, it is the need of the hour that composite systems such as centralised system complimented with FSSM can better serve the city.</p> <p>This training module is developed in order to make the ULBs realise the potential of existing infrastructure before creating newer infrastructure which burdens the ULB with O&M cost.</p> <p>Underutilised STPs have the potential to treat the septage generated at the onsite sanitation systems such as septic tanks. Co treatment of septage not only helps in optimising the utilization but also lowers the cost of treatment of wastewater</p>
Module is for	Officials from the parastatal departments and the ULB including engineers, sanitary inspectors, public health officials. Professional from public and private enterprises and NGOs working in the wastewater treatment sector.
Learning Objectives	<p>The module aims to convey the following learnings;</p> <ol style="list-style-type: none">1. There is a scope and significant potential for co treatment of septage and sewage in the existing and proposed sewage treatment plants.2. The requirement of framework and policy and its enforcement for successful state-wide implementation of co treatment of septage and sewage and sewage treatment plants3. Technical requirements for practicing co treatment of septage and sewage and estimating its feasibility.
Duration	The duration of this introductory module is maximum of two days which includes one and half day of classroom sessions and half a day of site visit to the sewage treatment plants practicing co treatment of septage and sewage.



MODULE

Session I

SCOPE AND POTENTIAL OF CO-TREATMENT IN INDIA

SESSION OBJECTIVES

1. To understand the basics of septage management options.
2. To realise the potential of co treatment in the STPs built under various programs and schemes in India.
3. To understand the wastewater treatment technologies used in sewage treatment plants in India
4. To introduce various methods of co treatment of septage and sewage at sewage treatment plants.

Session Methodology	Session Duration
Powerpoint presentation and structured discussions	45 min

1 Scope And Potential of Co-Treatment In India

Contents

- Scope of Co Treatment
 - *Why co treatment is a viable option in India?*
- Potential of Co Treatment in India
 - *Urban India*
 - *Class I and II cities in India*
 - *Ganga River Basin*
- STPs in India
 - *Sewage treatment processes and technologies*

1.1 Scope of Co-Treatment

Scope of Co Treatment

Why co treatment is a viable option in STPs in India?

1.1.1 Septage Management Options

Septage Management Options		
Raw Septage	Land Disposal	Land spreading
		Trench/Lagoon
		Subsurface incorporation
	Co Treatment	Addition of liquid stream
		Addition to sludge stream
		Addition to both stream
	Independent Treatment	Solid liquid separation
		Dewatering
		Disinfection

After the launch of the National FSSM Policy in February 2017, faecal sludge and septage has taken a centre stage in sanitation sector. There are several septage management options available, few of them are listed here. The simplest and preferred around the world is land disposal. Although simple, high level of monitoring is needed in order to avoid faecal oral transmission. Co-Treatment of septage and sewage is also a viable option and is next preferred option before having an independent faecal sludge and septage treatment plant.



Land disposal is interim solution which is sought for in India. However, the suitability of the land to accommodate the high quantities of organic load along with nitrogen and phosphorus needs be identified. Also, very strict monitoring needs to be done whenever and wherever land disposal of raw septage is practiced.

The percolate from the raw septage can potentially contaminate the ground water aquifer unsuitable for potable purposes.

Sub surface incorporation is by far the most appropriate method of land disposal of raw septage. It ensures that the septage is applied to only top layer of the soil and the septage is covered with the soil on top. Since the septage is introduced in controlled rates, the percolate does not seep into the ground water aquifer.

Sewage and septage

- Septage is concentrated but have similar characteristics like that of sewage in India.
- Septage can be treated in STP
 - Utilized capacity of the STP
 - Treatment chain
 - Space available
 - Disposal mechanism of solids

The constituents of the septage, although highly concentrated and much stronger than domestic sewage, are generally similar to domestic sewage. Therefore, the same processes used to treat domestic sewage can also be used for Co-Treatment of septage and domestic sewage.

In order to assess the potential of Co-Treatment of septage and domestic sewage, one needs to check the utilized design capacity of the sewage treatment plant, the treatment processes involved, space available for additional infrastructure to be created if necessary and disposal mechanisms of solids.

Sewage Treatment Plant

- Most of the STPs in India are under utilised by more than 50% of the design capacity.
- Treatment processes when operated under design capacity, are energy intensive and cost per unit volume of treated water is high.

Sl. No	Component	Design Period, Years (from base year)
1	Land Acquisition	30 years or more
2	Conventional sewers (A)	30
3	Non-conventional sewers (B)	15
4	Pumping mains	30
5	Pumping Stations-Civil Work	30
6	Pumping Machinery	15
7	Sewage Treatment Plants	15
8	Effluent disposal	30
9	Effluent Utilization	15 or as the case may be

(A) Typical underground sewers with manholes laid in the roads
(B) All types such as small bore, shallow sewers, pressure sewers, vacuum sewers

CPIEDO Manual on Sewerage and Sewage Treatment

Sewage treatment plants are designed for the time span of 15 years and the appurtenances are designed for 30 years. Due to various reasons, the sewage treatment plants remain underutilised for most of their life span. Such underutilised plants not only affect the performance efficiency but are also economically costlier to operate and maintain i.e. the cost per volume of treated water is higher than estimated.

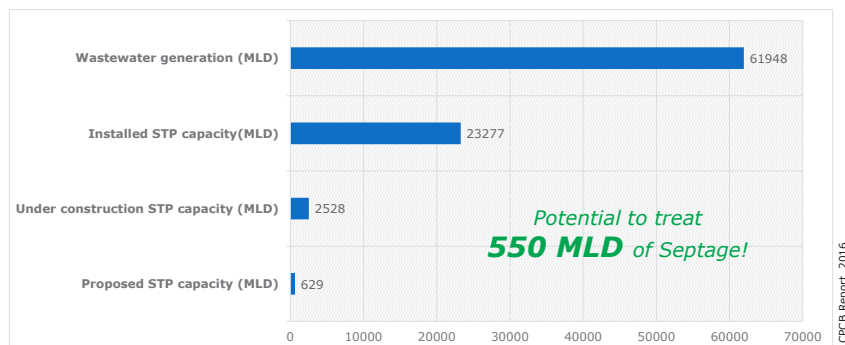
1.2 Potential of Co-Treatment

With the launch of various programs such as AMRUT, Smart Cities and Namami Ganga; a lot of focus is given to creating of wet infrastructure to manage the wastewater at the city level. The main objective of such schemes is to protect the environment from the disposal of untreated domestic sewage and help revive the state of the rivers in India.

As per the CPCB report of 2016, close to 62 MLD of wastewater was generated in India. The cumulative installed capacity of the STPs was 23.5 MLD i.e. 40% of the wastewater generated. This capacity was set to increase to 26.5 MLD.

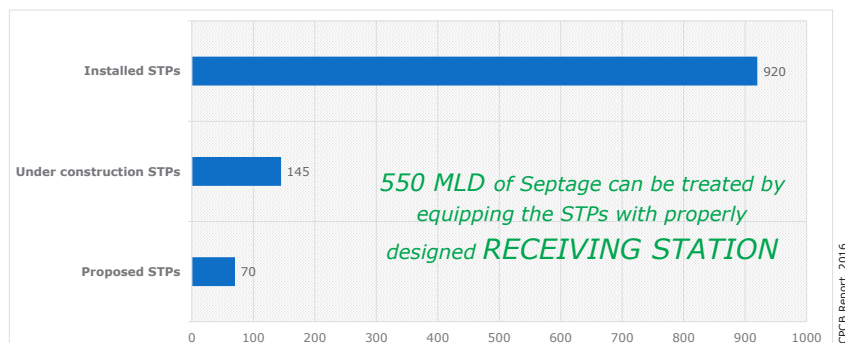


Wastewater in Urban India



Assuming that 1/4th of this capacity was unutilised, there is a scope of treating close of 550 MLD of septage, which translates to 1.5 lakh standard vacuum trucks or septage from 6 lakh people on daily basis.

STPs in Urban India



As per the CPCB report of 2016, there were 920 STPs which were installed and another 215 STPs were going to come up. In order to be able to co treat septage and domestic sewage, these STPs need to be augmented with a receiving station providing pre-treatment to the incoming septage.

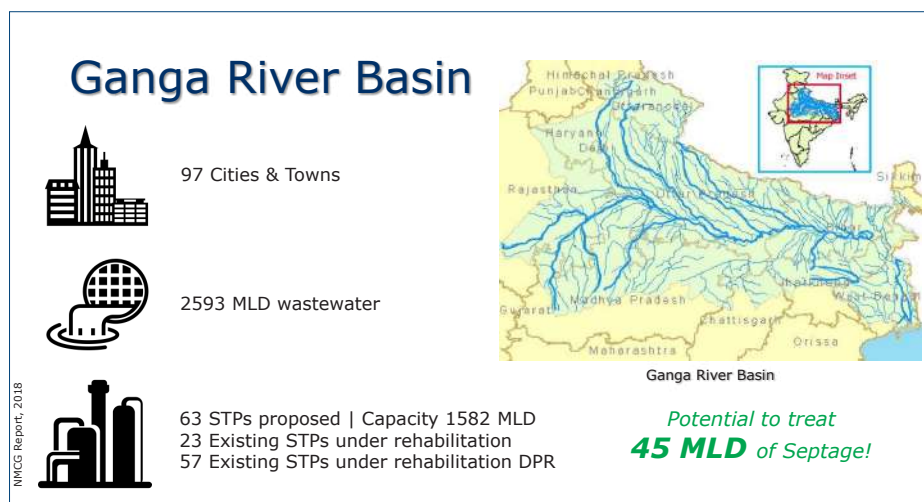
City category & population	Number of cities	Sewage generation, MLD	Installed sewage treatment capacity, MLD	Capacity gap in cities having STPs, MLD (A)	Sewage generation in cities having no STPs, MLD (B)	Total capacity gap, MLD \diamond (A+B)	Planned treatment capacity, MLD
▶ Class I cities having more than 10 lac population	▶ 39	▶ 13503	▶ 4472 (In 29 cities)	▶ 6135	▶ 2896	▶ 9031	▶ 1549
▶ Class I cities having 5 to 10 lac population	▶ 32	▶ 3836	▶ 485 (In 13 cities)	▶ 1293	▶ 2058	▶ 3351	▶ 123
▶ Class I cities having 2 to 5 lac population	▶ 119	▶ 4807	▶ 768 (In 34 cities)	▶ 804	▶ 3235	▶ 4039	▶ 4
▶ Class I cities having 1 to 2 lac population	▶ 224	▶ 4018	▶ 322 (In 36 cities)	▶ 373	▶ 3323	▶ 3696	▶ 32.5
▶ All the above Class I cities together	▶ 414**	▶ 26164 (100%)	▶ 6047(23.1%) (In 112 cities)	▶ 8605 (32.9%)	▶ 11512 (44%)	▶ 20117 (76.9%)	▶ 1708.5 (6.5%)
▶ Class II towns having 0.5 to 1 lac population	▶ 489**	▶ 2965 (100%)	▶ 200 (>143*) (4.8%) (In 22 towns)	▶ Nil	▶ 2822 (95.2%)	▶ 2822 (95.2%)	▶ 34.1 (1.15%)
▶ All Class I cities and Class II towns	▶ 893**	▶ 29129 (100%)	▶ 6190 (21.3%)	▶ 8605 (29.5%)	▶ 14334 (49.2%)	▶ 22939 (78.7%)	▶ 1742.6 (6.0%)

Source: <http://cpcb.nic.in/status-of-stps/>

Assuming that 1/4 of the existing capacity is unutilized, the scope of co treatment in Class I & II cities and towns itself is 65 MLD of septage!

Rapid urbanization and population migration are the two major challenges which the Indian cities are facing. With the increasing population, more and more wastewater management projects are being planned and executed in India. In the class I cities alone the installed capacities of the STPs is close to 6000 MLD and another 1700 MLD is planned.

If the class I and class II cities are clubbed together, there is a potential to treat close to 65 MLD of septage. This is equivalent to 16000 standard size vacuum trucks or close to septage of 70,000 people on daily basis.



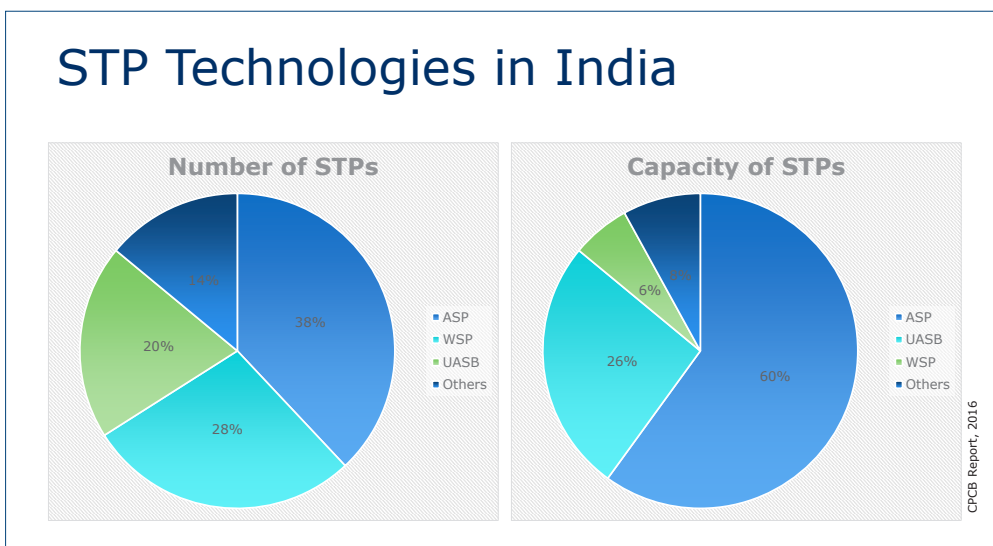
The flagship program of Namami Ganga caters to 97 cities and towns located in the Ganga River basin. It is estimated that close to 2600 MLD of domestic wastewater is generated in these cities and towns. In order to manage the gap of treatment, 63 STPs are proposed. The existing STPs are to be rehabilitated.

During the execution of new STPs and rehabilitation of the existing STPs, receiving stations can be planned in order to treat 45 MLD of septage.

1.3 STPs in India



1.3.1 STP Technologies in India



According to the CPCB report large number of STPs are based on the Activated Sludge Process followed by Waste Stabilisation Ponds and Up flow Anaerobic Sludge Blanket Reactor. However, it is to be noted that approximately 16000 MLD of wastewater is treated via ASP followed by 7000 MLD using UASB technology.

Both these technologies are appropriate for co treating septage and domestic sewage under controlled environment. There is also plenty of research and full-scale experience documented for Co-Treatment of septage and sewage using ASP and UASB.

1.3.2 Treatment Stages in STPs

Treatment stages in STPs			
Preliminary Stage	Primary Stage	Secondary Stage	Tertiary Stage
<ul style="list-style-type: none"> Screening Grit removal Flow equalisation 	<ul style="list-style-type: none"> Sedimentation Flotation Flocculation Aeration 	<ul style="list-style-type: none"> Aerobic biological oxidation Anaerobic digestion 	<ul style="list-style-type: none"> Polishing Disinfection
Design Criteria Hydraulic Loading	Design Criteria Hydraulic & SS Loading	Design Criteria Hydraulic & Organic Loading	Design Criteria Hydraulic Loading
Physical Process	Physical Process (aided with chemical)	Biological Process (w/ or w/o oxygen)	Chemical Process

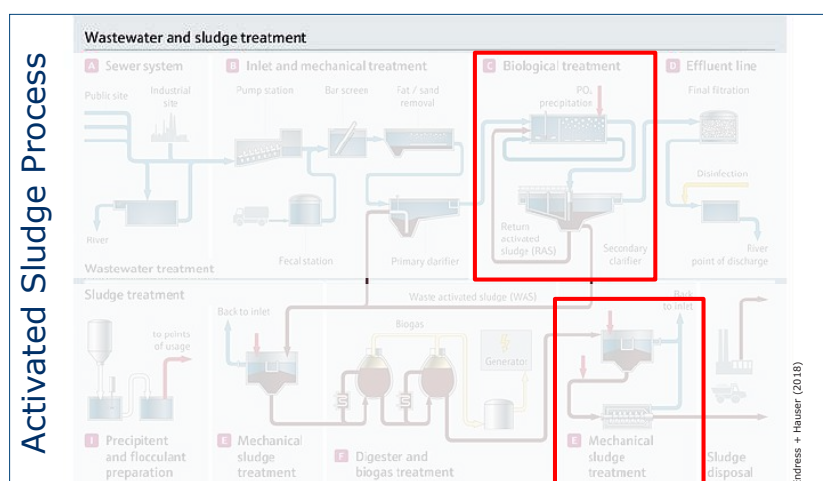
In order to understand the potential of Co-Treatment of septage and sewage, it is important to understand the various treatment processes involved in a STP and their design criteria.

The preliminary stage which is also known as head works of a STP is based on physical processes. Here mainly the size of the constituent, its density and specific gravity is taken into consideration to design the components such as screens and grit chamber. Hydraulic Loading Rate also needs to be considered for dimensioning of the channels and chambers. The main function of this step is to remove the solid waste and the inert solids which will clog or increase the wear and tear of the electromechanical components.

The objective of the primary stage is to remove the easily settle able solids (reduction of TSS and BOD) from wastewater. These solids increase the organic load to the secondary stage increasing the aeration requirement (aerobic biological process). The specific gravity of the particles along with the hydraulic loading and solid loading rate is considered for dimensioning of clarifiers.

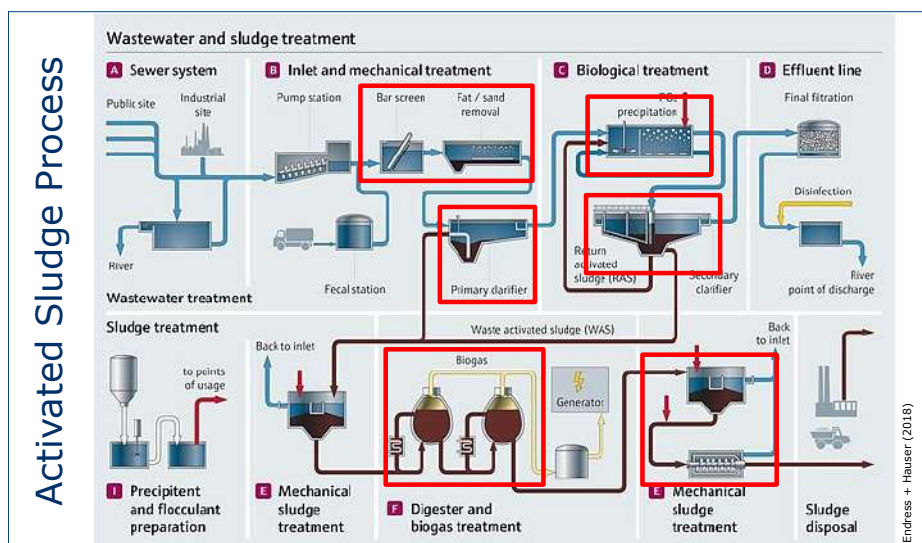
Secondary stage is the most important part of an STP which ensures that the organic constituents are digested aerobically or anaerobically. In both cases, the hydraulic loading rate, organic loading rate and sludge retention time is to be considered for dimensioning of the reactors and other electro mechanical components involved. Usually aerobic biological treatment includes and secondary clarifier to separate the sewage sludge from treated water.

Tertiary stage is intended to remove the pathogens from the secondary treated water. Hydraulic loading rate is used as the design criteria to estimate the contact time and dimensions of the channel.



A sewage treatment plant consists of several components treating mainly the domestic sewage and sewage sludge produced during the treatment. The diagram here shows a flow diagram of an Activated Sludge Process based sewage treatment plant. The top half of the diagram represents the treatment chain which caters to the domestic wastewater (shown by the blue lines) and the biological treatment becomes the heart and soul of the sewage treatment plant. It is the impact on this component which is critical while co treating the septage and the sludge.

The bottom half of the diagram represents the treatment chain for the sewage sludge. It is to be noted that there are mainly two different kinds of sewage sludge produced, (1) primary sludge from the primary clarifier and (2) secondary sludge from the secondary clarifier. Both these sludges have different characteristics. The primary sludge is more less organic as compared to the secondary sludge. On the other hand, the secondary sludge is more fluffy and light (due to aeration) and needs to be thickened before it can be digested in the digester. Depending upon the end use of the sludge, this step is optional. However, what is mandatory to have is a thickener and dewatering equipment. Hence it is the capacities of these components which puts a constraint on Co-Treatment of septage and sewage.



The other components which might have impact due to Co-Treatment of septage and sewage are shown in the slide. The impact (negative or positive) depends on the when and where the septage is introduced and if it was slug load or controlled load.

Co treatment possibilities

1. Addition to liquid stream
 - At preliminary stage (headworks)
 - At primary stage
 - At secondary stage
2. Addition to sludge stream
 - At stabilisation stage
 - At thickening stage
 - At dewatering stage
3. Addition to both liquid and sludge stream

So, it is seen that there are different ways the septage and sewage can be co treated. Introduction of the pre-treated septage (it is not recommended to attempt Co-Treatment of raw septage without providing pre-

treatment) is possible in liquid stream and/or sludge stream. Among each possibility there are three points at which the addition of pre-treated sludge can be done.

However, to minimise the impact on the components of the STP, it is recommended to use third option for Co-Treatment of septage and sewage.

Summary

- Sewage and septage have similar characteristics
- Potential to serve a large population by existing infrastructure of STPs
- Planned STPs can be modified to accommodate larger quantities of septage during its life time
- Components of sewage treatment plant and its design criteria
- Possibilities of co treatment of sewage and septage

Thank you...

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Session II

POLICY AND FRAMEWORK

SESSION OBJECTIVES

1. To understand enabling environment and WASH Framework functionality.
2. To realize the roles and responsibilities of state government and urban local bodies.
3. To understand the documentation required for implementation process.
4. To understand scaling up strategy to co treatment at state level.

Session Methodology	Session Duration
Powerpoint presentation, group exercise and structured discussions	75 minutes 30 min (powerpoint) + 45 min (group exercise)

2 Policy and Framework

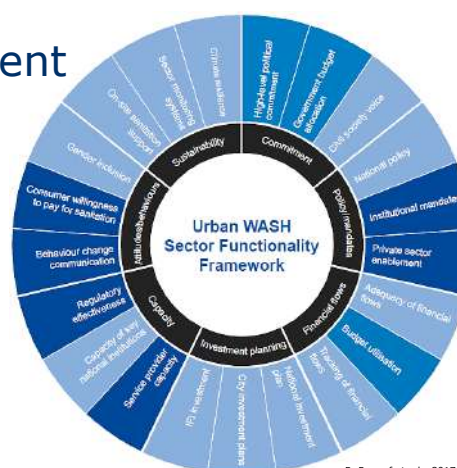
Content

- Enabling environment
- National Policy on Faecal Sludge and Septage Management
 - Roles & responsibilities of State Government
 - Roles & responsibilities of ULBs
 - Implementation process
- Scaling up – Co Treatment
- Group Work

2.1 Enabling Environment

Enabling Environment

- Urban WASH SFF
- 7 groups
- 21 qualitative indicators



The enabling environment of the Urban WASH sector is a set of interrelated sector functions that enable governments, public and private partners to engage in a sustained and effective WASH service delivery development process. In this framework there are seven group and under each group is a set of three qualitative indicators used to understand the WASH project functionality. The indicators in dark blue are the one which are critical for functionality of the WASH project and mainly belong to the group Policy, Capacity and Behaviour.

It is important to understand that how important it is to have a well-defined and structure policy and its related mandates. It is only when such policies and mandates are made and enforced, that the wheel starts turning and other groups and respective indicators gets impacted.

2.2 National Policy on Faecal Sludge and Septage Management

2.2.1 Roles and Responsibilities of State Government

State government	
Lead Role	Supportive Role
<ul style="list-style-type: none"> • Develop State level FSSM Strategy and Implementation Plan • Develop Operative Guidelines on FSSM • Training and capacity building of ULB officials • Funding through specific schemes and plans • 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 bye laws

National Policy on FSSM; 2017

According to the National Policy on FSSM released by Government of India in February, the roles and responsibilities of various stakeholder involved in propagating FSSM at the grass root level. According to the policy, it is the state government which should prepare Strategy and Implementation Plan along with the Operative Guidelines for FSSM. Allocation of funds and monitoring evaluation of the projects also is bestowed upon the state government. It is also expected that the state government should also provide support to the ULBs for various planning, technical and bye laws.

