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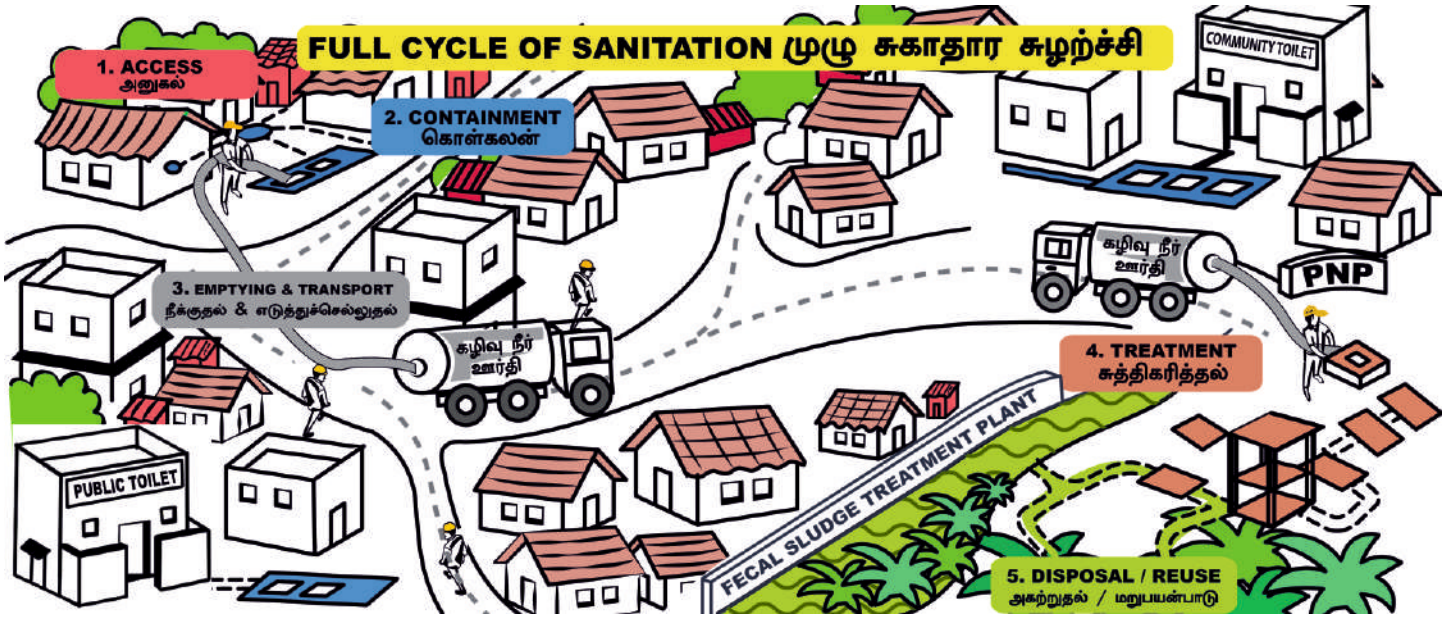