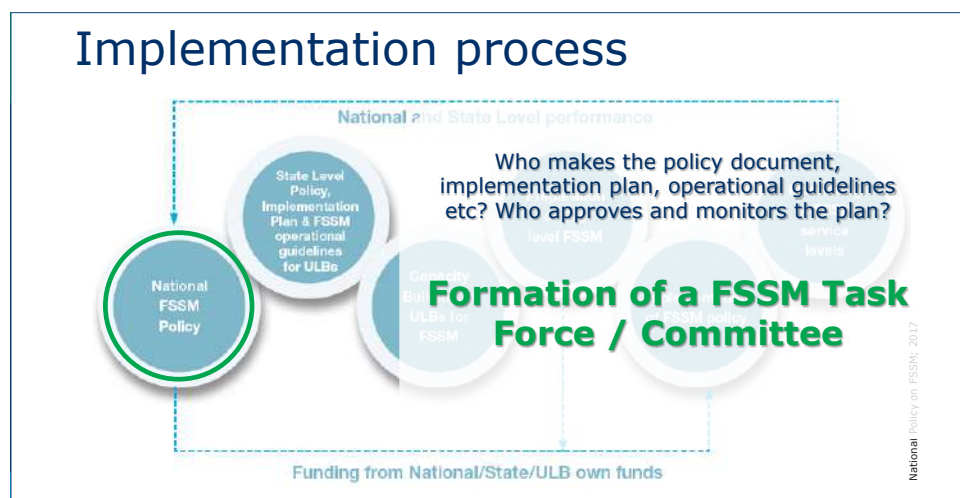
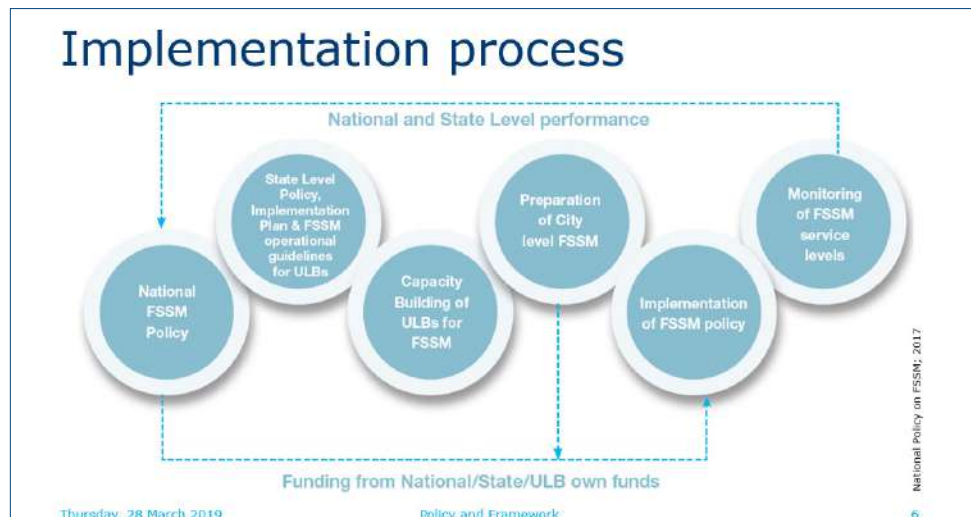
2.2.2 Roles and Responsibilities of Urban Local Bodies

Urban local body	
Lead Role	Supportive Role
<ul style="list-style-type: none"> • Design develop plan and implement ULB level FSSM Strategy. • Develop expertise to provide safe and effective FSSM services. • Set up systems to ensure financial sustainability in provision of FSSM services. • Monitor and evaluate FSSM strategy and implementation plan. • Implement municipal bye laws. 	<p>Create enabling environment for;</p> <ul style="list-style-type: none"> • NGOs • Private initiatives <p>To achieve safe and sustainable FSSM.</p>

National Policy on FSSM; 2017

According to the National Policy on FSSM released by Government of India in February, the roles and responsibilities of various stakeholder involved in propagating FSSM at the grass root level. According to the policy, the ULB is supposed to develop and implement plan at ULB level. Enforcing municipal bye laws and ensuring financial sustainability of FSSM services. In supporting role, the ULB is supposed to create enabling environment for the private sector such as Non-Governmental Organizations and Small Medium Enterprises to get interested and provide quality services to the households.

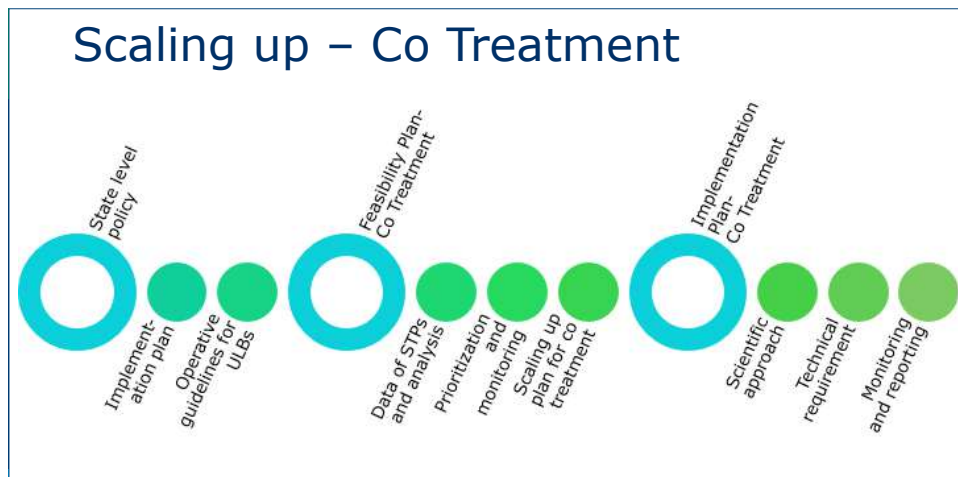
2.2.3 Implementation Process



As per the implementation process mentioned in the National Policy on FSSM by Government of India, the state government are advised to prepare the state level policy, implementation plan and operational guidelines for FSSM. Post this the state government should also build capacities of itself and the ULBs where FSSM needs to be prioritised. Post capacity building the ULBs should prepare the FSSM implementation plan and execute it. During the planning and execution phase, the state government is advised to extend support to the ULBs whenever and wherever required. Post implementation the monitoring and evaluation of the FSSM should be done in conjunction by state government and ULB.

To expedite the process and gain over all ownership at the state level, it is important that the most influential stakeholders should be part of the FSSM Task Force or a committee which overlooks the entire FSSM strategy and implementation.

2.3 Scaling up - Co-Treatment



Using the same approach, scale up of Co-Treatment of septage and domestic sewage can be done at the state level. It is important to understand that without state level policy supplemented by implementation plan and operative guidelines, it is impossible to ensure success and sustainability of the FSSM service delivery chain. Once the Co-Treatment of septage and domestic sewage is included in the state level policy, a feasibility plan should be created by the state government. This can be either done by para statal agencies in certain states or by ULBs in states like Maharashtra. The feasibility plan should contain data of the STPs and its analysis with respect to the treatment chain and capacity utilisation and potential of Co-Treatment possible. Prioritization of the STPs should be done based on the collected data and the radial distances from where the septage needs to hauled to the Co-Treatment facility. A strict monitoring protocol needs to be developed and followed in order to study the impact of Co-Treatment of septage and domestic sewage. Only after careful understanding, scale up plan should be implemented.

In case of STPs where there is needs of full-scale receiving station equipped with dumping station, screens, grit chamber and equalisation tank; a detailed project report should be prepared for further implementation.

Summary

- Enabling environment- 7 groups and 21 indicators for WASH sector functionality
- Roles and responsibilities of various stakeholders
- Implementation process
- Importance of FSSM Task Force
- Scaling up of Co Treatment in State

Session III

TECHNICAL REQUIREMENTS AND IMPACT

SESSION OBJECTIVES

1. To understand the importance of septage receiving station.
2. To understand the components of septage receiving station and their functions.
3. To introduce to types of receiving stations for co treatment septage and sewage.
4. To understand the parameters to check feasibility of co treatment at a sewage treatment plant.
5. To understand the impact of septage addition on the components of the sewage treatment plant.

Session Methodology	Session Duration
Powerpoint presentation, individual exercise and structured discussions	60 minutes

3 TECHNICAL REQUIREMENTS AND IMPACT

Content

- Current practices of Co Treatment in India
- Receiving station
 - Dumping stations
 - Screening
 - Grit removal
- Types of receiving station
- Examples of receiving station
- Best Practices
- Co treatment of septage and sewage
 - Feasibility
 - Points of septage addition
 - Impact on components of STPs
- Ideal practice for safe co treatment

3.1 Current Practices of Co-Treatment in India

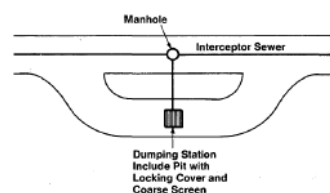
Interceptor receiving station

Practiced in most of the cities in India

- Should be practiced if -
- STP capacity is utilised up to 50%
 - Monitoring is done at the discharge point

Impact

- Deposits in sewers
- Clogging of pumps at pumping stations
- Corrosion of sewer pipes
- Odour problem at discharge point and downstream



Source: Environmental Leverage

US EPA Handbook on Technology Transfer: Septage Treatment & Disposal

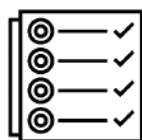
Currently the most popular practice under the pretext of co treatment in India is disposal in manhole located on the sewer line leading to the sewage treatment plant. Such practice will not affect the performance of STP if the sewage treatment plant is heavily unutilized. Also monitoring needs to be done in order to avoid dumping of industrial sludge. Industrial sludge may contain chemicals which might inhibit the biological processes in the sewage treatment plant.

Other long term impacts it will have is clogging of sewers and pumps and pumping station, heavy wear and tear of the pumps, corrosion of sewer pipes, resulting into breakage and leakage of wastewater. If the performance of the STP gets affected, then odor nuisance might be created at the discharge point and downstream of STP.

3.2 Receiving Station

Receiving station

Objectives

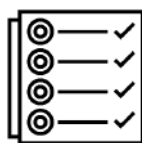


- Safe and easy transfer of septage
- Prevent clogging/fouling and excessive wear and tear of plant equipment
- Storage and equalisation of septage flows
- Prevent fouling of biological treatment process due to inert material

The aim of the receiving station is to reduce the impact and risk on the STP due to co treatment of septage and sewage. The objectives of the receiving station therefore are; (1) it should enable safe and hygienic transfer of septage from hauler truck to the STP, (2) preventive measure to keep a check on O&M cost of the STP, (3) storage and controlled discharge (addition) of septage into the sewage and (4) reduce impact on the secondary stage of the liquid and solid treatment chain at the STP.

Receiving station

Objectives



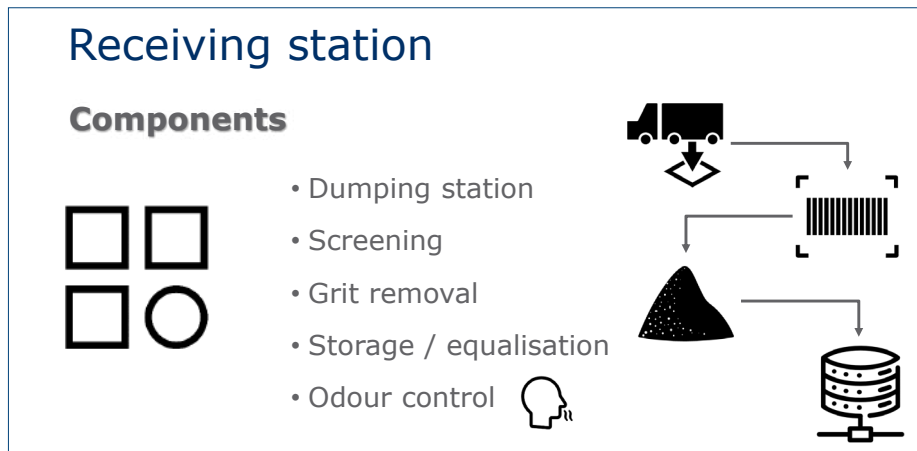
- Safe and easy transfer of septage
- Prevent clogging/fouling and excessive wear and tear of plant equipment
- Storage and equalisation of septage flows
- Prevent fouling of biological treatment process due to inert material

While designing a receiving station, one must consider the following;

- The quantity of the septage to be received daily along with the number of the trucks to be simultaneously emptied.
- The design and dimension of the desludging truck, especially the turning radius, its power to operate in reverse mode.
- Degree of pretreatment to be given to the raw septage. This depends on the appurtenances and the STP

where the mixed septage and sewage will be co treated.

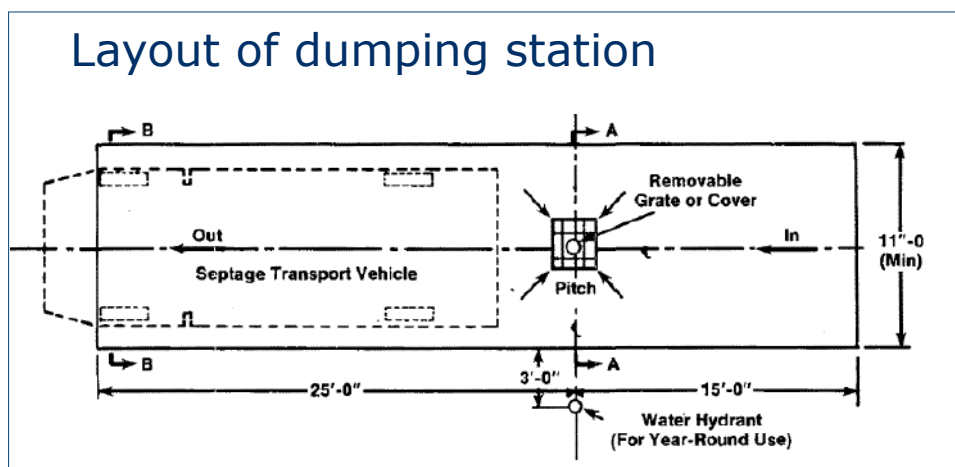
- Disposal mechanism of the solid waste and grit separated from the raw septage
- Odor nuisance. If the receiving station is near the residential/commercial area, odor control measures needs to be provided at the receiving station.



A receiving station consists of one or more of the following components;

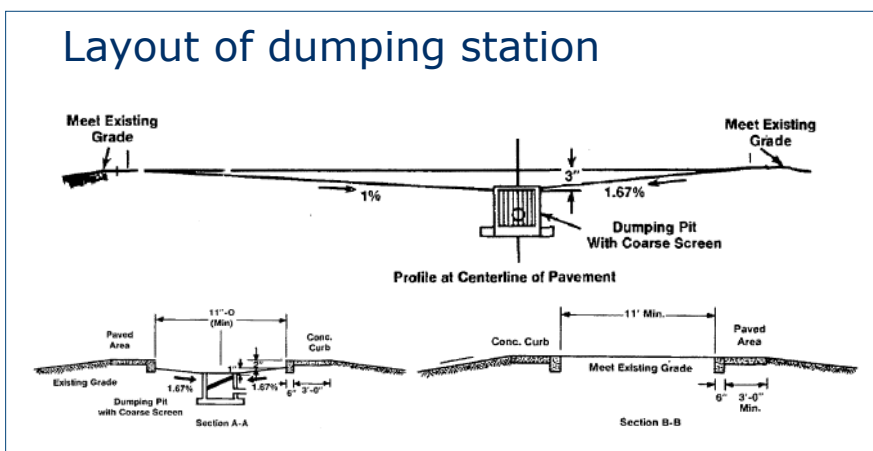
- Dumping station- it enables safe transfer of the raw septage from hauler truck to the pretreatment components such as screens. It is important that dumping station provides a leak proof equipment for transfer of raw septage and avoid odour nuisance.
- Screening - this is to eliminate the solid waste such as stones, plastic bags and rags etc. which are usually flushed down the toilet or dumped in the septic tanks.
- Grit removal- Grit removal is option. However, it is highly recommended to have it so that inert grit along with the fat and grease can be removed from the septage. Both these constituents have a potential to upset the biological treatment processes at the STP.
- Storage and equalisation- Storage and equalisation is optional but highly recommended in case of STPs which are utilised for more than 50% of their design capacity. This allows controlled addition of pretreated septage to the liquid stream depending on the actual flow rate of domestic sewage. In certain cases, storage can also provide necessary solid liquid separation where the supernatant is pumped to the liquid stream while the settled sludge is pumped to the sludge stream of the STP.
- Odour control- In cases where multiple dumping stations are provided and storage unit does not have aeration unit, odour might be generated. Therefore, an odour control unit needs to be placed. Odour control can be done using chemical scrubbers or activated charcoal filters.

3.2.1 Dumping Station



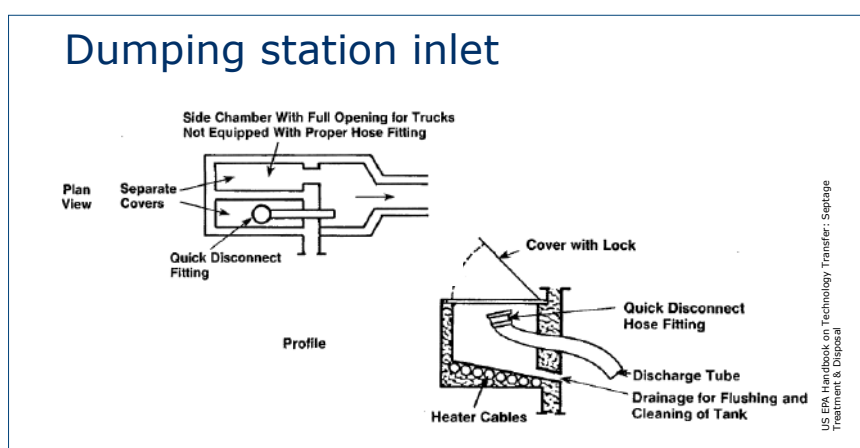
Dumping station has the following components such as (1) Ramp for the truck to enter and exit, the ramp should be sloping towards the dumping inlet so that any spillage or wash water will drain into the dumping hole, (2) Dumping inlet arrangements with a removable lid, (3) Water hydrant with pressurised water hose to wash down any spillage or the truck components after dumping.

Layout of dumping station



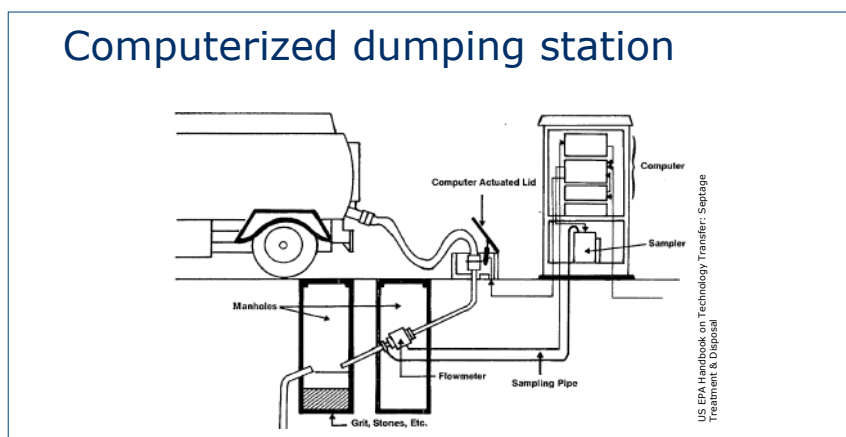
Sections of the dumping station are provided in the diagram above. It should be noted that high grade concrete (M 30 and above) should be used with adequate reinforcement since heavy vehicles would be plying on the ramp from time to time.

Dumping station inlet



The most important component of the dumping station is a dumping inlet. The dumping inlet has two parts, (1) Pipe with a quick disconnect fitting and (2) Chamber for trucks which are not equipped with proper hose fitting.

Computerized dumping station



In developed countries, few receiving stations have computerized dumping stations. The driver has a card which he swipes in to the machine to gain access to the dumping inlet. The computer registers the date, time, driver details and measures the volume of the septage dumped. Few stations are equipped with sampling arrangements, which sample the septage and registers the parameters such as pH, temperature, COD and BOD. This curbs down manual intervention and data is collated over a stipulated period.

3.2.2 Screening

Manual screening

Features

- 4" – 6" quick disconnect fitting
- Flow diverter
- V Shaped screen
- Manual raking
- Solid waste to be pushed in the channel
- Collection in a bin or wheel barrow



Source: Screeningsystems

Manual screens are used for smaller receiving station. Usually these screens are developed for emptying on single truck at a time. It has a 4-6 inch quick disconnect fitting which eliminates chances of spillage. The flow diverter is provided which eliminates any splashing of septage while emptying. Also, it even distributes the septage over the screen which eliminates the chances of choking of screen. The V shaped screen can accommodate higher flow and is easier to rake. The solid waste which is caught in the screen is raked manually into the channel which has holes in the bottom. Thus, the waste which is leaching septage will also get captured and is drained in the pan below. The solid waste then has to be pushed into a bin or wheel barrow.

Mechanical screening

Features

- 4" – 6" quick disconnect fitting
- Removal of stones and heavy object
- Shredding of solid waste
- Mechanical drum screen
- Screw conveyor for solid waste
- Automatic washing system
- Compacting of solid waste
- Washed solid waste is collected in a bin



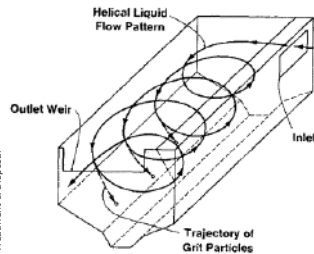
Source: WAM Group

The mechanical screens are used where human intervention needs to be completely eliminated and higher flows need to be accommodated. A 4-6 inch quick disconnect fitting is provided which ensures there is no spillage. Stone and heavy object removal can be done however it is optional. This is followed by shredder which shreds the solid waste such as rags, plastics etc to appropriate size. The mechanical drum ensures that all the solid waste is arrested and disposed into the screw conveyor which washes, compacts and transfers the waste to the bin or bag.

3.2.3 Grit Removal

Longitudinal grit trap

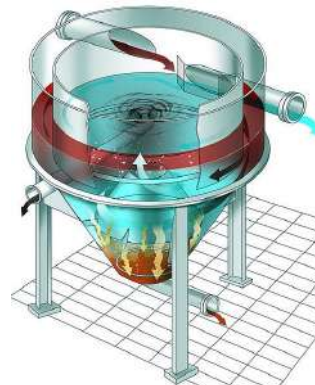
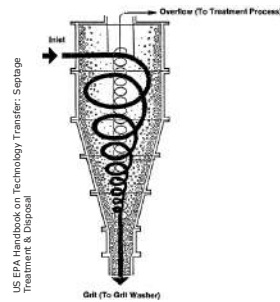
US EPA Handbook on Technology Transfer: Septage Treatment & Disposal



HUBER Longitudinal Grit Trap ROTOMAT Ro6

Longitudinal grit traps are used where high flows are expected. The septage after screening moves in the helical shape as shown in the figure on the left. During this movement, the grit settles down in the channel provided below. Aerated grit chambers are also used to improve the separation of the grit from the septage. There is screw conveyor at the bottom which collects all the grit to one end of the grit chamber from where it is removed, washed and dried before collecting in a bin.

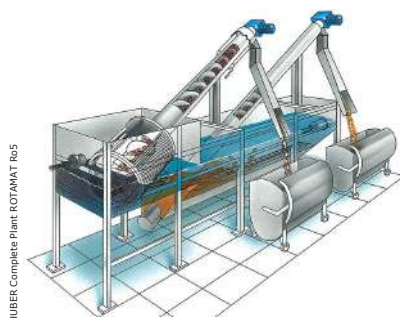
Cyclone degritter



HUBER Circular Grit Trap HRSF

Cyclone degritters are used where large volume needs to be treated and not much space is available. These degritters are vertical in shape and can be put underground too. However, in that extra screw conveyor is needed for removing the grit to the top or a pump is used. One more advantage of the cyclone degritter is that it can also separate oil, grease and fat from the septage. Cyclone degritters are becoming more and more popular due to their compact size.

Integrated Pretreatment Module



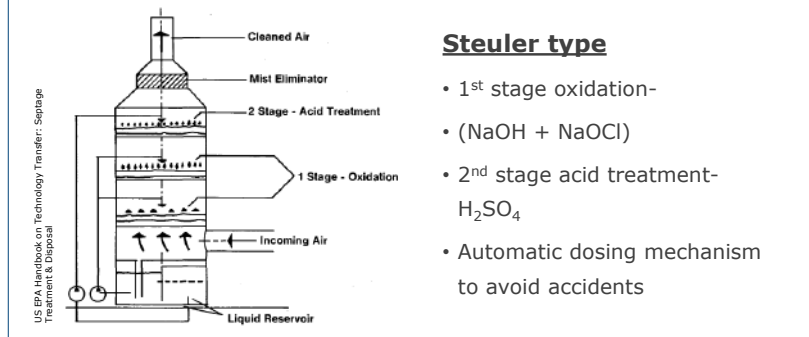
HUBER Complete Plant ROTAMAT Ro5

Features

- Fine screening with washing and dewatering
- Grit aeration, separation, dewatering and washing
- Removal efficiency with Q_{max} : 90% (particle diameter 0.2 – 0.25 mm)
- Capacity up to 300 l/s
- No odour nuisance
- Completely made of stainless steel

Integrated pre-treatment module combines the mechanical screen and longitudinal grit trap. This is a single equipment which can be placed after the dumping station. Washing, and dewatering is optional and is recommended so that the solid waste and grit can be safely handled and disposed appropriately.

Chemical scrubbers

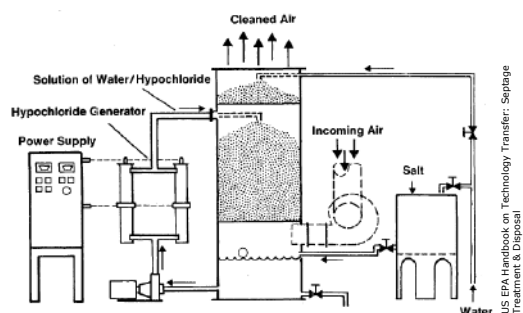


Chemical scrubbers are of two types, Steuler and Pepcon type. In Steuler type there are two stages. Firstly, oxidation of the compounds generating the odour are oxidised completely and then the air is passed through acid wash which strips down the remaining constituents. The clean air is now okay to be disposed. In this case the dosing of the chemicals should be done automatically in order to avoid any type of accidents during the handling.

Chemical scrubbers

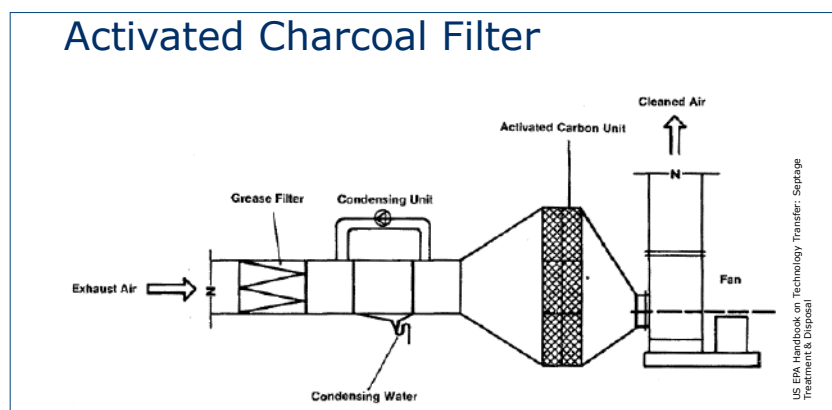
Pepcon type

- NaCl is used in Hypochloride generator
- No acid step is involved
- Efficiency of up to 98%
- Safe, however costly to operate and maintain



In Pepcon type of the chemical scrubbers, the air is passed through hypochloride steam which deodorises the air. The hypochloride is generated by electrolysis of NaCl which is easy to handle and store at the site. The efficiency of this scrubber is up to 98%. Chemical scrubbers are expensive for operation and maintenance. There are cases where the 2/3 of the O&M cost of the receiving station is contributed by chemical scrubbing equipment.

Activated Charcoal Filter

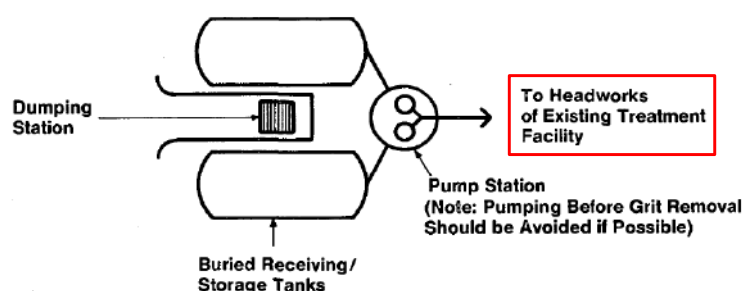


Activated charcoal filters are easy to operate and maintain. They are passive filters where the exhaust air passes through grease filter followed by condensation unit and then through activated charcoal filter. The grease filter and condensation unit are essential for proper functioning and long life of the Activated Charcoal filter. The filters need to be replaced completely at the end of its life. Since no hazardous chemicals are involved, these filters are easy to operate and maintain.

3.3 Types of Receiving Station

Receiving station- Option 1

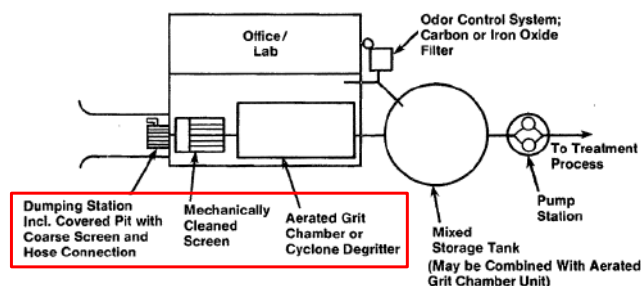
Pre treatment at headworks of STP



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Receiving station- Option 2

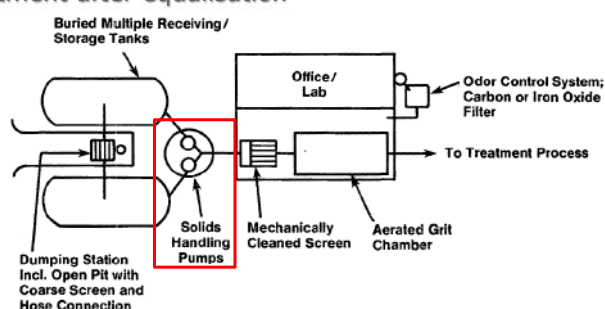
Pre treatment before equalisation



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Receiving station- Option 3

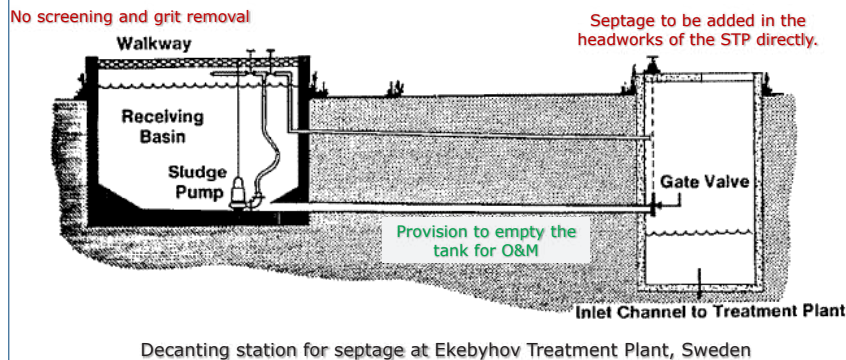
Pre treatment after equalisation



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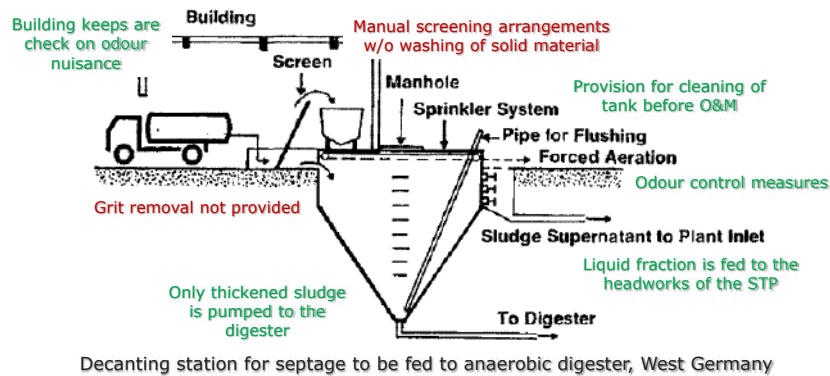
3.4 Receiving Stations - Examples

Receiving station- Example 1



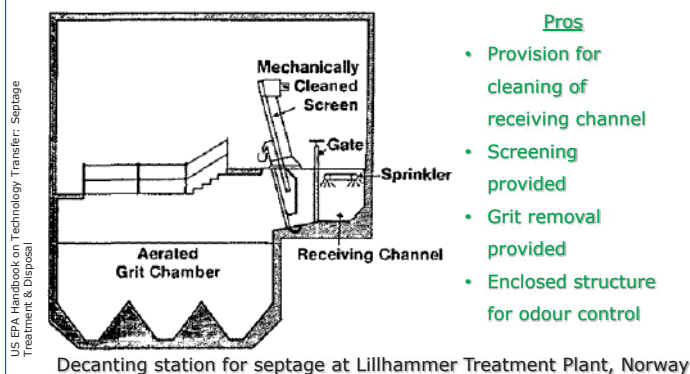
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Receiving station- Example 2



US EPA Handbook on Technology Transfer: Septage Treatment & Disposal

Receiving station- Example 3



US EPA Handbook on Technology Transfer: Septage Treatment & Disposal

- Pros
- Provision for cleaning of receiving channel
 - Screening provided
 - Grit removal provided
 - Enclosed structure for odour control

- Cons
- Direct feed to the headworks of the STP without equalisation

3.5 Best Practices

Best practices - Videos

[Dumping done right by Pumper Magazine](#)

[Combi Pretreatment & Septage Receiving System by Parkson Corporation](#)

3.6 Co-Treatment of Septage and Sewage

Co Treatment of Septage and Sewage

- Feasibility
- Impact on STP
- Points of septage addition
- Best Practices

3.6.1 Feasibility

Feasibility



- Plant location, type, and layout
- Plant design capacity
- Utilised capacity



- Plant effluent limitations (BOD, SS, Nitrogen and Phosphorus)



- Septage receiving and pretreatment facilities
- Sludge handling facilities, including disposal practices

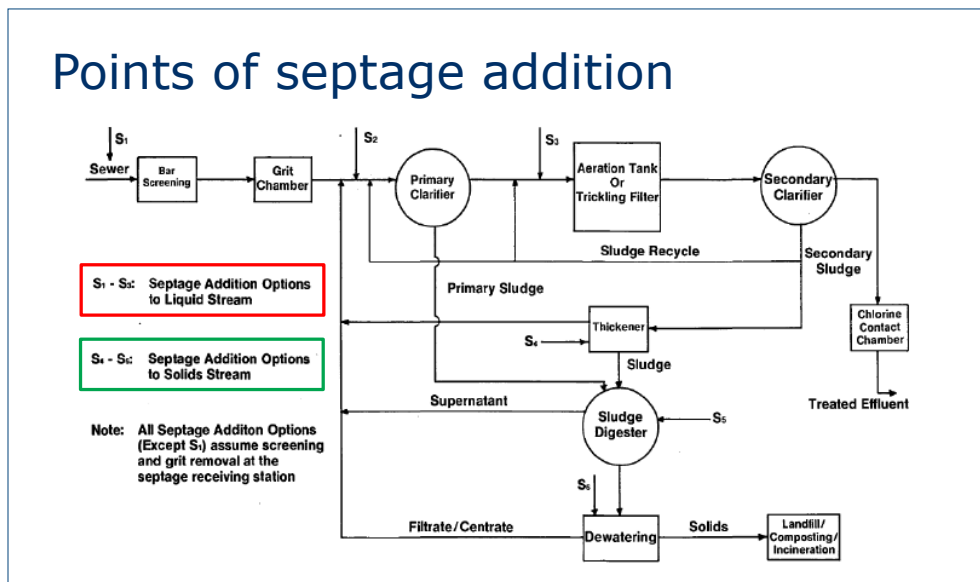
While checking the feasibility of co treatment of septage and sewage at a sewage treatment plant, following are the points that need to be considered.

1. Plant location- Studies claim that the economical distance for hauling raw septage to the sewage treatment plant is between 15 km to 30 km. Thus, it should be checked that how many households will be served via co treatment at the sewage treatment plant. Alternatively, Septage transfer stations will have to be planned to make the conveyance of the raw septage economical. However, siting of transfer stations is

another challenge.

2. Plant type- The type of plant i.e. anaerobic or aerobic biological treatment is employed for treatment of sewage needs to be checked.
3. Plant layout- The layout of the plant be such that the hauler trucks can access it easily and exit the premise as soon as the emptying of the truck is done. Size of the trucks and turning radius etc needs to be considered.
4. Plant design capacity- Studies suggest that the impact on the large-scale sewage treatment plants is less and can also accommodate shock loading coming from septage addition.
5. Utilised capacity- viability of co treatment of septage and sewage is high when large part of the design capacity is unutilised.
6. Septage receiving station- Does the plant has enough space to install a septage receiving station and whether pre-treatment will be needed to the raw septage before it is co treated.
7. Sludge handling facilities and disposal- Sludge handling equipment's should have enough capacity to accommodate the increased volumes of sludge to be processed. If the treated sludge is sent to the landfill or the STP operators pays to dispose off the sludge, then capacity of the landfill and financial viability needs to be checked.

3.6.2 Points of Septage Addition

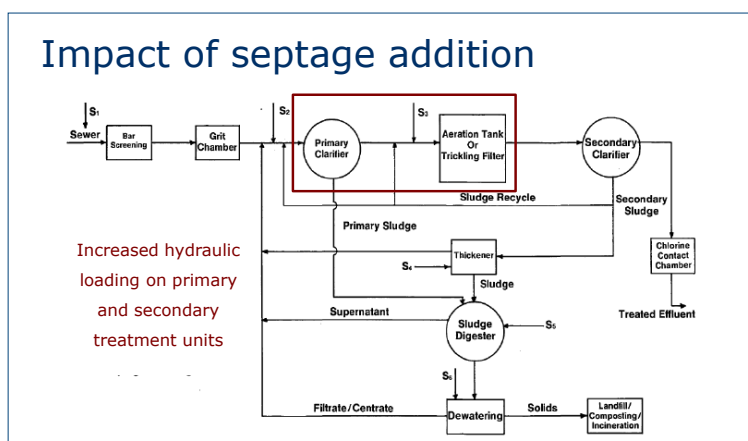


Pre-treated septage can be added in liquid stream or sludge stream as shown in the diagram. There are three points in each stream where pre-treated septage can be added.

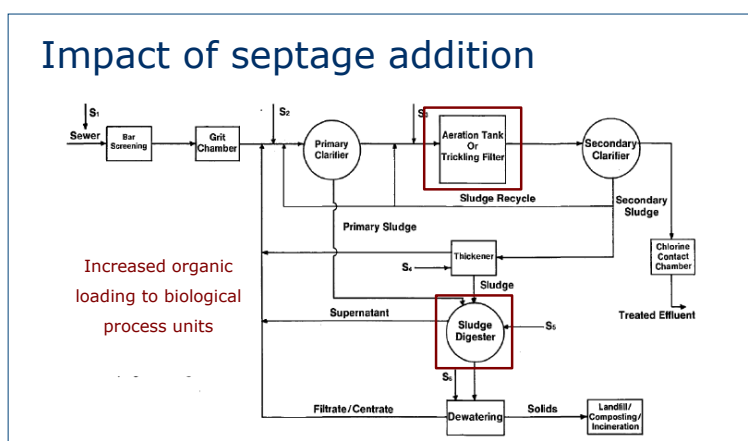
The point of addition is mainly decided by the kind of pre-treatment i.e. provided to the raw septage. It also depends on the efficiency of these pre-treatment processes and the type of addition i.e. slug loading or controlled loading. A careful analysis designed – utilised hydraulic and organic loading rates is needed to decide the point of addition of pre-treated septage to the treatment chain. Only through such analysis one can understand the possible impacts co treatment will have and be able to plan for the mitigation of the problems accordingly.

It is to be noted that addition to the liquid stream will have higher risk of affecting the STP performance as it will affect both the treatment chains i.e. liquid and sludge treatment chain.

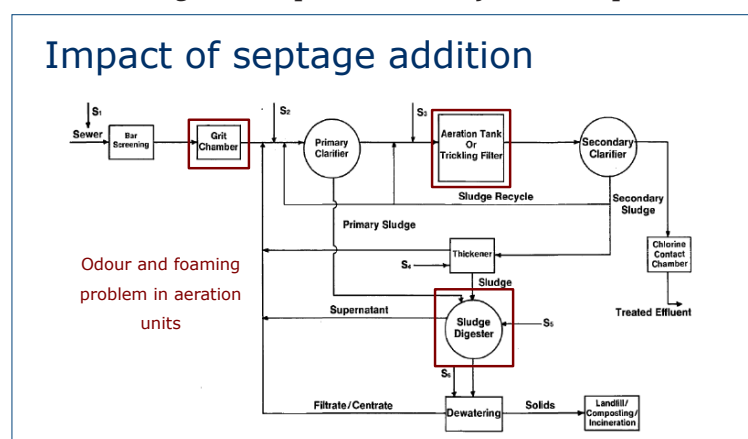
3.6.3 Impact of septage addition



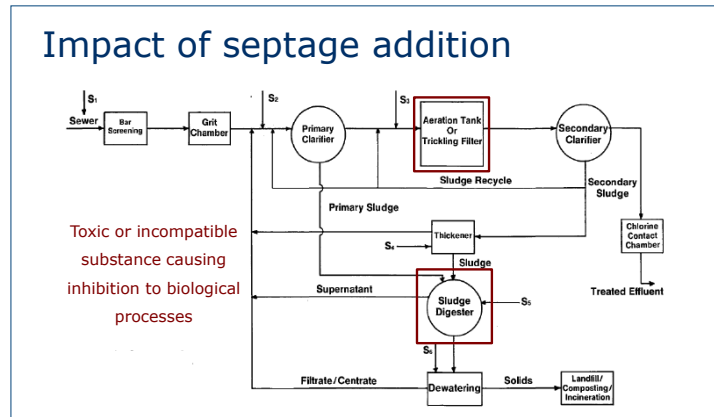
Smaller STPs are more prone to this problem. Even a tanker load of septage can increase the hydraulic load to the primary clarifier and aeration tank. Retention time of both the components will get reduced for a specific duration. The primary clarifier will not efficiently remove the solids and transfer them to the secondary stage where higher oxygen transfer will be required to digest the organic constituents. This is only possible if the aeration unit has buffer capacity. Retention time of aeration tank will also be reduced and as a result of this the effluent from the secondary stage will not meet the designed output.



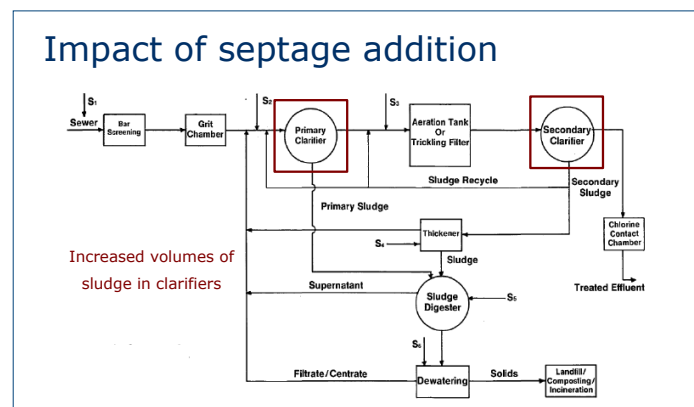
Increased organic load to the biological treatment units hampers the efficiency of treatment. The effluent from these units do not meet the design assumptions and may also hamper the further treatment chain.



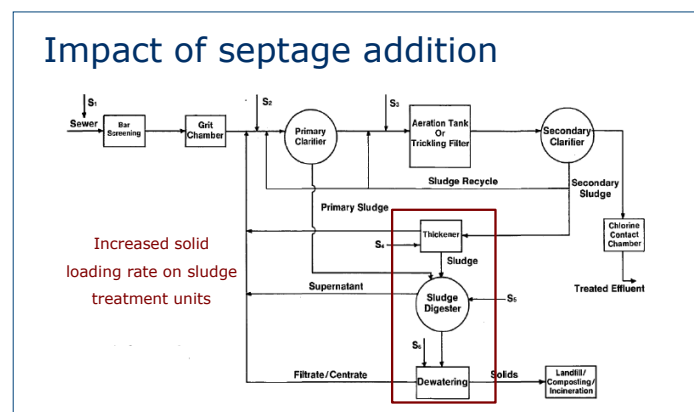
Odour and foaming problem occur in case of slug loading. Due to shock load, there are chances that septic conditions are created. This leads to problems related to odour and foaming.



If the receiving station is not monitored and industrial sludge or septage containing toxic substance is introduced, then the microbial balance in the biological steps gets hampered. Toxic substances change the pH of the reactors and microorganisms are susceptible to the pH. Thus, the efficiency of the treatment decreases and revival of it takes a considerable amount of time.

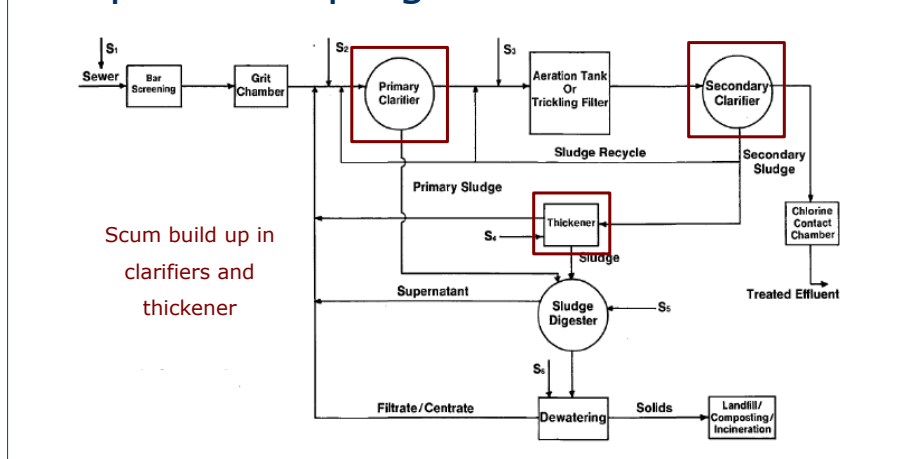


Co treatment of septage and sewerage surely impacts generation of sludge in the clarifiers. Primary sludge will now have higher percentage of organic content. The increase in the sludge quantities surely impact the sludge treatment chain. In the cases where the sludge handling facility is does not have a buffer capacity, this will create major challenge. The bio solids now created won't be digested and dewatered as expected. In case of anaerobic digester, there are high chances of the digester becoming sour due to excessive acid formation. However, in case of aerobic digester, it is seen that the BOD removal efficiency increases.



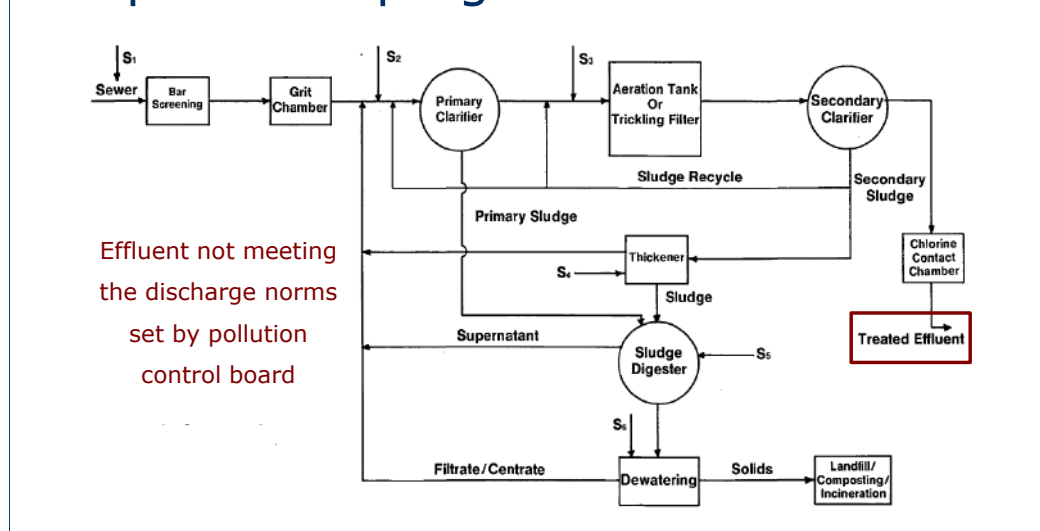
Due to increase in the sludge production, the solid loading rate increases in the sludge treatment units. Septage inherently takes time to thicken as compared to sewage sludge. Addition of septage hinders the thickening process. Increase in the solid loading in digester leads to souring if the solids are high on organic content. The dewatering equipment usually have constraints on Kg of solids it can handle. If the solid content increases, then the wear and tear increases. However, the efficiency of dewatering increases.