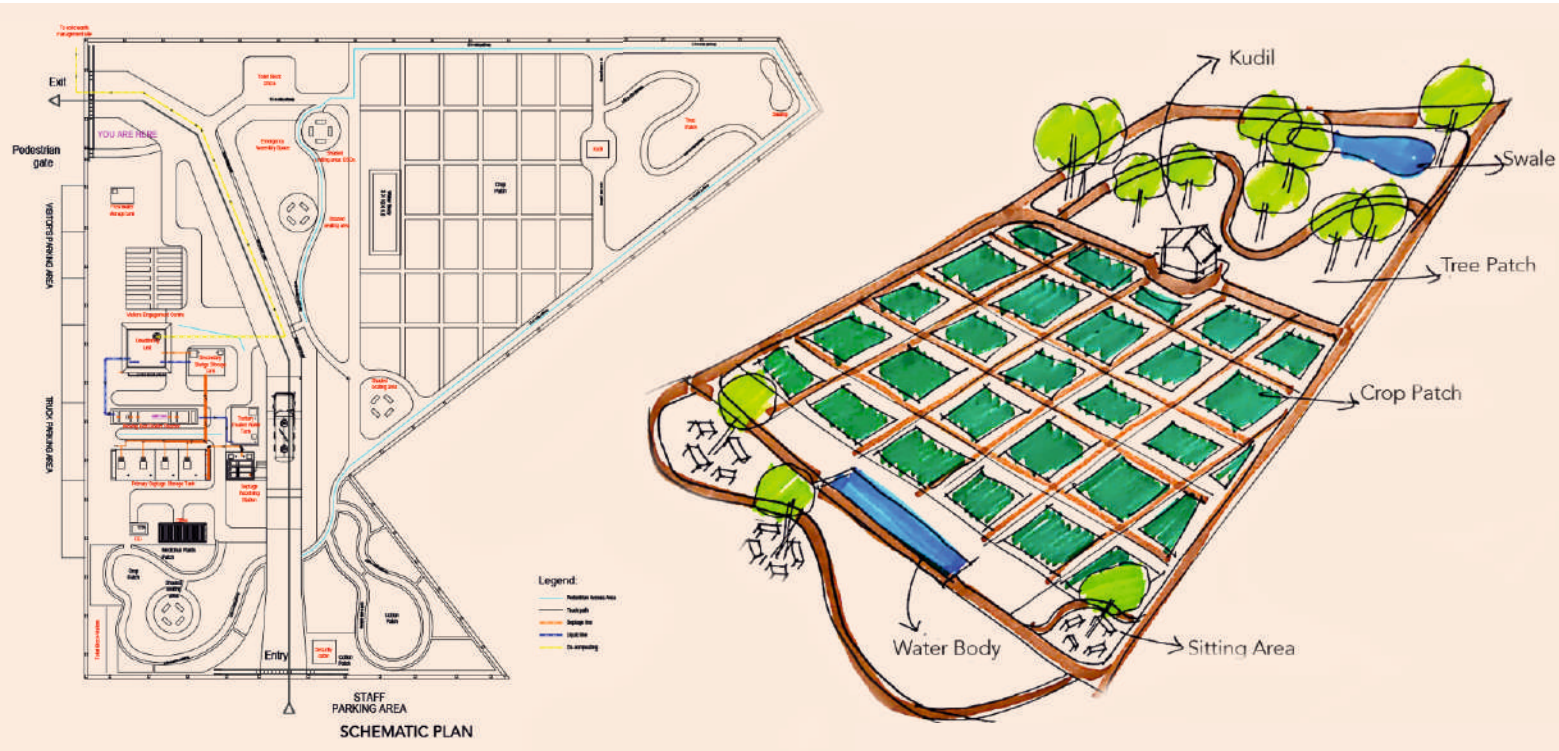
TAMIL NADU URBAN SANITATION SUPPORT PROGRAMME