Impact of septage addition



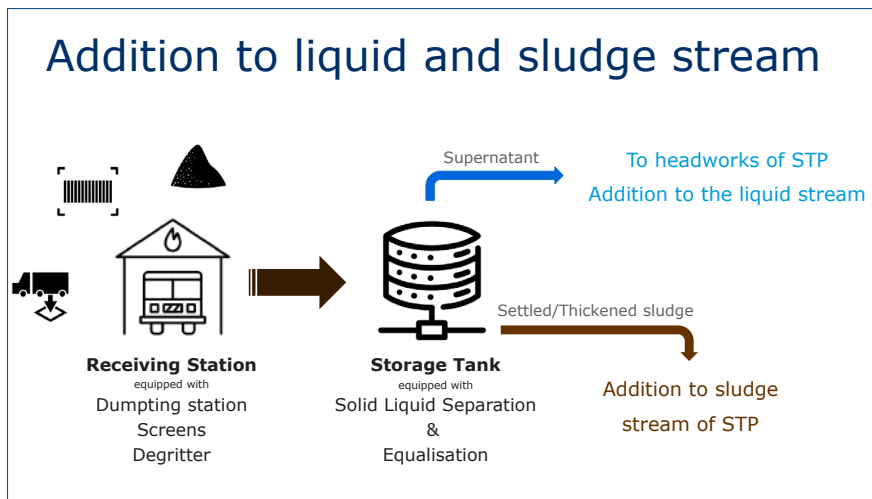
If oil, grease and fats are not removed during the pre-treatment of the raw septage, scum builds up in the clarifiers. Skimming of this excessive scum is the only remedy. This can be achieved by increasing the rpm of the skimmers and extending the length of it.

Impact of septage addition



Finally, if the liquid treatment chain gets affected, there are high chances that the treated effluents do not meet the discharge norms set by the pollution control board. This situation needs to be avoided as far as possible, as reviving the performance of the plant to achieve the set standards is difficult and time-consuming process. The increase in the pathogen levels can be catered to by increasing the chlorine/ozone dosing or increasing the intensity of the UV.

3.6.4 Best Practices



The safest and less risky way to co treat septage and sewage is to separate the solids and liquids and provide a control feed to the STP based on the actual flow rate during the day. In this way, higher quantities of the septage can be handled with creating a large impact on the STP components and its performance. Such receiving stations can also be planned at the sewage pumping station where the supernatant will be discharged into the sewer line and the solids can be hauled at the STP for addition in the sludge treatment stream directly.

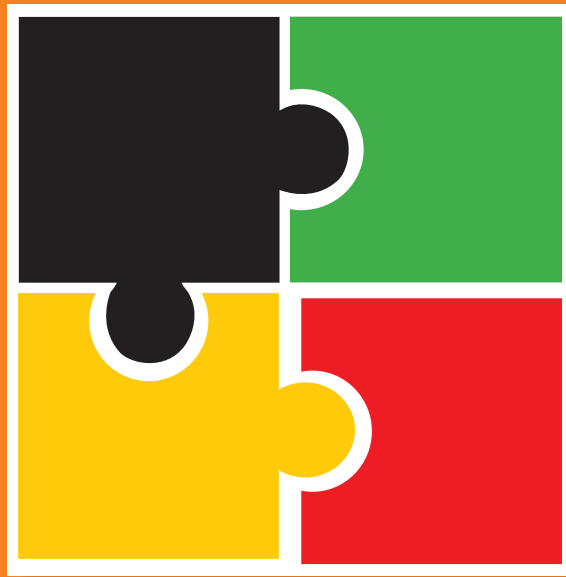


Thank you...

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Exercises

Session IV

SESSION OBJECTIVES

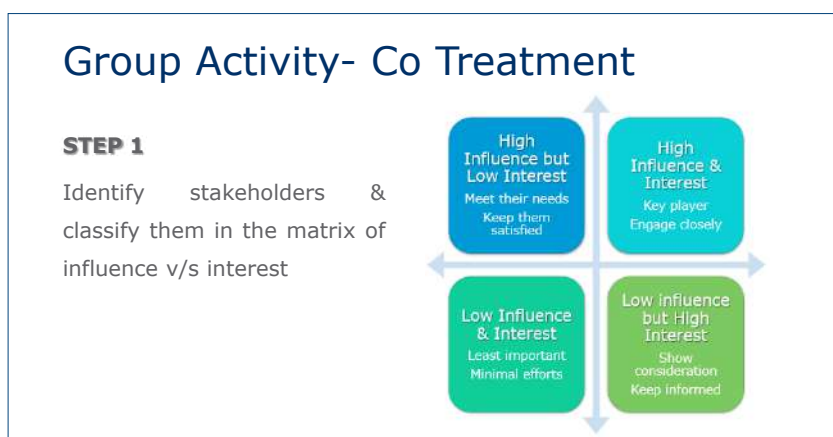
1. To understand the importance of septage receiving station.
2. To understand the components of septage receiving station and their functions.
3. To introduce to types of receiving stations for co treatment septage and sewage.
4. To understand the parameters to check feasibility of co treatment at a sewage treatment plant.
5. To understand the impact of septage addition on the components of the sewage treatment plant.

Session Methodology	Session Duration
Powerpoint presentation, Flip Charts and Sticky Notes	60 minutes

4 Group Exercise On Framework Planning



4.1 Stakeholder Identification and classification



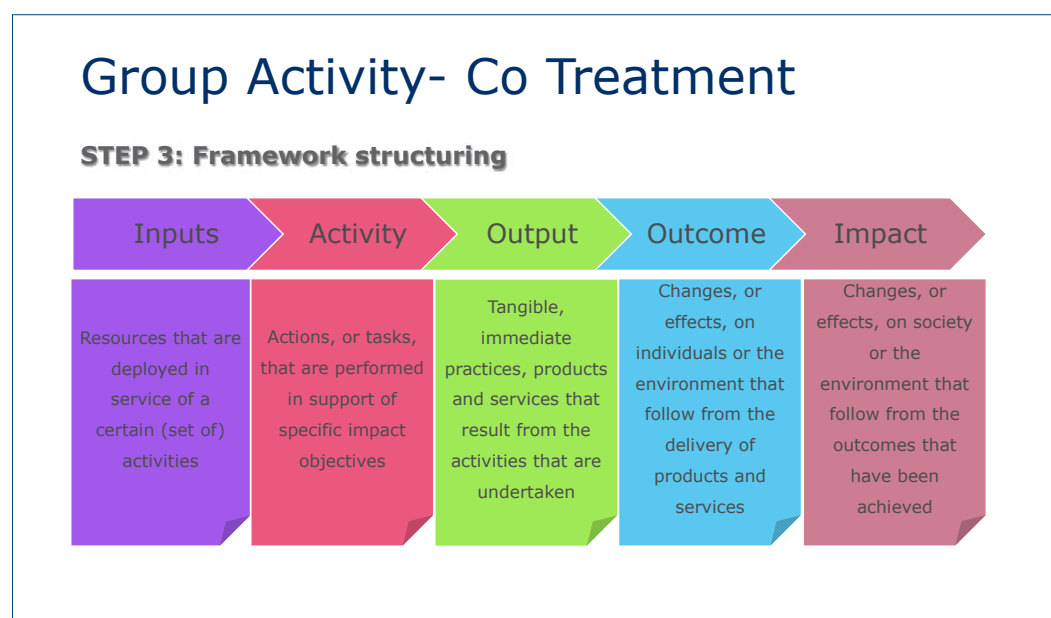
Stakeholder identification for scaling up of cotreatment of septage and sewage at state level. The stakeholders thus identified are classified into the four groups depending upon their interest and influence level.

4.2 Formulation of FSSM Task Force



Formation of an FSSM Task is the primary step to develop the strategy for scaling up of co treatment of septage and sewage at state level. This task force is responsible for developing the strategy and there by undertake certain activities to reach to the output and achieve the outcome.

4.3 Strategizing for State wide Cotreatment



The strategy building for co treatment of septage and sewage was based on the Theory of Change (ToC) Principle. ToC recommend the reverse approach i.e. realising the expected long term impact. To bring this impact, one identifies various outcomes that might be needed. The duration to realize the outcome is dependent on the nature of the outcome itself. Activities are the tasks, which need to be completed to have desired output. Finally identifying the input parameters which will be required to start the activities.

Thank you...

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Session V

FEASIBILITY OF CO TREATMENT AT STP

SESSION OBJECTIVES

1. To understand the data required for assessing feasibility of co treatment at STP.
2. To understand concepts of Hydraulic Load and Organic Load.
3. To understand the preliminary calculation for assessment of feasibility of co treatment at STP.

Session Methodology	Session Duration
Powerpoint presentation, White Board	30 minutes

5 Exercise: Feasibility Of Co Treatment At Stp



5.1 Characteristics of septage and sewage

Characterisation ratios

Ratios (g/g)	Public toilets	Septic tanks	Medium strength municipal wastewater
VSS:TSS	0.65-0.68	0.50-0.73	0.60-0.80
COD:BOD ₅	5.0	1.43-3.0	2.0-2.5
COD:TKN	0.10	1.2-7.8	8-12
BOD ₅ :TKN	2.2	0.84-2.6	4-6
COD:TP	109	8.0-52	35-45
BOD ₅ :TP	17	5.6-17.3	15-20

Source: Faecal Sludge Management: Systems Approach for Implementation and Operation

Characterization ratios convey a lot about the nature of the liquid waste. Since the characterization ratio of septage i.e. the digested human waste are closer to the ratios that of the medium strength wastewater. Hence the co treatment of septage and sewage is possible if appropriate methods are practiced.

Strength of faecal sludge & septage

Sludge type	Strength	COD (mg/L)	Total N (mg/L)	TSS (mg/L)
Fresh	High	250,000	5,000	100,000
	Medium	65,000	3,400	53,000
	Low	10,000	2,000	7,000
Digested	High	90,000	1,500	45,000
	Medium	45,000	400	25,000
	Low	3,000	200	1,500

Source: Faecal Sludge Management: Systems Approach for Implementation and Operation

Faecal sludge and septage can be of different strength and it is not advisable to co treatment fresh or high strength digested septage with wastewater. Pre treatment is required before the septage is introduced in the sewage treatment plant for co treatment.

Fractionation of sludge

Origin	Total COD (mg/L)	X _{CB} (slowly biodegradable)		X _B (particulate unbiodegradable)		X _A (acidogenic bacteria)		S _t (fermentable organic matter)		S _{va} (volatile fatty acids)		S _u (soluble unbiodegradable)		Sum of biodegradable fractions	Sum of non-biodegradable fractions
		(mgCOD/L)	Fraction	(mgCOD/L)	Fraction	(mgCOD/L)	Fraction	(mgCOD/L)	Fraction	(mgCOD/L)	Fraction	(mgCOD/L)	Fraction		
Digested faecal sludge ¹															
High strength septic sludge ¹	90,000	34,118	0.38	53,882	0.60			1,176	0.01			824	0.01	0.39	0.61
Low strength septic sludge ¹	6,000	2,235	0.37	3,565	0.59			118	0.02			82	0.01	0.39	0.61
Septic sludge ¹	2,186	568	0.26	1,218	0.56			262	0.12			138	0.06	0.38	0.62
Septic tank sludge Jordan winter (18.4 °C) ²	2,969	1,318	0.44	814	0.27			484	0.16			353	0.12	0.61	0.39
Septic tank sludge Jordan summer (21.9 °C) ²	6,425	615	0.10	2,254	0.35			1,949	0.30			1,607	0.25	0.40	0.60
Average fractions			0.31		0.47				0.13				0.09	0.43 ± 0.10	0.57 ± 0.10

Source: Faecal Sludge Management: Systems Approach for Implementation and Operation

Fractionation of sludge helps us to understand the importance of pre treatment of septage before co treatment. Literature states nearly 50% of the COD is contributed by particulate matter i.e. easily settle able solids. Also fraction of bio degradable content is approximately only 40%. Thus pre treatment of septage which includes screening, grit removal significantly reduces the COD of the septage. Practicing solid liquid separation further reduces the BOD, COD and TSS of the liquid fraction of septage which then can be safely co treated with sewage.

5.2 Feasibility check

Data required

Influent flow rate of wastewater and septage Concentration of wastewater and pre treated septage

- Daily (m³/d)
- Hourly (m³/h)
- BOD (mg/L)
- COD (mg/L)
- TSS (mg/L)
- NH₄ (mg/L)

Hydraulic load

$$Q_t = Q_w + Q_s$$

Where;

Q_t : Total wastewater flow (m³/d)

Q_w : Wastewater flow (m³/d)

Q_s : septage flow (m³/d)

Usually $Q_w \gg Q_s$; hence, daily hydraulic load will not exceed the designed capacity. However, certain components of the STP need to be checked for hourly hydraulic load to avoid operational issues.

Organic load

$$\text{Organic or Suspended solids Load} \left(\frac{kg}{d} \right) = (Q_w \times C_w) + (Q_s \times C_s)$$

Where;

C_w : concentration of COD, BOD, NH₄ and TSS in wastewater (mg/L)

C_s : concentration of COD, BOD, NH₄ and TSS in pre treated septage (mg/L)

Checks need to be performed for STP and its individual components. For some components the organic or solid loading might exceed the designed capacity.

COD: anaerobic treatment process; BOD: aerobic treatment process;

NH₄: denitrification process; TSS: grit removal and clarifying process

5.3 Problem statement

Problem statement

STP DETAILS

Technology: Activated Sludge Process

Designed capacity: 1.2 MLD

Current wastewater inflow: 540 KLD

Average BOD: 225 mg/L

Average COD: 405 mg/L

SEPTAGE DETAILS

Quantity: 24 KLD

Before pretreatment

Average BOD: 5000 mg/L

Average COD: 14000 mg/L

Solution

Designed BOD load: 270 kg/d

Designed COD load: 486 kg/d

Utilized BOD loading capacity: 121.5 kg/d

Utilised COD loading capacity: 218.7 kg/d

Additional load due to septage;

BOD load: 120 kg/d

COD load: 336 kg/d

Total load of wastewater + septage

BOD load_(w+s) : 241.5 kg/d

COD load_(w+s) : 554.7 kg/d

Thus;

BOD load_(w+s) < Designed BOD loading

COD load_(w+s) > Designed COD loading

Inferences

- Activated sludge process will not get hampered because of treatment.
- Grit chamber and clarifiers will face operational challenges.
- Grit and primary sludge production will increase.
- Septage needs to be pre treated before introducing into the headworks of STP.
- Pre treatment in the form of screens, grit removal is required.

Thank you...

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Case Studies

6.1 Scale up of Co Treatment in Tamil Nadu and its Learnings

Scale up of Co-Treatment in Tamil Nadu and its learnings

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Co-treatment practices in Tamil Nadu

- Tamil Nadu has been practicing co-treatment of Fecal sludge with sewage at STP and decanting stations.
- Experiences from Trichy, Nesapakkam and other parts of the State.
- Very few studies and reports detailing about the co-treatment practices in Tamil Nadu and other parts of the country.

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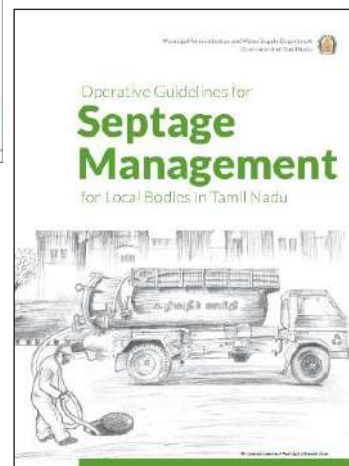
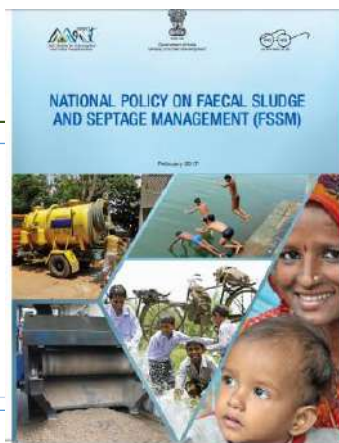
Regulation framework

National Policies

National Urban Sanitation Policy, 2008
MoUD Advisory Note for Urban Water Supply and Sanitation
MoUD Advisory on Septage Management, 2012
National Policy on Faecal Sludge and Septage Management, 2017

GoTN

Septage Management Operative Guidelines for Local Bodies in Tamil Nadu, 2014



- Tamil Nadu is the 1st Indian state to issue Guidelines for FSM.
- Commitment to FSM.
- Provisioning for rural areas.

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Operative guidelines - Overview

1



Design &
Construction of
Septic Tanks

2



Septic Tank
Pumping &
De-Sludging

3



Septage
Transportation

4



Treatment &
Septage
Disposal

5



Fees/Charges for
Collection,
Transportation &
Treatment

6



Information
Education &
Communication

7



Record Keeping
&
Reporting (MIS)

- Includes both residential & non-residential/ commercial waste
- Operative guidelines seeks to empower the local bodies with knowledge, procedures and facilities for effective septage management

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GoTN Operative guidelines - Co-treatment



Septic Tank
Pumping &
Desludging

Local bodies should **ensure proper collection (transportation) system, and treatment of septage at the nearest STP and safe disposal.**



Septage
Transportation

All Septage Transportation Vehicles should be directed to transport septage to their **designated STP or Decanting Stations.**



Fees/Charges for
Collection,
Transportation &
Treatment

Treatment Charges: For treatment, the on-going rate of Rs. 150-200 can be charged for 9000 L of waste collected.



Treatment &
Disposal

Decantation facility should be designed based on the **expected volumes of septage** generated in local body clusters

Should ensure **adequate capacity for the next five years** based on urbanization trend in the cluster

Input quality of the collected septage should be tested at the decanting facility for presence of any **metal or traces of industrial waste**

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GoTN Operative guidelines - Co-treatment



Information
Education &
Communication

Safe treatment and disposal of waste for **municipal staff, desludging operators and private vendors**



Record Keeping
&
Reporting (MIS)

Location of **STP earmarked for disposal of septage**, and decanting facility details should be duly collected by all Local Bodies.

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GoTN Operative guidelines - Co-treatment and Cluster Approach

1. Cluster of Local Bodies identification based on the existing STPs location.
2. The local bodies are clustered in such a way that all the collection points are situated approximately 18-20 km of the radius of the designed STP.
3. The Cluster of local bodies includes Corporation, Municipalities, Town Panchayats and Village Panchayats.
4. Cluster approach has few challenges.
5. GoTN Operative Guideline has given provision for updating clusters based on establishment of new STPs.

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Muzhu Sugadharam application

- GoTN to track implementation status of FSM
- Application developed based on the operative guidelines.
- Computerized database of information organized and programmed in such a way that it produces regular reports.
- Track the progress/ bottleneck along the sanitation value chain.

Screenshot of the MuSu application dashboard

Muzhu Sugadharam POLUR CHANGE PASSWORD

2017/06 Polur
(*) Mandatory fields

2.3 DE-SLUDGING OPERATORS FUNCTIONAL IN ULB

1. Total no. of private de-sludging operators working in the ULB area

2. No. of private de-sludging operators registered by the ULB

3. Number of de-sludging operators from neighboring ULBs operating in this ULB

Remarks :-

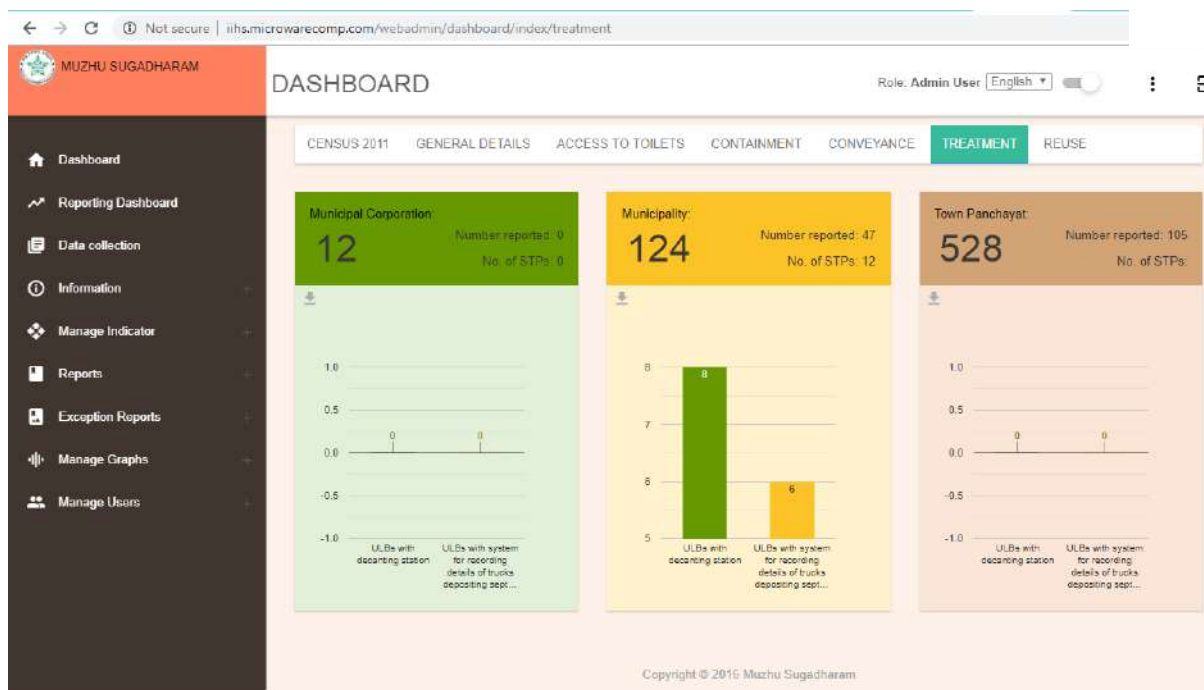
Screenshot of the MuSu application



8

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Screenshot of the MuSu application dashboard



Muzhu Sugadharam Indicators related to Co-treatment

Estimate of septage received for treatment

Estimate of septage (from septic tank) received for treatment per year (Million litres)

Decanting and Pumping stations

- Location of pumping station.
- Whether decanting facility is available
- Whether a system for recording details of trucks depositing septage functional is available

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Treatment

A. Fecal Sludge Treatment Plant

- Whether the ULB has a plant dedicated for septage
- Name of the fecal sludge treatment plant
- Technology used in the fecal sludge treatment plant
- Capacity (KLD) of the fecal sludge treatment plant
- Utilisation (KLD) of the fecal sludge treatment plant

B. Sewage Treatment Plant

- Name of the sewage treatment plant
- Technology used in the sewage treatment plant
- Capacity (MLD) of the sewage treatment plant
- Utilisation (MLD) of the sewage treatment plant
- Does the plant receive septage for treatment?

Tamil Nadu State Investment Plan for treatment

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Components of the State Investment Plan

S. No.	Value Chain	Item	CAPEX	OPEX
1	Access	Construction of Toilets	Household, with support from govt.	Household
2	Safe Containment	Construction of Septic Tanks	Household with support from govt.	Household
3	Conveyance	De-sludging Trucks	Private Sector	Private Sector
4	Treatment	FSTPs	Govt.	Govt./ User
5	Treatment	Decanting stations	Govt.	Govt. / User

Source: TNUSSP Analysis, 2018

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State Investment Plan - Co-treatment

Approach and Methodology for Phasing of Treatment Facilities

- A cluster approach has been adopted to ensure optimum utilisation of resources.
- The ULBs have been clustered around existing treatment facilities or proposed facilities within a radius of 10 km.
- The phasing plan proposes initial clustering around existing STPs, and then proposes addition of new treatment facilities.

Phase I and II: Provision of decanting stations in STP sites

- Phase I – Existing STPs
- Phase II – Proposed STPs
- Provision of decanting stations at all existing and proposed STPs, and suitable pumping stations (existing and proposed) enables a wider coverage of households.



State Investment Plan - Co-treatment

Phase I and II: Provision of decanting stations in STP sites:

- Phase I and II covers **155 ULBs through co-treatment** (60 per cent urban population coverage).
- Proposed that sludge generated by ULBs is treated further at the existing STP around which they are clustered.
- Many of the STPs have **spare capacity for receiving the additional sludge**, a few have already reached their installed capacity, for these customised solutions will be devised.
- These 2 phases require **minimal capital investment** – for providing appropriate sludge receiving facilities either at the STPs or suitable pumping stations.

Implementation of SIP Phase I and II

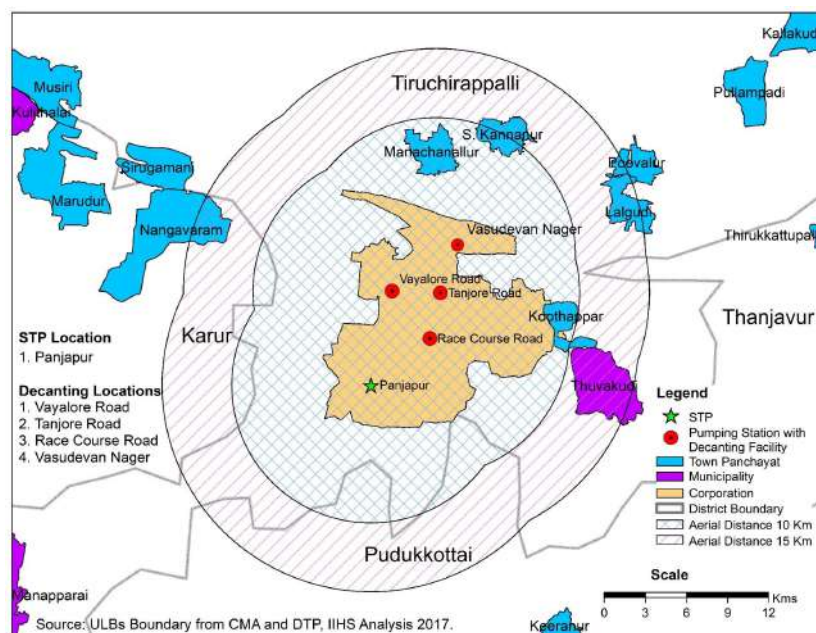
- Upgradation of decanting station
- Provision of decanting stations



Co-treatment in STPs: Regulated Cluster Approach

STPs in Tamil Nadu

Functioning STP 54 in
38 ULBs



TN Phase Wise Plan for all ULBs

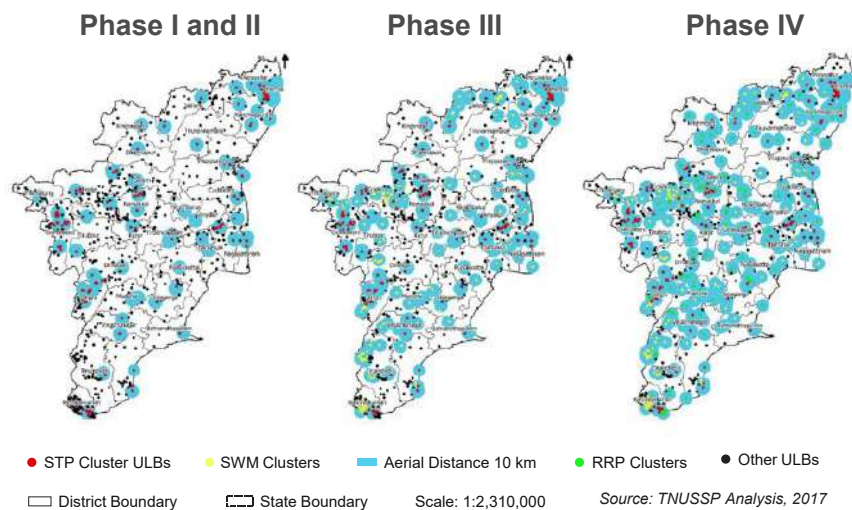
Suggested Phase Wise Coverage of ULBs for FSM

Phase I & II co-treatment at existing STPs and proposed STPs in all ULBs.

Phase III Municipalities with Solid Waste Management (SWM) sites.

Phase IV Town Panchayats land secured within Resource Recovery Parks (RRP).

Phase V ULBs not falling in any of the above clusters.



16

TN Phase Wise Plan for all ULBs

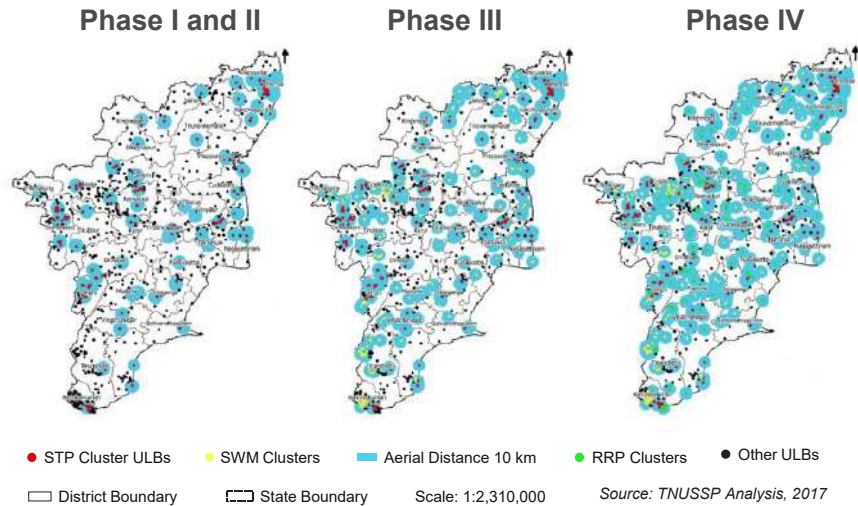
Suggested Phase Wise Coverage of ULBs for FSM

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Phase III Municipalities with Solid Waste Management (SWM) sites.

Phase IV Town Panchayats land secured within Resource Recovery Parks (RRP).

Phase V ULBs not falling in any of the above clusters.



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Enabling and sustaining
co-treatment

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18

Data collection at the ULB / Cluster level

Need for data collection - Situation assessment

- Data collection not at the State level

Why?

- To understanding the feasibility of co-treatment, the assessment of sewage treatment plants and of decanting facility types, capacity and performance in order to determine the feasibility of using unused capacity to treat FS along with sewage across ULBs.
- Aim of the data collection exercise is to saturate the existing infrastructure and provide augmentation of the same for safe treatment and disposal of fecal waste with sewage.

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Checklist for Assessment of Pumping Station

1. ULB Details

2. Location and Access details

1. Capacity, influent and discharge mains details
2. Population served, HSCs, Inlet BOD, TSS
3. Distance to STP
4. Area served by SPS
7. Type of neighborhood area
8. Distance to the nearest residence
9. Access road details

3. Availability of Space and existing infrastructure details

1. Average no. and capacity of trucks
2. Pre treatment unit details
3. Area of SPS, Total and unbuilt area
4. Internal access road details

4. Pump details

5. Staffing details

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Challenges in scaling up of co-treatment – Information quality

At the STP:

- Quantity and quality of FS and sewage
 - Design inlet levels (TSS and BOD)
 - Actual inlet and effluent quality parameters (TSS, BOD and COD)
 - Current average daily flow received at the STP
 - Quantity of incoming FS and sewage
 - Unit wise treatment processes description
 - Details of pretreatment infrastructure (type, sizing and current status of utilization)
 - Aeration methods and capacity
- Space availability for underground storage tank for receiving FS
- Solids management operations and options for direct management at STP

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At the Pumping station:

- Details of pumps (numbers, capacity and current status)
- Details of flow meter
- Details of pretreatment infrastructure (type, sizing and current status of utilization)
- Avg no of trucks that empty FS at the Pumping station
- Quantity of FS received

Overall challenges in scaling up of co-treatment

- FS and sewage volumes and characteristics
- Pre-treatment
- FS Screening
- O&M practices
- Monitoring of plant performance
- Record keeping
- System and procedures

Provisions for:

- Spillage management
- Safety and personal protective gear
- Sanitation facilities at the site

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Opportunities and solutions for Co-treatment

1. Development of new infrastructure and treatment facilities at ULBs
2. Upgradation and augmentation of existing cotreatment facilities at ULBs
3. Support for proposed STPs and decanting facilities at ULBs
4. Support for Operation and maintenance

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Options for decanting facilities and its improvements

1. Stand alone decanting station

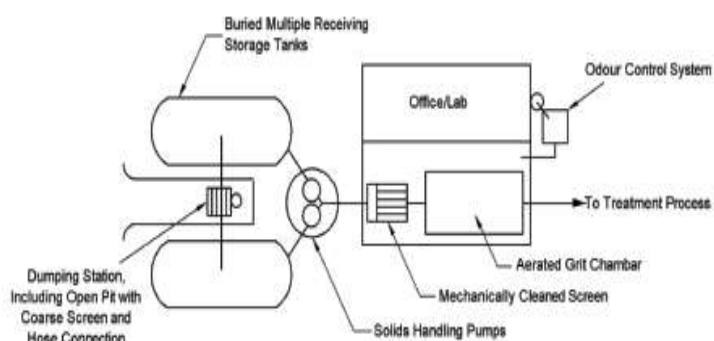
2. Improvements in pumping station

- A receipt facility with screen and grit removal
- Ramp for unloading

3. Options at STP

- Solid Liquid separation
- Equalization Tank

CPHEEO Guidelines



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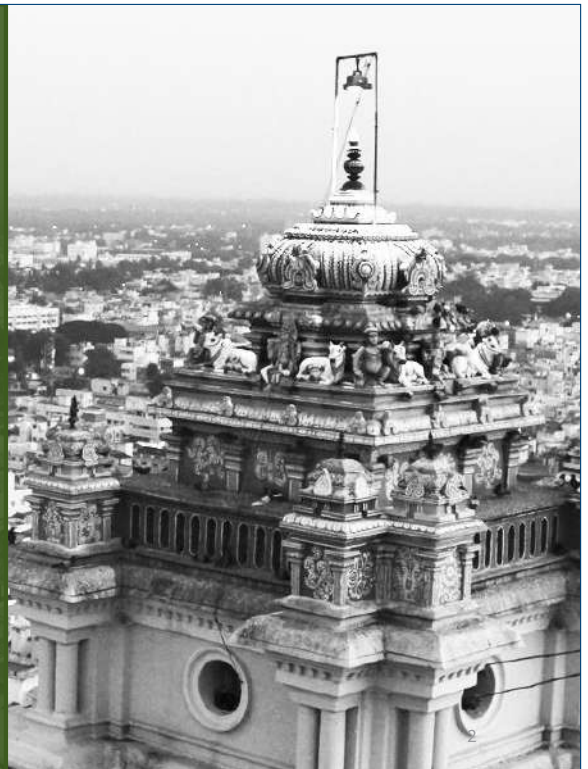
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Co-treatment of Fecal Sludge in STP – Cases from Tamil Nadu

1

TIRUCHIRAPPALLI

- Four administrative zones
Ponmalai, Srirangam, K. Abhishekapuram, Ariyamangalam
- Trichy has a population of approximately 10 lakh people living in 65 wards. Floating Population increases during festival seasons
- Area of 167 sq. km.
- 154 notified and 108 non-notified slums
- Fourth largest Municipal Corporation in Tamil Nadu
 - ✓ Headed by a Commissioner
 - ✓ 4 Assistant Commissioners
 - ✓ 1 City Health Officer
 - ✓ 29 Engineers belonging to JE / AEE / EE / CE cadre
 - ✓ 7 departments with Public Health & Engineering departments mainly dealing with sanitation



Sanitation in Trichy: Overview

Co-existence of networked systems and FSM

City's Strengths

1. Large Infrastructure of Community and Public Toilets
2. De-sludging vehicles meet certain standard
3. Presence of decanting stations

Present:

Total wards: 65

1. 25 are fully sewerred; 25 Partially sewerred
2. Rest – OSS, and 4 decanting facilities, co-treating in STP with 88 MLD capacity

Plan:

1. Sewerage is planned in phased manner, FSM to complement sewerage
2. Sewerage Phase II & III : Expected to be implemented in 3-5 years
 - a. FSTP under construction, additional decanting facility is proposed



Overview of Collection and Conveyance

Network

- 2 Main Pumping stations- 1 Decanting station (Anna Stadium)
- 24 Sub Pumping stations- 3 Decanting stations
- 26 Lifting stations
- Existing length 330 km of network

De-sludging operators in the city

- 31 operators; 41 vehicles
- 36 operator vehicles registered with TCC for the year 2017-18
- Tank capacities range from 4000 L to 10000 L; common size is 6000 L

Tank capacity	Per load price in Rupees	
	Within TCC limits	Peripheral Areas 20 Kms +
4000 – 5000 L	1000 - 1500	1800 - 2500
6000 L	1500 - 1800	2000 - 3000
8000 – 10000 L	1500 - 2000	2500 upwards



Overview of FS and Sewage Treatment

STP Components

No.	Description		Value	Unit	Source
1	Waste stabilization ponds as treatment technology. Effluent discharge to Koraiyar River	Defunct cells	30	MLD	TCC
		Operating cells	58		
2	Current inflow		45	MLD	Field estimation, estimated from pumping stations
3	No. of Households covered by sewerage network		45000	No.	TCC
4	Amount of fecal sludge received (Max)		480	m ³ per day	Decanting station survey
5	Inlet BOD at STP		103	mg/L	Sampling Analysis during March 2017

Non functional



Currently operating

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Evolution of Co-treatment in Trichy

2005

Provided FS emptying facility at the facultative ponds of the 30 MLD Plant

With the primary objective of reducing open dumping

STP

2013

Provided designated facilities at three of the pumping stations

With the primary objective of reducing hauling distance and spillage near the STP area

Decanting Station

2017

2014- GoTN issued Septage Management Operative Guidelines

Added one more decanting station; Assessment of STP
At present one decanting station in each Administrative zones of TCC

Assessment of STP; Integrated Planning

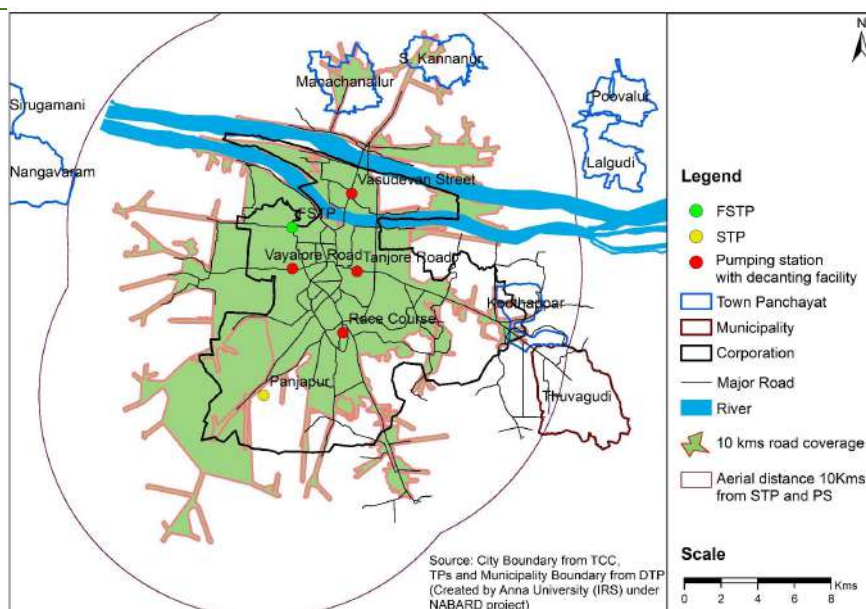
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Decanting Facilities

7

Decanting Facilities: Area Covered

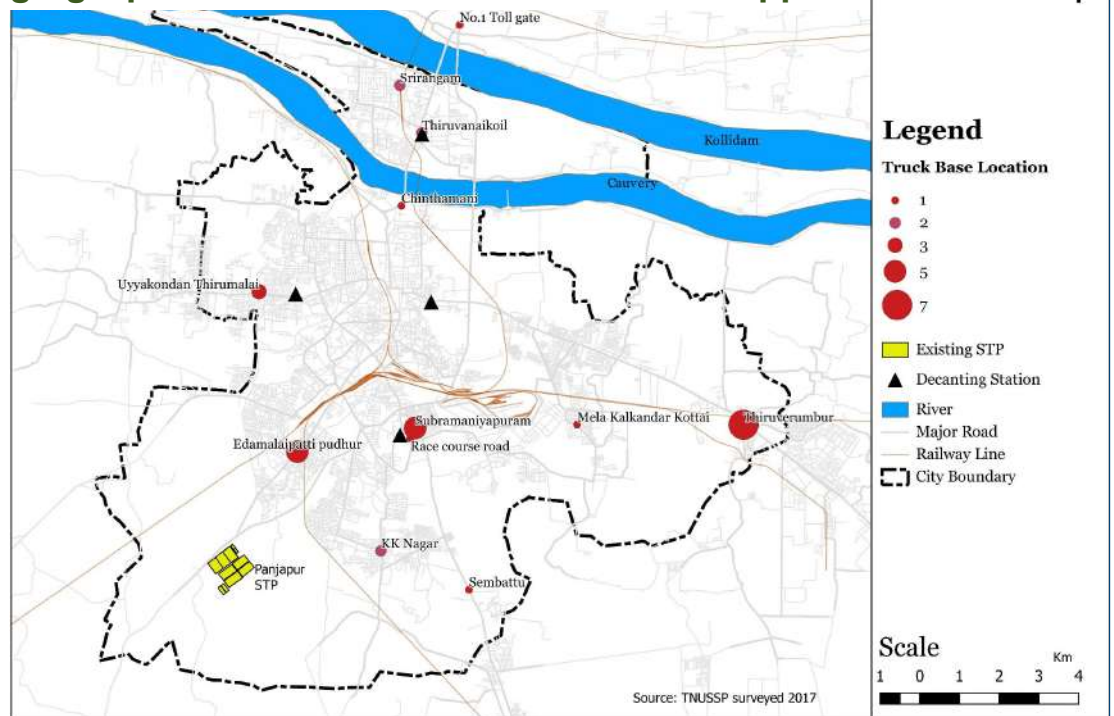
Area of covered decanting facilities:
10 km aerial and road distances



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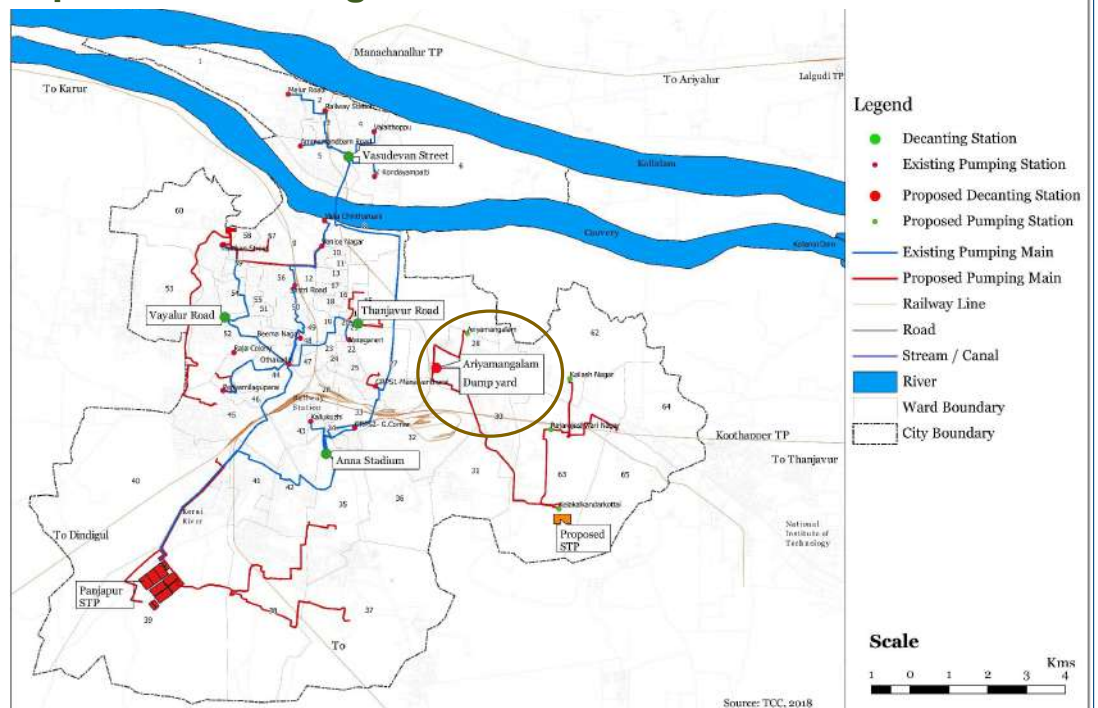
Private desludging Operator's Base Location in Tiruchirappalli

Most trucks are parked at Tiruverumbur, followed by Subramaiyapuram and Edamalaipatti pudur



Existing and proposed decanting station with sewer network

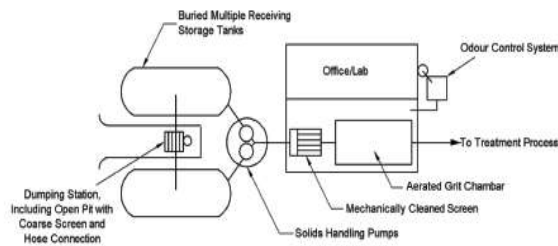
Decanting facility is proposed at Ariyamangalam (Inside solid waste dump yard)



Decanting Stations: Standard Requirements

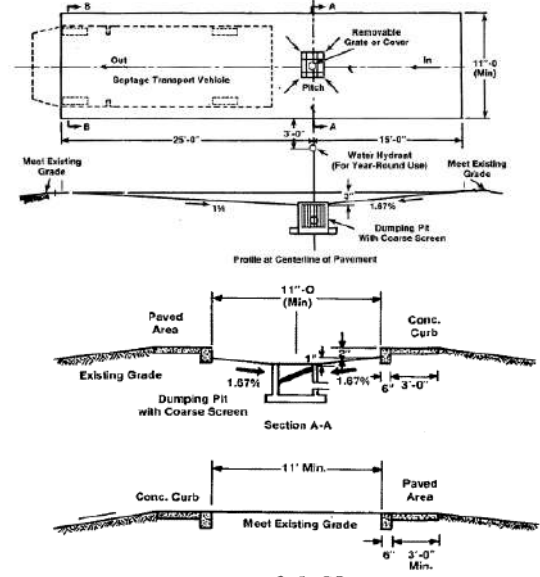
1. Dumping station/receiving tank
2. Screening
3. Grit removal
4. Storage or equalisation
5. Odour Control

CPHEEO Guidelines



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USEPA Guidelines



Source: Handbook on septage treatment and disposal, USEPA

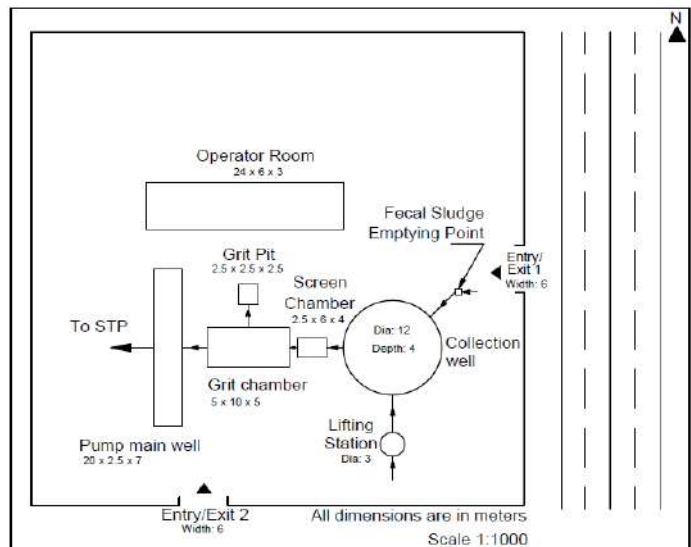
Assessment of Decanting Stations in Trichy

Infrastructure at Trichy Decanting Station

- Screening and grit removal facility
- Receiving facility (At present not in use)



Layout



Decanting Station-Trichy

Main Pumping station at Anna stadium



Collection well where FS is received



Screen chamber



Pumping well



Grit Chamber

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Protocol for Fecal Sludge Testing and Screening

1. TSU developed the protocol that should be carried out on-site by trained plant operators from the trucks at the FS receiving facility.
2. The protocol describes:
 - Sample collection
 - Testing procedure for pH and Electrical conductivity
 - Observation of color, odor and temperature
 - Interpretation of the test results
3. Training to the plant operators at Karunguzhi TP.
4. The kit has been given to Karunguzhi TP and CMA, as part of the TSU activities.
5. **Next steps:** Institutionalization and challenges in scaling up

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Sample collection



pH measurement



EC measurement



Sampling and testing kit

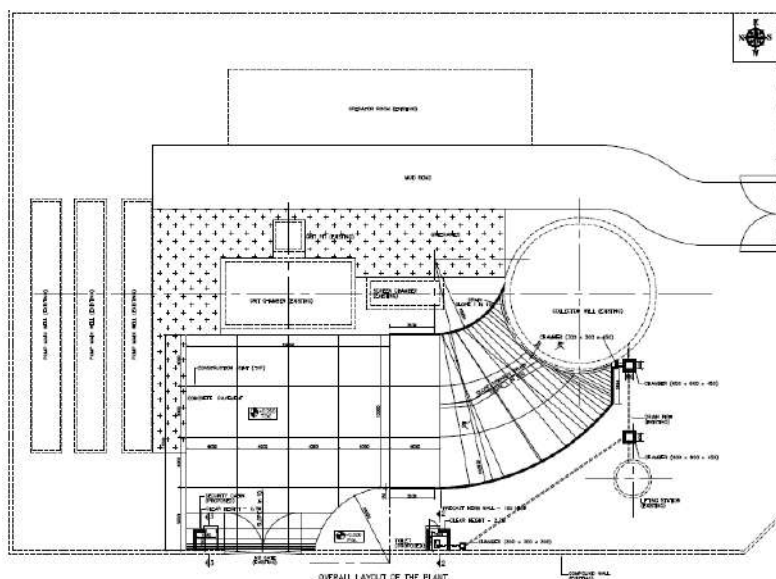
Planned Improvements

1. Layout and Infrastructure

- a. Unloading ramp
- b. Wash facilities, toilet revamping
- c. Renovation of existing screen and grit chamber

2. Operation and Maintenance

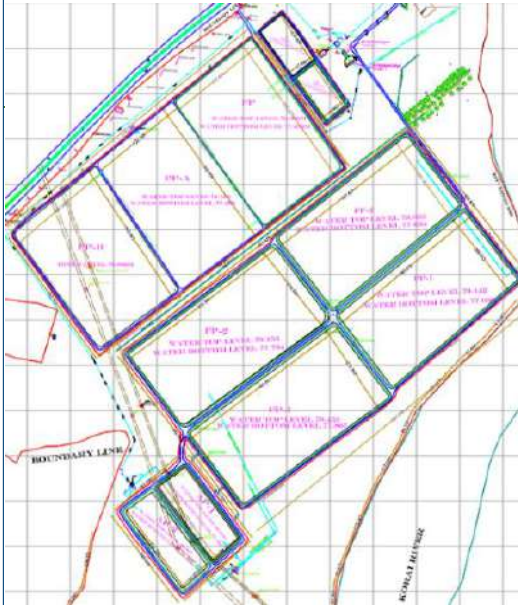
- a. Conditioning of motors
- b. Regular removal of screenings and grit
- c. Establish a system to monitor FS quality
- d. Monitor night time operations.
- e. Use of PPE
- f. Data and record keeping



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**Waste
Stabilization
Pond**



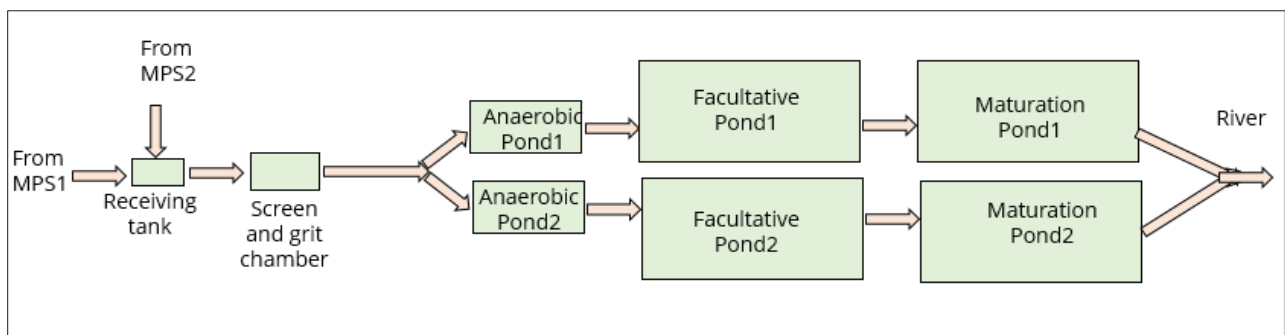
**Layout of the Sewage
Treatment Plant at Panjappur**

Waste Stabilization Pond

- Constructed in 1998.
- Sewage is pumped to the treatment plant through 52 pumping stations, which currently serves about 30% of the city.
- Four of these pumping stations are equipped with septage receiving facilities where the city's septage transportation fleet discharges their loads.
- There are nine ponds, six of which are currently operational (operational system), and three of which are not (old system).
- The STP at Panjappur was originally designed to meet 30 mg/L BOD and <100 mg/L for TSS discharge standards.