REPORT

SUPPORT FOR LANDSCAPING AND AESTHETIC UPLIFT OF FSTPS IN TAMIL NADU

June 2020





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Support for Landscaping and Aesthetic Uplift of FSTPs in Tamil Nadu

June 2020

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

Document Team: Abhilaasha Nagarajan, Sasikumar Eswaramurthy, Jega Loyal

Editing: Sofia Juliet Rajan, Word Lab, IIHS, Bengaluru

Design and Layout: Divya Dhayalan

Production: Shaheena Manoj, Krishnapriyaa P., Govardhan Seshachalam

Team Leader: KV Santhosh Raghavan

Project Director: Kavita Wankhade

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Tables

Abbreviations

BMGF	Bill and Melinda Gates Foundation
DSO	De-sludging Operators
FS	Fecal Sludge
FSTP	Fecal Sludge Treatment Plants
GoTN	Government of Tamil Nadu
KLD	Kilo Litres per Day
MAWS	Municipal Administration and Water Supply
PNP	Periyanaicken Palayam
SIP	State Investment Plan
STP	Sewage Treatment Plants
SWM	Solid Waste Management
TNUSSP	Tamil Nadu Urban Sanitation Support Programme
TSU	Technical Support Unit
ULB	Urban Local Bodies

Executive Summary

Executive Summary

As part of the statewide strategy for the implementation of Fecal Sludge Management (FSM) based on the operative guidelines issued by the Government of Tamil Nadu (GoTN), the Municipal Administration and Water Supply (MAWS) Department, with the support of Tamil Nadu Urban Sanitation Support Programme (TNUSSP) prepared a State Investment Plan (SIP) in 2018. The SIP estimates the investment required by the GoTN to ensure total sanitation across 649 urban local bodies (ULB) in a phased manner.

The SIP was developed on two principles – optimal utilisation of treatment facilities by clustering ULBs and co-treatment of fecal sludge at existing sewage treatment plants (STP). A cluster approach, wherein ULBs are clustered around an existing or a potential treatment facility, within a 10 km radius, has been adopted to ensure optimum utilisation of infrastructure. As part of the SIP, 56 Fecal Sludge Treatment Plants (FSTPs) are under various stages of construction in Tamil Nadu. TNUSSP aims to develop the FSTPs as resource centres with proper landscaping and visitor-friendly premises.

The FSTP in Periyanaicken Palayam (PNP) in Coimbatore district has already been developed into a resource centre, with support for landscaping and other aesthetic elements. In addition, a detailed plan for reusing treated wastewater and growing indigenous plants/crops which suit the soil type and require low maintenance has been suggested.

Communication materials such as wall paintings and information hoardings about the plant, FSM, and sanitation workers were created and installed on site. The FSTP also houses a visitors' centre to host other communication materials, such as posters about the full cycle of sanitation. In addition, exposure visits were conducted for students from local engineering colleges and schools to help them learn about the FSTP and FSM.

Based on the pilot project, the TSU developed a suggestive guideline for support for landscaping and aesthetic uplift of FSTPs in Tamil Nadu for implementation in the upcoming 56 FSTPs.

The guideline suggests that FSTPs have a simple landscape with indigenous plants, which can be maintained with the treated water from the facility. In addition, the site must include toilets with a changing room for the staff and de-sludging operators (DSO), as well as space for pedestrian and vehicle movement. It also proposes a visitor engagement centre with relevant communication resources related to the FSTP as well as the various aspects of sanitation.

The guidelines include:

1. Generic guidance for landscape and hardscape, and plants according to the soil type and paver material, and a site analysis guide which explains the existing facilities and features of the site;

2. Suggestions to make FSTPs user friendly with proper vehicular and pedestrian circulation plan, gender-friendly toilets, and conceptual functional diagrams for 20, 30 and 40 KLD FSTP layouts proposed in Tamil Nadu;

3. Provision of sample communication materials such as hoardings, posters, wall paintings, and details on visitor engagement centre; and

4. Guidance to provide awareness to sanitation workers on their health, safety and welfare while valorising their service to the FSTP as well as the environment.

Positioning FSTPs as resource centres will not only help change public perception about 'treatment facilities' but will also create awareness among the stakeholders about related environmental concerns, such as safe management of fecal sludge through treatment facilities, regular emptying of septic tanks and proper de-sludging practices.

Additionally, if appropriate sanitation and washing facilities are provided, FSTPs can serve as a place to enhance the safety and well-being of DSOs and other sanitation workers. It can also be a potential

place for them to socialise and relax, and access information on various social and health schemes available for them.

The generic guidance suggested on landscaping and making FSTPs user-friendly, can be adapted and applied for FSTPs and other treatment facilities such as STPs and decanting stations, thereby creating more avenues for taking FSM to stakeholders across the full cycle of sanitation.