Waste stabilisation ponds

STP Components



Planned Improvements

- **Infrastructure:** Requirements such as flow measurements, installing adequate outlet structures to restrict the carryover of algae or solids
- **Infrastructure changes:** Installation of air vac valves to removal of air block in the conveyance pipeline, retrofitting the old ponds.
- **Operation:** Regular desludging of ponds, scum and weed removal, regular screenings and grit removal (frequency should be increased).
- **Maintenance:** reconditioning the valves, reconditioning the screen and grit removal systems, field measurements and laboratory analysis of key parameters, establish sludge management.
- **Performance Improvements and Capacity Enhancement:** Installation of aerators/baffles to reduce short-circuiting and improve BOD and Nitrogen removal.
- **Record keeping and reporting:** Establish daily/monthly and annual report keeping of observations, analysis and maintenance at the plant.

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Chennai Sewerage System and Co-treatment facilities at Nesapakkam STP

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Chennai Sewerage System

- Chennai city sewerage systems is divided into 5 zones.
- Each zone has been provided with individual collection areas, pumping stations, force mains etc.
- Zone-IV is the smallest of the macro systems lying to the Southwest of the City. The areas covered are Ashok Nagar, Saidapet, Jafferkanpet, K.K. Nagar and **Nesapakkam**.
- The first STP was constructed in 1974 at Nesapakkam with 23 MLD capacity.
- In Chennai there are **5 decanting facilities**, **3 co-located at STP (Kodungaiyur, Nesapakkam and Perungudi)** and **2 are at Sewage Pumping Stations connected to Koyambedu STP**.
- 5 Proposed STPs - 3 STPs are proposed near existing STP at Kodungaiyur, Nesapakkam and Perungudi. Construction is ongoing for 2 within Greater Chennai Corporation (GCC) and for 4 outside GCC.

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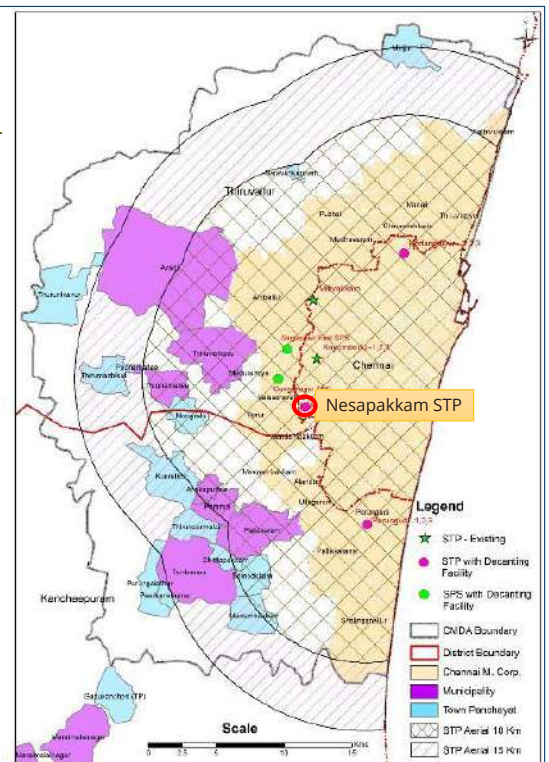
Sewage Treatment Facilities at Chennai

No	Name of Sewage Treatment Plant	Year of Commissioning	Treatment Capacity (in MLD)
1	Kodungaiyur - Zone I	1991	80
2	Kodungaiyur - Zone II	1989	80
3	Kodungaiyur - Zone I & II	2006	110
4	Koyambedu - Zone III	1978	34
5	Koyambedu - Zone III	2005	60
6	Koyambedu - Zone III	2015	120
7	Nesapakkam - Zone IV	1974	23
8	Nesapakkam - Zone IV	2006	40
9	Nesapakkam - Zone IV	2014	54
10	Perungudi - Zone V	2006	54
11	Perungudi - Zone V	2012	60
12	Alandur - Zone V	2003	12
Total			727

1. Treatment technology at all STP is Activated Sludge Process
 2. Villivakkam, a small treatment plant of 5 MLD capacity developed by the Housing Board for SIDCO Nagar of Villivakkam was taken over by C.M.W.S.S. Board during 1984 and now abandoned.

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Source: CMWSSB, 2017



Decanting Station- Nesapakkam STP

- Design Capacity of Sewage Treatment Plant is 117 MLD (45 acres land area).
- Current sewage inflow is 100 MLD.
- Nesapakkam STP started receiving FS since 2006.
- FS mixed with the sewage in the ratio of approximately 1:9 (i.e. around 1.6 to 1.8 MLD).
- No. of registered trucks is 52 and around 200 trucks loads of FS treated at STP per day. The average volume of FS is 9 KLD per trip.
- Three trucks can decant FS at same time.
- The truck operator is charged Rs. 100 per trip for utilising the decanting facility.
- The Desludging Operators charge in the core area about Rs. 700 to 900 per trip (5-6 km) and in peripheral areas Rs. 1200 to 1500 (8-10 km).

TN US SP



Decanting Facility - Nesapakkam STP



Receiving point-
Outside the facility



Receiving Tank



Screen chamber

TN US SP

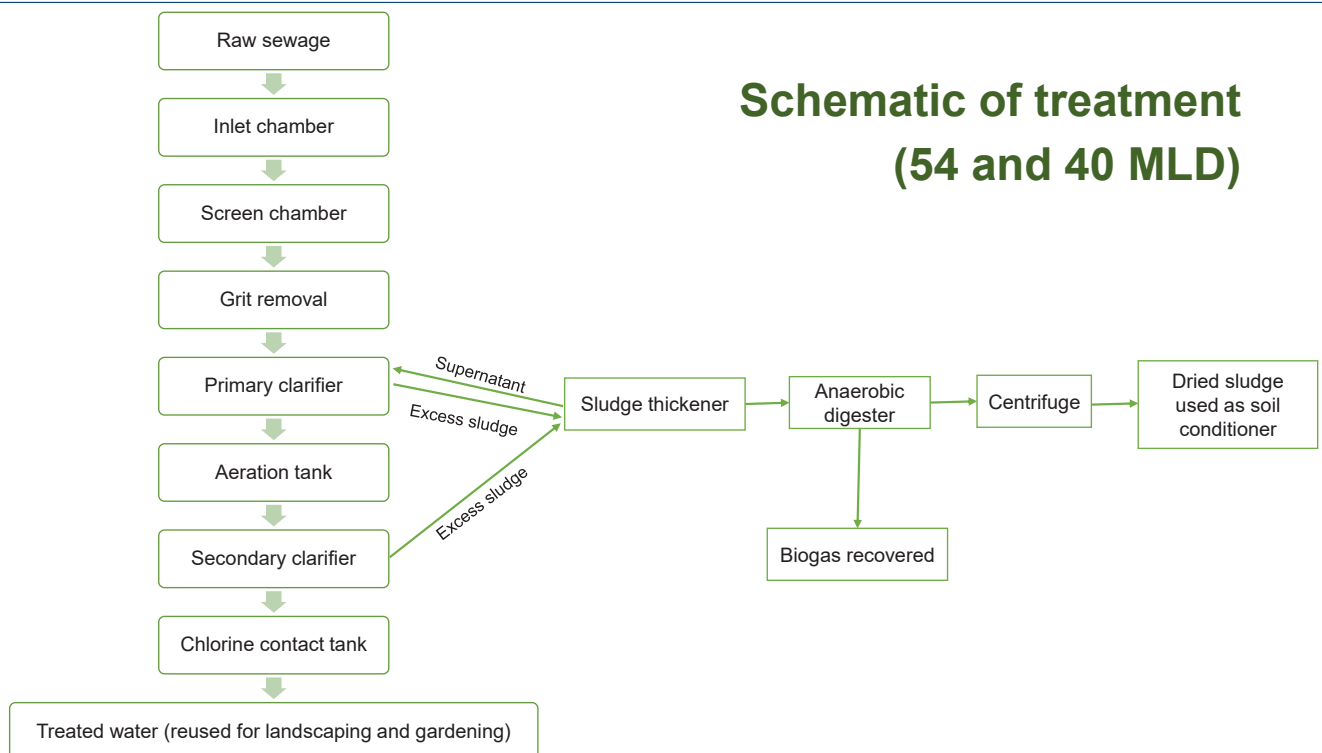
Co-treatment of FS with sewage

1. Distance station to Pumping Station is around 1 km.
2. FS received at STP premises is directed to the pumping station through main sewer line.
3. From pumping station FS mixed with sewage is pumped to elevated chamber located at STP.



TN US SP

Schematic of treatment (54 and 40 MLD)



Summary

Key takeaways

- Incremental and Phase wise approach across the State paving the way for Co-treatment in existing and upcoming facilities.
- Minimal capital expenditure and saturating the treatment infrastructure thereby utilizing residual capacity of STPs.
- Cluster approach
- Challenges in technical requirements and implementation.
- Need to understand the local context when initiating and sustaining co-treatment.

CO-TREATMENT OF SEPTAGE & SEWAGE

Nesapakkam, Chennai



CHENNAI AT A GLANCE

The Chennai Metropolitan Water Supply and Sewerage Board (CMWSSB) has been entrusted with the responsibility of planning, developing and regulating water supply and sewerage services in the GCMC area. For the purposes of planning and operation, the GCMC area has been divided into 15 zones and 200 divisions. According to the CMWSSB, currently the entire core city is covered with underground sewerage systems (UGSS).

The city has 12 Sewage Treatment Plants (STPs) at five locations namely, Kodungaiyur, Koyambedu, Nesapakkam, Perungudi and Alandur with total installed capacity of 727 MLD. Nesapakkam STP is located in Zone IV and serves the south western part of the GCMC area. Spread over an area of 45 acres, the Nesapakkam site has three treatment trains with a combined installed capacity of 117 MLD (23 MLD, 40 MLD and 54 MLD respectively). All three STPs at Nesapakkam are based on an “Activated Sludge Process” (ASP) Technology. The combined waste water flow ranges from 95 to 100 MLD.

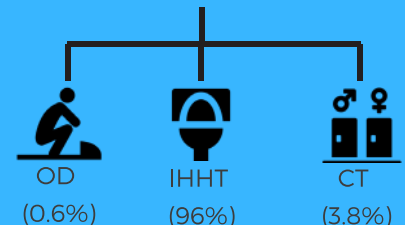


FACTS & FIGURES

Chennai Metropolitan Area (CMA) consists of 7 municipalities, 12 Town Panchayats, 30 Census Towns, 11 Urban Outgrowths and 150 villages, along with the Greater Chennai Municipal Corporation (GCMC)

Population (2011): 4,646,732

Access to sanitation under GCMC



Sewage treatment technology at STP

Activated Sludge Process

GENESIS AND IMPLEMENTATION OF CO-TREATMENT

The main drive for initiating co-treatment was to end the practice of unauthorised septage dumping into the region's open areas, storm water drains and water ways. Roughly about 1.8 MLD septage is discharged on a daily basis. The presence of spare treatment capacity (of up to 17-22 MLD) enabled implementation of co-treatment of septage at Nesapakkam STP.

DECANTING STATION



A decanting station has been created at the Nesapakkam STP to allow desludging. The decanting station comprises a receiving tank followed by an odor control unit. Septage from the receiving tank flows into the STP.



MODIFICATIONS TO THE PLANT

Some modifications were required in the plant's operation and maintenance in order to implement the co-treatment process:

1. Increased aeration
2. Increase in sludge-handling load



RECORD KEEPING PROTOCOLS

The decanting facility at Nesapakkam has a supervisor who maintains a "Daily Trip Sheet", within which records of vehicles and desludging activities are recorded.

IMPACT OF CO-TREATMENT



It is estimated that the co-treatment of septage at Nesapakkam is able to provide septage treatment solution for roughly 180,000 to 600,000 households with septic tanks



Regularisation protocols have ensured that the 52 private trucks registered with the Nesapakkam STP have been provided with a safe and economical option for desludging



Unauthorised dumping of septage in the city's waterways has reduced substantially. The water post co-treatment has BOD, TSS and faecal coliform levels well within range of the prescribed levels



Regularisation of the co-treatment and the user charges collected from private desludging operators is resulting in generating revenue to the tune of INR 6 million per year.



CO-TREATMENT OF SEPTAGE & SEWAGE

Tonca, Panjim



PANJIM AT A GLANCE

According to the City Sanitation Plan 2015 (CSP), 74-80% of the house-hold toilets and 70% of the public toilets are connected to a centralised sewerage network and discharged either into Outfall Sewers (OFS) or pumped to one of the two Sewage Treatment Plants (STPs) at Patto and Tonca.

The Sewage Treatment Plant at Tonca was commissioned in 2005 and has an installed capacity of 12.5 MLD and serves around 12,000 households. The STP is based on Cyclic Activated Sludge Technology (C-Tech), an advanced Sequential Batch Reactor (SBR) technology. The STP is located in the south eastern part and serves most of Panaji (area under CCP).

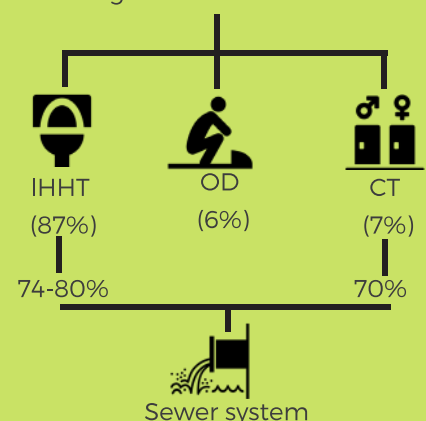


FACTS & FIGURES

Panjim Urban Agglomeration (PUA) comprises the area under the City Corporation of Panaji (CCP) along with the seven out-growths

Population (2011): 114,759
Projected population (2041): 181,543

Access to sanitation & sewage collection for PUA



CO-TREATMENT OF SEPTAGE & SEWAGE

Bingawan, Kanpur



KANPUR AT A GLANCE

Kanpur is divided into four sewerage districts. The total installed capacity of STPs in Kanpur is 481 MLD. The total amount of waste water inflow at STPs is 240 MLD which is around 50 percent of the total treatment capacity. Multiple institutions are involved in management of sewage:

1. Uttar Pradesh Jal Nigam (UPJN): planning, designing, construction and implementation of capital projects for sewerage along with Operation and Maintenance (O&M) of large Sewage Pumping Stations (SPS) and STPs.
2. Kanpur Jal Sansthan of the Kanpur Nagar Nigam (KNN): maintenance of trunk sewers, lateral sewers and collection of revenue from house connections.

Sewerage District II covers the southern parts of the city (including Kakadeo, Shashtri Nagar, Geeta Nagar, Anwarganj etc.) and the waste water generated is treated at the Bingawan STP. It has an installed capacity of 210 MLD and is designed as an Upflow Anaerobic Sludge Blanket (UASB) Reactor system. The STP receives inflow from 80 to 90 MLD.

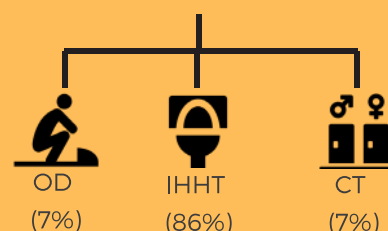


FACTS & FIGURES

Kanpur Urban Agglomeration
Population (2011): 2.92 million
Projected population (2041): 3.38 million

Current population of Kanpur
Metropolitan Area is 5 million.

Access to sanitation



65-73%



Sewer system

Currently, a total of 61% of the city's area is connected to sewer systems

GENESIS AND IMPLEMENTATION OF CO-TREATMENT

The main drive for initiating co-treatment was to end the practice of unauthorised septage dumping into the region's open areas, storm water drains and water ways. Approximately 0.48-0.96 MLD of septage is discharged at the plant on a daily basis. Currently, the following parameters ensure implementation & efficacy of the co-treatment:

DECANTING STATION



A decanting station created at the beginning of the Tonca STP allows systematic desludging of septage into a manhole, which is internally connected to the preliminary treatment and eventually to the STP.



RECORD KEEPING PROTOCOLS

The records related to decanting are maintained by a supervisor at the decanting station. He manages and supervises the entry and exit of vehicles at the decanting station. This allows limited desludging at the site and prevents dumping of septage.

IMPACT OF CO-TREATMENT



Co-treatment has resulted in providing treatment solution for roughly 0.11 – 0.23 million households and 5 Public toilets with septic tanks



Co-treatment has resulted in regularisation of private desludging operators and provided them with a safe & authorised place for desludging



Co-treatment has reduced the practice of unauthorised dumping of septage. Furthermore, the treated water post co-treatment has low BOD, TSS and faecal coliform levels



Regularisation of the co-treatment and the user charges collected from private desludging operators is resulting in generating revenue to the tune of INR 18 million per year



CO-TREATMENT OF SEPTAGE & SEWAGE

Bingawan, Kanpur



KANPUR AT A GLANCE

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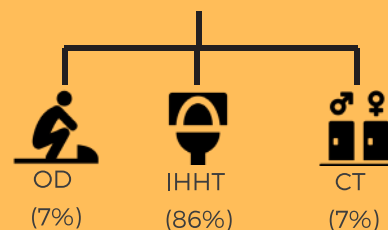


FACTS & FIGURES

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Sewer system

Currently, a total of 61% of the city's area is connected to sewer systems

GENESIS AND IMPLEMENTATION OF CO-TREATMENT

After KNN took a decision to tighten the noose on private desludging operators in June 2017, the private operators formed a committee: "Kanpur South City Tankers Committee" which sought to negotiate a viable solution to the problem. Thus, they set upon a Standard Operating Procedure through a process of confrontation, consultation & consensus building. This gave birth to the rules of septage co-treatment. The Bingawan facility receives about 0.18 to 0.24 MLD of septage on a daily basis.



DECANTING STATION

A manhole, for receiving septage, has been created at the STP's entrance into which private desludging operators decant their tankers. The area around the manhole is paved and a gradient is created to allow any spillage to flow back into the manhole.



SEPTAGE SAMPLING PROTOCOLS

At present, random sampling of septage takes place which is tested at the existing laboratory at the STP. UPJN officials revealed a plan to acquire an instant analyser which will allow them to conduct immediate testing prior to discharge



RECORD KEEPING PROTOCOLS

A specially appointed supervisor maintains a log book in which he records the registration number of the vehicle & location. The driver of the truck needs to carry a copy of the monthly payment receipt issued by the KNN. This is checked by the supervisor before allowing the vehicle to discharge their septage load.

IMPACT OF CO-TREATMENT



It is estimated that the co-treatment of septage at Bingawan is able to provide septage treatment solution for roughly 27,000 – 0.112 million households with septic tanks



Regularisation protocols have ensured that the 21 private trucks registered with the KNN are now regularly monitored through the log books that are maintained at the STP



Coupled with strict enforcement of the provisions of Municipal Waste Management Rules and the recommendations of the National Green Tribunal have ensured that illegal dumping of septage has been reduced dramatically in Division II.



The annual registration charge and the monthly tipping fee charged to the private desludging operators have emerged as a revenue source for the KNN. In the last six months approximately INR 0.462 million have been collected.



HANDOUTS

TNUSSP PRACTICE BRIEF #1

LEGAL & INSTITUTIONAL ARRANGEMENTS FOR SANITATION IN TAMIL NADU



INTRODUCTION

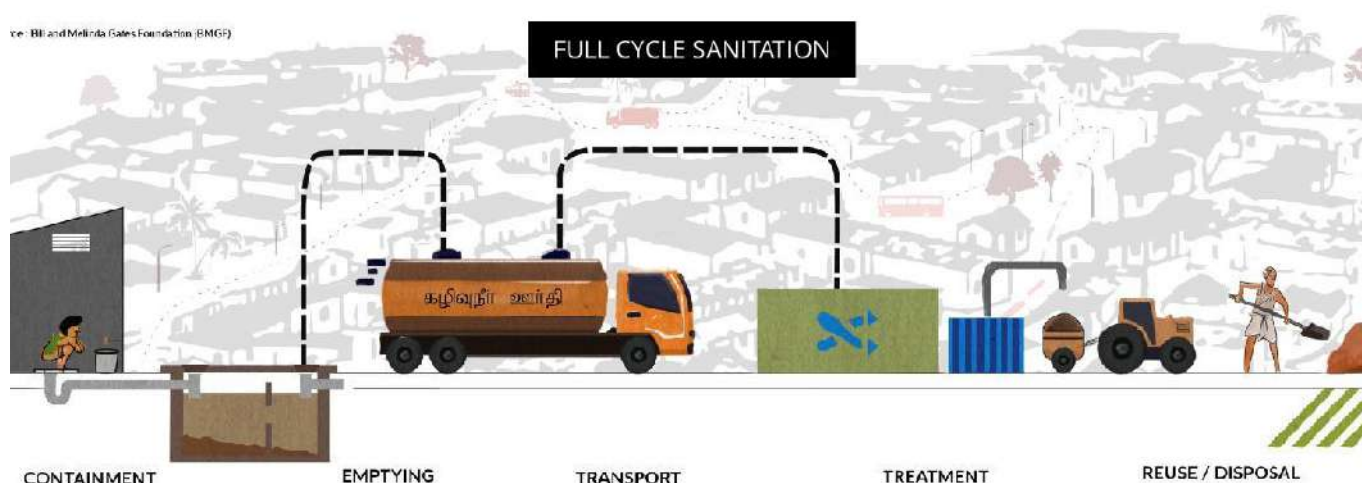
The lack of adequate sanitation poses one of the greatest barriers for Tamil Nadu achieving its full development potential and ensuring high standards of public health for its citizens. While sewerage and treatment plants in larger cities have received policy attention and investments, on-site sanitation systems that are the predominant household arrangement across with the State have received limited attention.

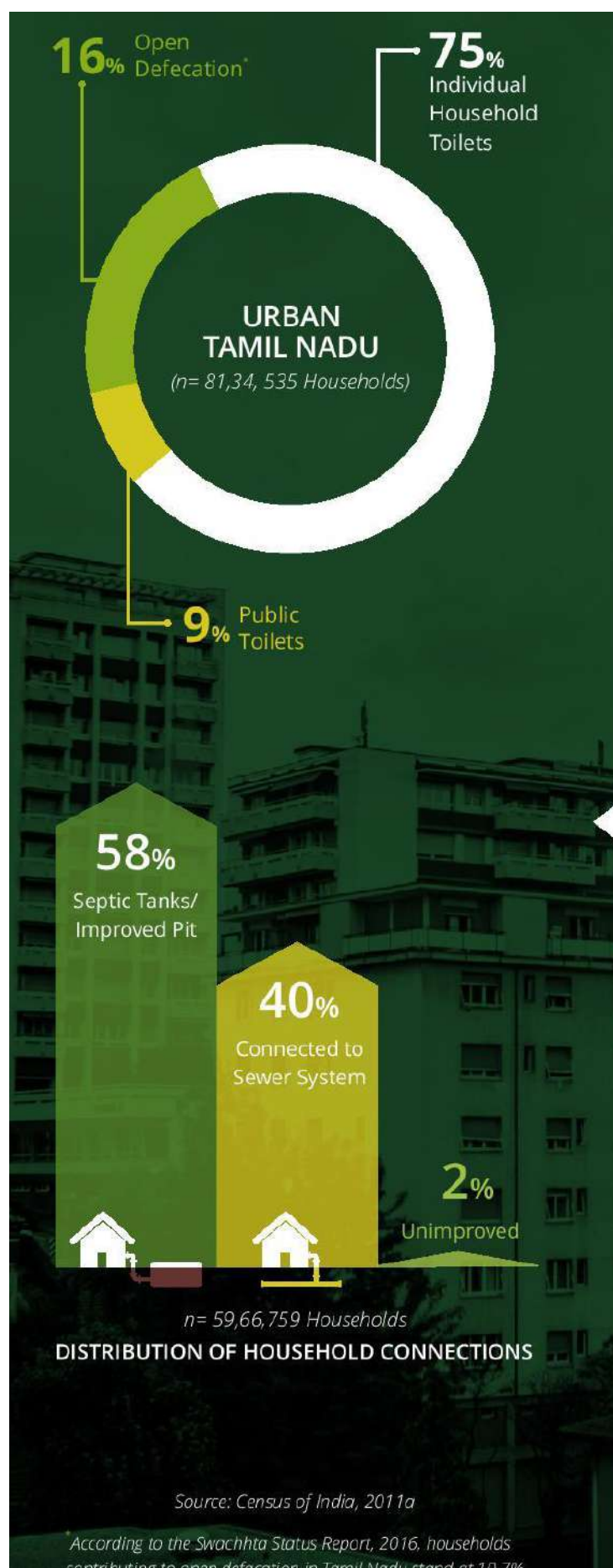
WHAT IS FSM?

The management of fecal sludge that is collected from pit latrines, septic tanks and or other on-site sanitation facilities is called Septage management or Fecal Sludge Management (FSM). FSM includes the storage, collection, transport, treatment and safe end-use or disposal of fecal sludge.

– Faecal Sludge Management: Systems Approach for Implementation and Operation, International Water Association (IWA), 2014.

re: BM and Melinda Gates Foundation (BMGF)





Many smaller urban settlements are grappling with the challenge of severe deficits along the full cycle of the sanitation value chain. In order to overcome these deficits, adequate attention needs to be paid to the comprehensive management of human excreta—septage or sewage, known as FSM.

Physical infrastructure for FSM is limited in most Urban Local Bodies (ULBs), as is awareness on the subject. In this scenario, the Government of Tamil Nadu (GoTN) prioritised the full cycle of sanitation and issued Operative Guidelines for Septage Management in 2014.

At the national level, the Ministry of Housing and Urban Affairs (previously known as the Ministry of Urban Development) has emphasised the importance of on-site sanitation systems through the National Urban Sanitation Policy, 2008, the Advisory on Septage Management, 2012 and the National Policy on Faecal Sludge and Septage Management, 2017.

However, the institutions, laws, and regulations that currently govern sanitation in the State are uncoordinated, resulting in administrative fragmentation and poor service delivery. Legal and institutional arrangements take a technocratic view of the challenges in the full cycle of sanitation, rather than a public health approach where the State is the ultimate custodian of ensuring environmental sanitation. In this context, a comprehensive legal and institutional review was carried out by TNUSSP to identify key areas of improvement, and recommend suggestions for the State to achieve 100% safe sanitation and improve public health outcomes.

INSTITUTIONAL ARRANGEMENTS

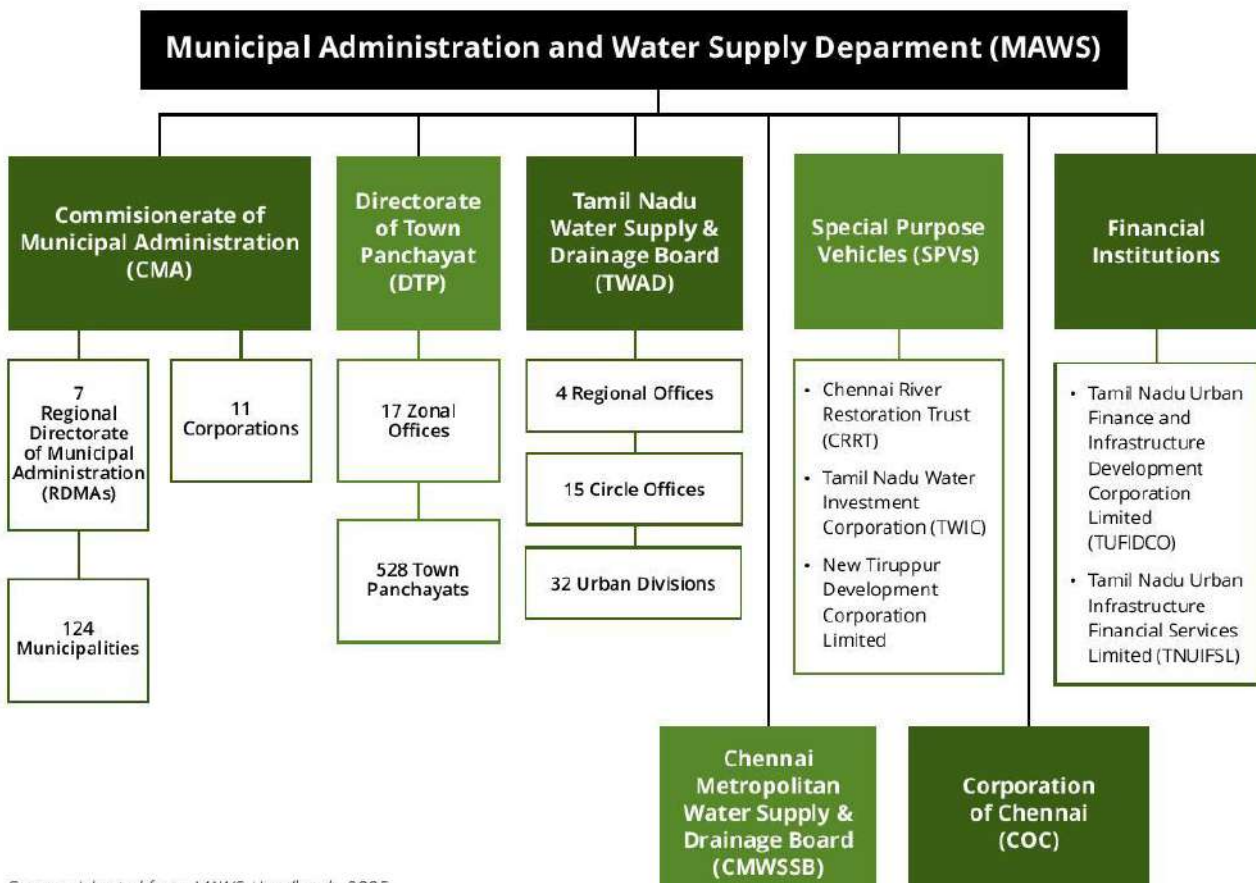
The institutional arrangements that govern various aspects of sanitation in Tamil Nadu include several implementation and financial agencies at the State and ULB level.

STATE-LEVEL ARRANGEMENTS

In Tamil Nadu, the Municipal Administration and Water Supply Department (MAWS) is the principal department responsible for planning, design and execution of urban sanitation initiatives. The various government agencies within MAWS include the following:

- The Commissionerate of Municipal Administration (CMA) supervises the functioning of water supply and sanitation inter alia for all the 124 Municipalities and
- The Directorate of Town Panchayats is the governing body for all 528 towns in the State and caters to all service delivery at the Town Panchayat level.
- The Tamil Nadu Water Supply and Sewerage Board (TWAD) is the main engineering agency for implementing all water supply and sewerage schemes outside the Chennai Metropolitan Area.
- The Corporation of Chennai and Chennai Metro Water are separate entities whose jurisdiction of services is limited exclusively to the Chennai Metropolitan Area (Municipal Administration and Water Supply [MAWS], 2005).

INSTITUTIONAL ARRANGEMENTS FOR SANITATION IN TAMIL NADU



Source: Adapted from MAWS Handbook, 2005

Tamil Nadu Urban Finance and Infrastructure Development Corporation (TUFIDCO) is the financing institution that deals with provision of financial assistance and guidance to ULBs, corporations, boards, authorities and parastatal agencies for their development schemes. Apart from being a nodal agency to implement government programs/schemes in the State, TUFIDCO also extends financial assistance from its own source to the ULBs and parastatal agencies for various infrastructure development schemes. Similarly, Tamil Nadu Urban Infrastructure Financial Services Limited (TNUIFSL), a public limited company and fund manager, provides consultancy, financial and investment advisory services to the government. TNUIFSL and TUFIDCO both guide the ULBs in assessing the financial viability of projects and assist in the development of urban infrastructure.

In addition, there are a number of special purpose vehicles that carry out specific mandates with respect to urban infrastructure. These include vehicles that belong to the Chennai River Restoration Trust, the Tamil Nadu Water Investment Company Limited, the New Tiruppur Area Development Corporation Limited and so on.

URBAN LOCAL BODY ARRANGEMENTS

According to the 74th Constitutional Amendment, the State and the ULBs in particular are responsible for sanitation and other municipal services such as water supply, roads, solid waste management, sanitation, street lighting and so on. There are a total of 664 ULBs in Tamil Nadu that are classified into 12 Corporations, 124 Municipalities and 528 Town Panchayats. While the administrative head of the ULBs focuses on the managerial policies and administration of sanitation programmes in the cities, the Public Health Department and the Engineering Department have major roles in

executing and monitoring these policies. In addition, the town planning authority is concerned with proper planning and construction as per laws and buildings rules. The municipal cadres assigned to various urban local bodies include public health, engineering, and municipal town planning each of which is governed by its respective service rules.

LEGAL FRAMEWORK

The onus of ensuring safe sanitation, and thereby achieving public health goals falls within the purview of the State and its institutions. Sanitation is a state subject and is recognised in the 74th Constitutional Amendment, 1992, which devolved 18 functions to the state and ULBs. Of these, the ULBs bearing influence on sanitation are:



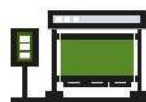
Water supply for domestic, industrial & commercial purposes



Public health, sanitation conservancy and solid waste management



Slum improvement and upgradation



Public amenities including street lighting, parking lots, bus-stops & public conveniences

Apart from the Operative Guidelines for Septage Management issued in 2014, current state legislations, do not adequately address issues across the full cycle of sanitation. The lack of a comprehensive law, and dedicated institutions oriented towards public health and promoting safe sanitation, add to challenges in governance.



ACTS & RULES GOVERNING SANITATION

Tamil Nadu Town & Country Planning Act, 1971

Governs master planning for existing and new regional areas; provision of water supply, drainage, sewerage and sewage disposal facilities

Tamil Nadu District Municipalities Act, 1920 Municipal Corporation Acts, & Public Health Act, 1939

Governs containment, emptying and transport of fecal sludge; prescribes rules and bye-laws for the construction, operation and maintenance of toilets, sewer systems and septic tanks

Tamil Nadu District Municipalities Building Rules, 1972

Prescribes standard number of sanitary facilities required for residential and commercial buildings

Environment (Protection) Act, 1986 & Water (Prevention & Control of Pollution) Act, 1974

Enforces treatment and safe disposal/re-use of sewage/septage

PUBLIC INVESTMENTS IN WATER AND SANITATION

Major sources of finance for the ULBs include the state budgets, grants from the State Finance Commission, state plans, Central Finance Commission, centrally sponsored schemes, own revenue, assigned revenue and loans from multilaterals.



A few key programmes and centrally sponsored schemes that promote sanitation provisions in urban areas are listed below.

Key Programmes and Schemes for Sanitation Finance

Programmes / Schemes	Details
Atal Mission for Rejuvenation and Urban Transformation (AMRUT)	This mission provides basic services (e.g. water supply, sewerage, urban transport) to households and builds amenities in cities to improve quality of life of all people. The scheme covers 27 urban areas in the State.
Swachh Bharat Mission-Urban (SBM-U)	This mission aims to improve the overall sanitation situation in the country through various initiatives such as building toilets, eliminating open defecation, managing solid waste and adopting healthy sanitary practices. At present, SBM-U is being implemented in all ULBs in the State.
Integrated Urban Development Mission (IUDM)	This mission was launched by the Tamil Nadu State government in 2011 to provide basic infrastructure in all corporations (except Chennai), municipalities and town panchayats.
Heritage City Development and Augmentation Yojana (HRIDAY)	This scheme was inaugurated to improve Indian Heritage cities with efficient infrastructural facilities such as water supply, sanitation and roads, and basic amenities like toilets, signage and street lights. Kancheepuram and Velankanni are the two cities in Tamil Nadu selected under HRIDAY.

KEY FINDINGS AND RECOMMENDATIONS

On the basis of the sanitation policies and programs enacted in the State, the statement of intent and political commitment of the GoTN to prioritise and address urban sanitation are commendable. However, there are some drawbacks along the full cycle of sanitation that prevent successful implementation. In order to achieve 100% sanitation and improve public health outcomes in urban Tamil Nadu, legal, regulatory and institutional reforms across the sanitation value chain are needed. Key findings and recommendations are discussed below:

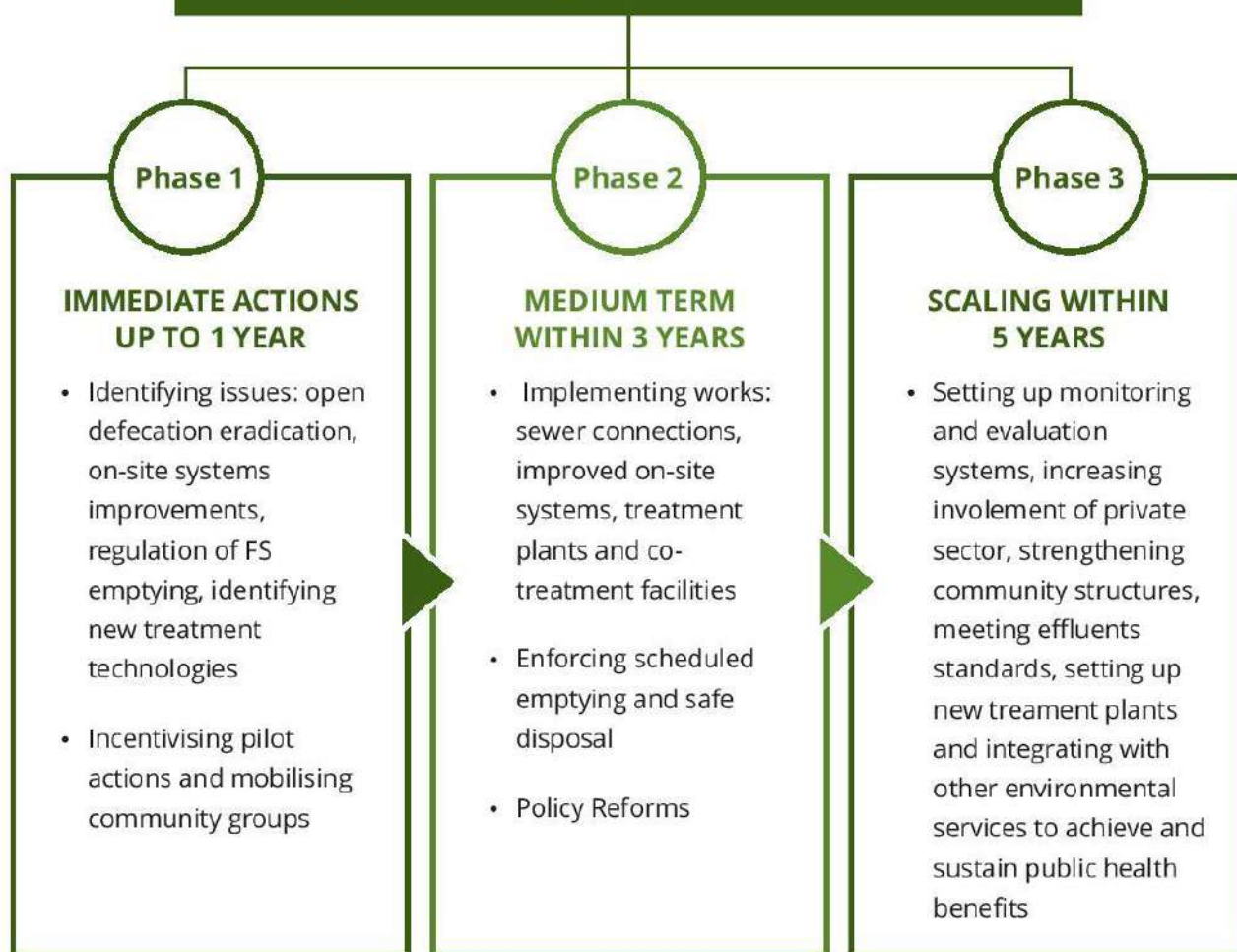
1. Multiple laws and actors govern the provision of sanitation in Tamil Nadu – this impedes the achievement of goals set out in the TN Sanitation Mission, SBM and initiatives such as

Namma Toilets. The **State must become the custodian of sanitation** by revising laws to ensure all aspects of the sanitation value chain are addressed. Service delivery institutions must be strengthened by improving the financial and human resource capacities of ULBs to undertake FSM activities.

2. Devolution of sanitation service delivery to ULBs remains unfulfilled due to the lack of funds and functionaries. Service provision still rests with parastatal agencies such as the TWAD Board, and efforts to build ULB capacity, staffing and financial allocation to implement FSM are inadequate. In addition to solid waste management, **human excreta management must be accorded primacy within ULBs' responsibility.**

3. Communities make their own arrangements for FSM because of the **fragmented approach in sanitation service delivery**. They do this through the construction of improper on-site sanitation systems and rely on private operators to de-sludge septic tanks and dispose of fecal sludge. Although these operators are a viable option, they are often unregistered and are not governed by sufficient regulations. Such unregulated practices must be controlled by the government through the registration of private de-sludging operators and ensuring that they have appropriate licenses. In addition, de-sludging operators should be provided with **personal protective equipment (PPE)** to safeguard themselves while handling fecal matter. Setting up a **call centre system** that operates on request-based de-sludging may be beneficial to customers who can avail themselves of economical rates as well as ensure regular emptying that will prevent overflow and seepage into the environment.
4. In order to ensure safe containment structures, **training should be provided to masons** who construct on-site sanitation systems that follow the standards prescribed by CPHEEO. For effective implementation of legislations, FSM by-laws must be formulated to ensure that households adhere to standards for safe construction, maintenance of toilets, and on-site containment structures. In order to control violations, a separate **sanitary task force** should be created to monitor violations, and penalties should be increased for such violators.
5. Encouraging **communities to take ownership of FSM** by imparting information and knowledge geared towards changing behaviour should be another area of intervention by the State.
6. The performance of existing treatment plants can be improved by adopting three approaches namely:
 - (i) phased regional approach
 - (ii) phased all-out approach
 - (iii) phased equitable approach
 - (I) The phased regional approach recommends region-wise **refurbishment and augmentation of existing treatment plants**, with corresponding regulation.
 - (ii) The phased all-out approach follows a two-term augmentation plan in which existing plants are refurbished to their full capacity in the first term, and proposals for new plants are developed in the second term.
 - (iii) In the phased equitable approach, customised options based on local environmental conditions are suggested to treat fecal sludge/sewage. As an alternative to co-treatment of fecal sludge with sewage, **stand-alone fecal sludge treatment plants (FSTPs)** should be set up on a pilot basis. Such initiatives must be replicated and scaled up across the State.
7. In order to overcome the deficits in treatment plants, **land should be allocated for setting up new plants and decanting stations** within a city's vicinity. This would encourage safe disposal by reducing the distance travelled by de-sludging operators.
8. **Involvement of private players as stakeholders** for construction and maintenance of treatment plants and operation of de-sludging trucks must be encouraged. The state must create an **enabling environment for the private sector** to undertake innovations in treatment, and create a market for new technologies.

Roadmap for Promoting Urban Sanitation in Tamil Nadu



References:

FSFC (2011). Report and Recommendations of Fourth State Finance Commission, Tamil Nadu. Available at http://www.tn.gov.in/fsfc/FSFC_Report.pdf

MAWS Handbook (2005) available at http://www.tn.gov.in/rti/proactive/maws/handbook_MAWS.pdf

Strande, L., Ronteltap, M., & Brdjanovic, D. (2014). Faecal sludge management: Systems approach for implementation and operation. London: IWA, 427.

TNUSSP, (2016). Legal and Institutional Review, available at <http://tnussp.co.in/resources/>

This document is to be cited as TNUSSP, 2017, TNUSSP Practice Brief #1, Legal and Institutional Arrangements for Sanitation in Tamil Nadu, TNUSSP, Chennai.

This practice brief is based on the report titled 'Legal and Institutional Review'. This brief has been produced as part of the TNUSSP knowledge product series. All practice briefs and the full reports are available in the resources section of the TNUSSP website.



What is TNUSSP?

The Tamil Nadu Urban Sanitation Support Programme (TNUSSP) supports the Government of Tamil Nadu and cities in making improvements along the entire urban sanitation value chain. The TNUSSP is implemented by a consortium of organisations led by the Indian Institute of Human Settlements (IIHS), in association with CDD Society, Gramalaya and Keystone Foundation.

TECHNICAL SUPPORT UNIT:



IIHS CHENNAI: Floor 7A, Chaitanya Exotica, 24/51, Venkatnarayana Road, T. Nagar, Chennai-600017.
 044-6530 5500 tnussp@ihs.ac.in www.tnussp.co.in www.facebook.com/TNUSSP

Checklist for Assessment of Pumping Stations to Use as Decanting Facilities

Assessment objective: This assessment aims to assess the feasibility of converting existing sewage pumping stations into decanting stations to allow FS addition into the sewer network. A separate assessment of STP capacity and performance is also being undertaken to understand the feasibility of co-treatment at each STP.

Assessment Target: Pumping Stations of Sewer Network in Cities/Towns. One questionnaire should be used for each sewage pumping station in the city/town. If there is more than one pumping station per town, please use separate checklist for each of the pumping station.

Assessment Information: The assessment will be carried out by the ULB officials, and findings from the same will be shared with ULB.

I. CITY DETAILS		
1.	Name of Corporation/Municipality	
2.	District Name	
3.	Name of Assessor	
4.	Designation of Assessor	
5.	Name of Authorizing Officer	
6.	Designation and Contact information of Authorizing Officer	
7.	Mobile No.	
8.	Email id	
9.	Office address	
10.	Date of Assessment	<div> <div><input type="text"/></div><div><input type="text"/></div> <div><input type="text"/></div><div><input type="text"/></div> <div><input type="text"/></div><div><input type="text"/></div><div><input type="text"/></div><div><input type="text"/></div> <div>DD</div><div>MM</div><div>YY</div> </div>
II. LOCATION AND ACCESS DETAILS		
1.	Name of the pumping station	
2.	Type of pumping station (TICK IN THE BOX GIVEN AGAINST THE OPTIONS)	a) Main pumping station <input type="checkbox"/> b) Sub-pumping station <input type="checkbox"/> c) Lift Station <input type="checkbox"/> d) Others (Specify) <input type="checkbox"/> -----
3.	Pumping station capacity	
4.	Geo-coordinates of the SPS	a) Lat : b) Long :

II. LOCATION AND ACCESS DETAILS		
5.	What are different types of influent mains/sewage lines discharging into the SPS?	
6.	Distance of the SPS from the STP? (in km)	<input type="text"/> <input type="text"/>
7.	Length of the sewer mains from the SPS to the STP? (in km)	<input type="text"/> <input type="text"/> <input type="text"/>
8.	What areas within the city are served by the SPS?	
9.	What type of neighbourhood is the SPS located in? (TICK IN THE BOX GIVEN AGAINST THE OPTIONS)	a) Largely residential <input type="checkbox"/> b) Densely populated <input type="checkbox"/> c) Near market area <input type="checkbox"/> d) Outskirt/periphery areas <input type="checkbox"/> e) Others (Specify) <input type="checkbox"/> -----
10.	What is the distance to the nearest residence from the SPS? (TICK IN THE BOX GIVEN AGAINST THE OPTIONS)	a) < 100 m <input type="checkbox"/> b) 100 – 300 m <input type="checkbox"/> c) 300 – 500 m <input type="checkbox"/> d) >500 m <input type="checkbox"/>
11.	Does the access road pass through areas of habitation? (TICK IN THE BOX GIVEN AGAINST THE OPTIONS)	a) Yes <input type="checkbox"/> (Continue) b) No <input type="checkbox"/> (Go to Q.13)
12.	Will there be challenges in passage of vehicle through residential areas / markets etc? (TICK IN THE BOX GIVEN AGAINST THE OPTIONS)	a) Yes <input type="checkbox"/> b) No <input type="checkbox"/>

II. LOCATION AND ACCESS DETAILS

13.	Type of external access- roads to the pumping station (TICK IN THE BOX GIVEN AGAINST THE OPTIONS)		
	a) Type	b) Width	c) Condition
	i. Single lane <input type="checkbox"/>	i. <3 m <input type="checkbox"/>	i. Paved and in good condition <input type="checkbox"/>
	ii. Two lane-undivided <input type="checkbox"/>	ii. 3-4.5m <input type="checkbox"/>	ii. Paved but road condition requires improvement (eroded / potholes) <input type="checkbox"/>
	iii. Two lane-divided <input type="checkbox"/>	iii. 4-7m <input type="checkbox"/>	iii. Unpaved road <input type="checkbox"/>
	iv. Multi-lane <input type="checkbox"/>	iv. >7m <input type="checkbox"/>	iv. Others (Specify) <input type="checkbox"/> -----
	v. Others (Specify) <input type="checkbox"/> -----		

III. AVAILABILITY OF SPACE AND EXISTING INFRASTRUCTURE

1.	Does the SPS currently receive fecal sludge?	a) Yes <input type="checkbox"/> b) No <input type="checkbox"/>
2.	If YES , since when (Year) has the SPS been receiving fecal sludge?	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
3.	On an average, how many trucks empty fecal sludge in a day at the SPS?	<input type="text"/> <input type="text"/>
4.	What is the average capacity of the trucks that empty fecal sludge at the SPS? (in litres)	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>

III. AVAILABILITY OF SPACE AND EXISTING INFRASTRUCTURE		
5.	Average volume of fecal sludge received in a week (in MLD)	<input type="text"/> <input type="text"/>
6.	What are challenges faced by the SPS in receiving fecal sludge? For example, poor external and internal access, odour, lack of human resource, etc	
7.	Is the internal access road to pumping station wide enough for the septage truck (3.5 m width, 9 m length, dimensions to be confirmed) movement? (TICK IN THE BOX GIVEN AGAINST THE OPTIONS)	a) Yes <input type="checkbox"/> b) No <input type="checkbox"/>
8.	Is there enough space within the pumping station premises for a septage truck (3.5 m width, 9 m length, dimensions to be confirmed) to enter, turn around and exit? (TICK IN THE BOX GIVEN AGAINST THE OPTIONS)	a) Yes <input type="checkbox"/> b) No <input type="checkbox"/>
9.	Is there a point such as collection well etc. in which the septage trucks can empty septage/ fecal sludge/ sewage from ground level (TICK IN THE BOX GIVEN AGAINST THE OPTIONS) – Refer to photo provided in Annexure 1	a) Yes <input type="checkbox"/> (Go to Q.11) b) No <input type="checkbox"/> (Continue)
10.	If the response ' NO ' to above question, can a simple ramp be constructed for the trucks to empty? (TICK IN THE BOX GIVEN AGAINST THE OPTIONS)	a) Yes <input type="checkbox"/> (Go to Q.12) b) No <input type="checkbox"/> (Go to Q.12)
11.	(OPTIONAL) If YES , approximate cost of the ramp in Rs. Lakhs:	

III. AVAILABILITY OF SPACE AND EXISTING INFRASTRUCTURE		
12.	Existing Infrastructure for Pre-treatment	
	A. Type	B. Availability C. If Yes in 'B', current working condition
	i. Coarse screen	Yes <input type="checkbox"/> Working <input type="checkbox"/> No <input type="checkbox"/> Needs major refurbishment <input type="checkbox"/>
	ii. Fine screen	Yes <input type="checkbox"/> Working <input type="checkbox"/> No <input type="checkbox"/> Needs major refurbishment <input type="checkbox"/>
	iii. Grit removal	Yes <input type="checkbox"/> Working <input type="checkbox"/> No <input type="checkbox"/> Needs major refurbishment <input type="checkbox"/>
	iv. Screening disposal arrangements	Yes <input type="checkbox"/> Working <input type="checkbox"/> No <input type="checkbox"/> Needs major refurbishment <input type="checkbox"/>
	v. Others (Specify) _____	Yes <input type="checkbox"/> Working <input type="checkbox"/> No <input type="checkbox"/> Needs major refurbishment <input type="checkbox"/>
13.	What is the total area of the SPS? (in m ²)	<input type="text"/> <input type="text"/>
14.	What is the total built area available at the SPS? (in m ²)	<input type="text"/> <input type="text"/>
15.	What is the total unbuilt area available at the SPS? (in m ²)	i. Area covered by trees <input type="text"/> <input type="text"/> ii. Area covered by shrubs, grass <input type="text"/> <input type="text"/> iii. Parking space <input type="text"/> <input type="text"/> iv. Others (Specify) <input type="text"/> <input type="text"/> _____
16.	Attach plan of the pumping station. If plan is not available, hand sketch the layout approximately to scale (Layout of the site should include: Boundary, dimension of existing structure, open space, width of entry/exit points, roads, operator room) Refer plan provided in Annexure 2	

III. AVAILABILITY OF SPACE AND EXISTING INFRASTRUCTURE		
17.	What is the size of the discharge mains from the SPS?	<input type="text"/> <input type="text"/>
18.	Number of pumps at the SPS?	<input type="text"/> <input type="text"/>
19.	Is there existing room/space for operators? (TICK IN THE BOX GIVEN AGAINST THE OPTIONS)	a) Yes <input type="checkbox"/> b) No <input type="checkbox"/>
20.	Is there access to water supply at the pumping station? (TICK IN THE BOX GIVEN AGAINST THE OPTIONS)	a) Yes <input type="checkbox"/> b) No <input type="checkbox"/>
21.	Is there access to toilet and washroom facilities at the pumping station? (TICK IN THE BOX GIVEN AGAINST THE OPTIONS)	a) Yes <input type="checkbox"/> b) No <input type="checkbox"/>
22.	Feasibility for construction of additional infrastructure for pumping station	
i.	Is there space to construct an underground storage tank to receive fecal sludge? (TICK IN THE BOX GIVEN AGAINST THE OPTIONS)	a) Yes <input type="checkbox"/> b) No <input type="checkbox"/>
ii.	If an operator room does not exist, Is there space to construct one? (TICK IN THE BOX GIVEN AGAINST THE OPTIONS)	a) Yes <input type="checkbox"/> b) No <input type="checkbox"/>

IV. PUMPS		
1.	What type of pumps and pumping configuration are used at the pumping station?	
	A. Type (TICK IN THE BOX GIVEN AGAINST THE OPTIONS)	B. No.
	i. Horizontal Pumps in dry pit <input type="checkbox"/>	
	ii. Vertical pumps in dry pit <input type="checkbox"/>	
	iii. Vertical pumps in wet pit <input type="checkbox"/>	
	iv. Submersible sewage pumps in wet pit <input type="checkbox"/>	
2.	Flow meter present (TICK IN THE BOX GIVEN AGAINST THE OPTIONS)	a) Yes <input type="checkbox"/> (GO TO SECTION VI) b) No <input type="checkbox"/> (Continue)
3.	If yes, Flow Meter working (TICK IN THE BOX GIVEN AGAINST THE OPTIONS)	a) Yes <input type="checkbox"/> b) No <input type="checkbox"/>

V. STAFF

1.	Staff working at the pumping station	
	Designation	Role
a.		
b.		
c.		
d.		
2.	Will there be concern of complaints from neighbourhood because of odour, movement of septage trucks etc. if the pumping station is converted to decanting station? (TICK IN THE BOX GIVEN AGAINST THE OPTIONS)	a) Yes <input type="checkbox"/> (Continue) b) No <input type="checkbox"/>
2a.	If <u>YES</u> , give details	

Signature of the Assessor:

Checklist for Assessment of STPs for Co-treatment of Fecal Sludge

Assessment objective: This assessment aims to determine the feasibility of using unused capacity at sewage treatment plants to treat FS along with sewage. A separate assessment of decanting facility capacity and performance is also being undertaken to understand the feasibility of co-treatment in each city.

Assessment Target: ULBs with sewage treatment plant. If there is more than one STP per town, please use separate checklist for each of the STP.

Assessment Information: The assessment will be carried out by the ULB officers, and findings from the same should be shared with the respective ULB.

I. CITY DETAILS		
1.	Name of Corporation/Municipality	
2.	District Name	
3.	Name of Assessor	
4.	Designation of Assessor	
5.	Name of Authorizing Officer	
6.	Designation and Contact information of Authorizing Officer	
7.	Mobile No.	
8.	Email id	
9.	Office address	
10.	Date of Assessment	<div> <input type="text"/> <input type="text"/> </div> <div> <input type="text"/> <input type="text"/> </div> <div> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> </div> <div> Date Month Year </div>

II. DESIGN OF SEWAGE TREATMENT PLANT		
1.	Name of the STP	
2.	Geo-coordinates of the STP	a) Lat : b) Long :
3.	Design capacity of the STP (in MLD)	<input type="text"/> <input type="text"/>
4.	Treatment technology used at the STP (TICK IN THE BOX GIVEN AGAINST THE OPTIONS)	a) Conventional Activated Sludge <input type="checkbox"/> b) Waste Stabilisation Pond <input type="checkbox"/> c) UASB <input type="checkbox"/> d) SBR <input type="checkbox"/> e) Others (Specify) <input type="checkbox"/> _____

II. DESIGN OF SEWAGE TREATMENT PLANT		
5.	Design inlet BOD and TSS levels (in mg/l)	a) BOD: <input type="text"/> <input type="text"/> b) TSS: <input type="text"/> <input type="text"/>
6.	Total area and estimated population served by the STP	a) Area: b) Population:
7.	No. of connections (HSCs) connected to the UGD network	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
8.	Year of construction	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>

III. LOCATION AND ACCESS DETAILS		
1.	Distance of the STP from the SPS? (in km)	a) <input type="text"/> <input type="text"/> b) No pumping station <input type="checkbox"/> (Go to Q.3)
2.	What areas within the city are served by the STP?	
3.	What type of neighbourhood is the STP located in? (TICK IN THE BOX GIVEN AGAINST THE OPTIONS)	a) Largely residential <input type="checkbox"/> b) Densely populated <input type="checkbox"/> c) Near market area <input type="checkbox"/> d) Outskirt/periphery areas <input type="checkbox"/> e) Others (Specify) <input type="checkbox"/> -----

III. LOCATION AND ACCESS DETAILS		
4.	What is the distance to the nearest residence from the STP? (TICK IN THE BOX GIVEN AGAINST THE OPTIONS)	a) < 100 m <input type="checkbox"/> b) 100 – 300 m <input type="checkbox"/> c) 300 – 500 m <input type="checkbox"/> d) > 500 m <input type="checkbox"/>
5.	Does the access road pass through areas of habitation? (TICK IN THE BOX GIVEN AGAINST THE OPTIONS)	a) Yes <input type="checkbox"/> (Continue) b) No <input type="checkbox"/> (Go to Q.7)
6.	Will there be challenges in passage of vehicle through residential areas/ markets etc? (TICK IN THE BOX GIVEN AGAINST THE OPTIONS)	a) Yes <input type="checkbox"/> b) No <input type="checkbox"/>

III. LOCATION AND ACCESS DETAILS

7.	Type of external access- roads to the STP (TICK IN THE BOX GIVEN AGAINST THE OPTIONS)		
	a) Type	b) Width	c) Condition
	i. Single lane <input type="checkbox"/>	i. <3 m <input type="checkbox"/>	i. Paved and in good condition <input type="checkbox"/>
	ii. Two lane-undivided <input type="checkbox"/>	ii. 3-4.5m <input type="checkbox"/>	ii. Paved but road condition requires improvement (eroded / potholes) <input type="checkbox"/>
	iii. Two lane-divided <input type="checkbox"/>	iii. 4-7m <input type="checkbox"/>	iii. Unpaved road <input type="checkbox"/>
	iv. Multi-lane <input type="checkbox"/>	iv. >7m <input type="checkbox"/>	iv. Others (Specify) <input type="checkbox"/> -----
	v. Others (Specify) <input type="checkbox"/> -----		

IV. STP PERFORMANCE

1.	Current average daily flow received at the STP? (in MLD)	<input type="text"/> <input type="text"/> <input type="text"/> . <input type="text"/> <input type="text"/>
2.	Describe the treatment train (treatment units) at the STP (Individual units, and their capacities)	
	a) Individual Units	b) Capacity
	Unit 1	
	Unit 2	
	Unit 3	
3.	Actual sewage characteristics at inlet to the STP? (Measured after commissioning or during O&M of the STP) (in mg/l)	a) BOD: <input type="text"/> <input type="text"/> b) TSS: <input type="text"/> <input type="text"/> c) COD: <input type="text"/> <input type="text"/>

IV. STP PERFORMANCE						
4.	If available, provide monthly average BOD & TSS at the inlet and outlet of each process unit in mg/l as analysed for the last 2 years:					
	Sewage characteristics	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
	a) BOD					
	b) TSS					
5.	Average effluent quality parameters at the STP? (in mg/l)		a) BOD: <input type="text"/> <input type="text"/> b) TSS: <input type="text"/> <input type="text"/> c) COD: <input type="text"/> <input type="text"/>			
6.	Type of receiving body/ environment for disposal of the treated wastewater (TICK IN THE BOX GIVEN AGAINST THE OPTIONS)		a) River <input type="checkbox"/> b) Stream <input type="checkbox"/> d) Land <input type="checkbox"/> e) Irrigation <input type="checkbox"/> f) Others (Specify) <input type="checkbox"/> -----			

V. FINAL DISCHARGE/REUSE OF TREATED WATER		
1.	Process adopted for sludge treatment (drying beds/mechanical dewatering/anyother method) with capacity details	
	a) Process	
	b) Capacity	
2.	Is treated water reused for any purpose? (TICK IN THE BOX GIVEN AGAINST THE OPTIONS)	a) Yes <input type="checkbox"/> (Continue) b) No <input type="checkbox"/> (Go to Q.6)

V. FINAL DISCHARGE/REUSE OF TREATED WATER		
3.	If YES , please provide details	a) Irrigation <input type="checkbox"/> b) Sale to industry <input type="checkbox"/> c) Sale to commercial establishments <input type="checkbox"/> d) Others (Specify) <input type="checkbox"/> -----
4a.	Are there specific water quality criteria that are required to be met by the STP? (TICK IN THE BOX GIVEN AGAINST THE OPTIONS)	a) Yes <input type="checkbox"/> (Continue) b) No <input type="checkbox"/> (Go to Q.6)
4b.	If, YES please describe the same	
5.	List of non compliances if any reported by the Pollution control board/court if any:	
6.	List out any structural damages & malfunctioning of process units /equipment.	
7a.	Is there concern of odor from the STP in its current state of operation? (TICK IN THE BOX GIVEN AGAINST THE OPTIONS)	a) Yes <input type="checkbox"/> (Continue) b) No <input type="checkbox"/> (GO TO SECTION VI)
7b.	If YES , please specify if specific units are a concern.	

SECTION VI SEEKS INFORMATION ON THE FOLLOWING:

- Co-treatment at STP
- Availability of space within the STP including internal access
- Existing STP infrastructure

VI. AVAILABILITY OF SPACE AND EXISTING INFRASTRUCTURE		
1.	Does the STP currently receive fecal sludge for co-treatment?	a) Yes <input type="checkbox"/> (Continue) b) No <input type="checkbox"/> (Go to Q.5)
2.	If YES , since when (Year) has the STP been receiving fecal sludge?	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
3.	On an average, how many trucks empty fecal sludge in a day at the STP?	<input type="text"/> <input type="text"/>
4.	What is the average capacity of the trucks that empty fecal sludge at the STP? (in litres)	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
5.	Average volume of fecal sludge received in a week (in MLD)	<input type="text"/> <input type="text"/>
6.	What are challenges faced by the STP in receiving fecal sludge? For example, poor external and internal access, odour, lack of human resource, etc	
7.	Is the internal access road to STP wide enough for the septage truck (3.5 m width, 9 m length, dimensions to be confirmed) movement? (TICK IN THE BOX GIVEN AGAINST THE OPTIONS)	a) Yes <input type="checkbox"/> b) No <input type="checkbox"/>
8.	Is there enough space within the STP premises for a septage truck (3.5 m width, 9 m length, dimensions to be confirmed) to enter, turn around and exit? (TICK IN THE BOX GIVEN AGAINST THE OPTIONS)	a) Yes <input type="checkbox"/> b) No <input type="checkbox"/>
9.	Is there a point such as collection well etc. in which the septage trucks can empty septage/ fecal sludge/ sewage from ground level (TICK IN THE BOX GIVEN AGAINST THE OPTIONS)	a) Yes <input type="checkbox"/> (Go to Q.11) b) No <input type="checkbox"/> (Continue)
10.	If the response ' NO ' to above question, can a simple ramp be constructed for the trucks to empty? (TICK IN THE BOX GIVEN AGAINST THE OPTIONS)	a) Yes <input type="checkbox"/> (Go to Q.12) b) No <input type="checkbox"/> (Go to Q.12)

VI. AVAILABILITY OF SPACE AND EXISTING INFRASTRUCTURE		
11.	(OPTIONAL) If YES , approximate cost of the ramp in Rs. Lakhs:	
12.	Existing Infrastructure for Pre-treatment	
	A. Type	B. Availability
		C. If Yes in 'B', current working condition
	i. Coarse screen	Yes <input type="checkbox"/> No <input type="checkbox"/>
		Working <input type="checkbox"/> Needs major refurbishment <input type="checkbox"/>
	ii. Fine screen	Yes <input type="checkbox"/> No <input type="checkbox"/>
		Working <input type="checkbox"/> Needs major refurbishment <input type="checkbox"/>
	iii. Grit removal	Yes <input type="checkbox"/> No <input type="checkbox"/>
		Working <input type="checkbox"/> Needs major refurbishment <input type="checkbox"/>
	iv. Screening disposal arrangements	Yes <input type="checkbox"/> No <input type="checkbox"/>
		Working <input type="checkbox"/> Needs major refurbishment <input type="checkbox"/>
	v. Others (Specify) ----- -	Yes <input type="checkbox"/> No <input type="checkbox"/>
		Working <input type="checkbox"/> Needs major refurbishment <input type="checkbox"/>
13.	What is the total built area available at the STP? (in m ²)	<input type="text"/> <input type="text"/>

VI. AVAILABILITY OF SPACE AND EXISTING INFRASTRUCTURE		
14.	What is the total unbuilt area available at the STP? (in m ²)	<div>i. Area covered by trees <input type="text"/><input type="text"/></div> <div>ii. Area covered by shrubs, grass <input type="text"/><input type="text"/></div> <div>iii. Parking space <input type="text"/><input type="text"/></div> <div>iv. Others (Specify) <input type="text"/><input type="text"/></div> <div>-----</div>
15.	What is the size of the discharge mains from the STP?	<input type="text"/> <input type="text"/>
16.	Is there existing room/space for operators? (TICK IN THE BOX GIVEN AGAINST THE OPTIONS)	<div>a) Yes <input type="checkbox"/></div> <div>b) No <input type="checkbox"/></div>

VI. AVAILABILITY OF SPACE AND EXISTING INFRASTRUCTURE			
17.	Is there access to water supply at the STP? (TICK IN THE BOX GIVEN AGAINST THE OPTIONS)	a) Yes	<input type="checkbox"/>
		b) No	<input type="checkbox"/>
18.	Is there access to toilet and washroom facilities at the STP? (TICK IN THE BOX GIVEN AGAINST THE OPTIONS)	a) Yes	<input type="checkbox"/>
		b) No	<input type="checkbox"/>
19.	Feasibility for construction of additional infrastructure for STP		
i.	Is there space to construct an underground storage tank to receive fecal sludge? (TICK IN THE BOX GIVEN AGAINST THE OPTIONS)	a) Yes	<input type="checkbox"/>
		b) No	<input type="checkbox"/>
ii.	If an operator room does not exist, Is there space to construct one? (TICK IN THE BOX GIVEN AGAINST THE OPTIONS)	a) Yes	<input type="checkbox"/>
		b) No	<input type="checkbox"/>

VII. CO-TREATMENT RECEIVING INFRASTRUCTURE			
1.	Access roads to the STPs (TICK IN THE BOX GIVEN AGAINST THE OPTIONS)		
	a) Type	b) Width	c) Condition
	i. Single lane <input type="checkbox"/>	i. <3 m <input type="checkbox"/>	i. Paved and in good condition <input type="checkbox"/>
	ii. Two lane-undivided <input type="checkbox"/>	ii. 3-4.5m <input type="checkbox"/>	ii. Paved but road condition requires improvement (eroded / potholes) <input type="checkbox"/>
	iii. Two lane-divided <input type="checkbox"/>	iii. 4-7m <input type="checkbox"/>	iii. Unpaved road <input type="checkbox"/>
	iv. Multi-lane <input type="checkbox"/>	iv. >7m <input type="checkbox"/>	iv. Others (Specify) <input type="checkbox"/>
	v. Others (Specify) <input type="checkbox"/>		
	-----		-----

VIII. STAFF			
1.	Are there dedicated staff for receiving fecal sludge at the STP? (TICK IN THE BOX GIVEN AGAINST THE OPTIONS)	a) Yes <input type="checkbox"/> (Continue)	
		b) No <input type="checkbox"/> (Go to Q.1b)	
1a.	If YES , give details of their designation and role		
	Designation	Role	
a.			
b.			

VIII. STAFF		
c.		
1b.	If <u>NO</u> , from the existing staff who additionally handles the fecal sludge that is received at the STP? MENTION THE DESIGNATION AND THEIR ROLE	
	Designation	Role
a.		
b.		
c.		

Signature of the Assessor:

About NIUA

NIUA is a premier national institute for research, capacity building and dissemination of knowledge in the urban sector, including sanitation. Established in 1976, it is the apex research body for the Ministry of Housing and Urban Affairs (MoHUA), Government of India. NIUA is also the strategic partner of the MoHUA in capacity building for providing single window services to the MoHUA/states/ULBs. The Institute includes amongst its present and former clients Housing and Urban Development Corporation, Niti Ayog, City and Industrial Development Corporation of Maharashtra, USAID, World Bank, Asian Development Bank, GIZ, UNICEF, UNEP, UNOPS, Cities Alliance, Bill & Melinda Gates Foundation, Rockefeller Foundation, Global Green Growth

About SCBP

Sanitation Capacity Building Platform (SCBP) is an initiative of the National Institute of Urban Affairs (NIUA) for addressing urban sanitation challenges in India. The 3 year programme (starting 2016) is supported by a Gates Foundation grant. It is aimed at promoting decentralised urban sanitation solutions for septage and waste water management. The Platform is an organic and growing collaboration of universities, training centres, resource centres, non-governmental organizations, consultants and experts. The Platform currently has on board CEPT University, CDD Society and BORDA, ASCI, AIILSG, UMC, ESF, CSE, WaterAid, CPR, iDECK, CSTEP and WASHi. The Platform works in close collaboration with the National Faecal Sludge and Septage Management Alliance (NFSSMA).



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