1 Introduction

1. Introduction

The Government of Tamil Nadu (GoTN) has been a pioneer in the sanitation sector by recognising the importance of total sanitation as core to improving public health standards. It has also prioritised the full sanitation chain including the strengthening of fecal sludge and septage management as an economic and sustainable supplement to network-based sewerage systems. In 2014, the GoTN was the first State to announce the 'Operative Guidelines for Septage Management for Local Bodies in Tamil Nadu' (OGSM), to standardise existing containment structures and systematise and regulate the process of collection, transportation, treatment and disposal of fecal sludge.

The Tamil Nadu Urban Sanitation Support Programme[1] (TNUSSP) was launched in 2015 to support the GoTN in achieving improvements along the entire urban sanitation chain by demonstrating innovations in two model urban locations as well as enabling its state-wide scaling up. A technical Support Unit (TSU) has been set up under the Municipal Administration and Water Supply (MAWS) Department, with support from the Bill and Melinda Gates Foundation (BMGF) to implement the TNUSSP.

As part of the statewide strategy for the implementation of fecal sludge management based on the operative guidelines, the MAWS Department, with the support of TNUSSP prepared a State Investment Plan (SIP) in 2018. The SIP estimates the investment required by the GoTN to ensure total sanitation across 663 urban local bodies (ULB) in a phased manner.

The SIP was developed on two principles – optimal utilisation of treatment facilities through clustering of ULBs and co-treatment of fecal sludge (FS) at existing sewage treatment plants (STP). A cluster approach, wherein ULBs are clustered around an existing treatment facility or a potential one, within 10 km of the treatment facility, has been adopted to ensure optimum utilisation of infrastructure.

Details of the SIP are listed below[2]:

1. Phases-I & II: Enabling co-treatment in existing and upcoming sewage treatment lants (STPs)
2. Phase-III: Utilising the solid waste management sites in municipalities for construction of new FSTPs.
3. Phase-IV: Utilising the resource recovery parks in town panchayats for construction of new FSTPs
4. Phase-V: Treatment facilities catering to standalone towns/cities (not covered in clusters)

Under Phase-III, 49 FSTPs are under construction, covering a total of 110 cities with an administrative spread of 51 municipalities and 59 town panchayats. Similarly, under Phase-IV, 11 FSTPs are under construction.

As part of TNUSSP and Citywide Sanitation Inclusion (CWIS), fecal sludge management (FSM) solutions are being implemented, and existing facilities and services are being strengthened to ensure that the cities and towns in Tamil Nadu are 100 per cent sanitation secure. Apart from the FSTP locations, TNUSSP is working in two urban locations – Tiruchirappalli and Periyanaicken Palayam-Narasimhanaicken Palayam (PNP-NNP), to understand on-the-ground challenges, test and demonstrate approaches and innovations.

For cities looking to introduce FSM, improvements to current treatment infrastructure for co-treatment are important. An assessment of decanting facilities and existing STPs was carried out in Trichy to understand the infrastructure, and operation and maintenance practices, based on which recommendations for improvement were made to the Trichy City Corporation (TCC). Besides, infrastructural improvements are under way at Panjapur STP to allow co-treatment of fecal sludge and

[1] About TNUSSP: The Tamil Nadu Urban Sanitation Support Programme (TNUSSP) —a consortium of organisations led by IIHS —supports the Government of Tamil Nadu (GoTN) to effect improvements along the entire urban sanitation chain, particularly Fecal Sludge Management, across 663 towns and cities in the State.

[2] TNUSSP, 2018. State Investment Plan for FSM

sewage. Infrastructural changes have also been made to the decanting station at Anna Stadium for its safer functioning. Studies are being carried out on reuse of water and sludge after treatment.

PNP and NNP are two town panchayats chosen to demonstrate FSM as an economical and effective means to achieve total sanitation. The two towns will serve as an example of how FSM can be a standalone solution for small towns.

To showcase FSTPs with different technology options and capacities, an FSTP of 25 KLD (Kilo Litres per Day) capacity was constructed to cater to the needs of the two TPs. The FSTP is located within the Resource Recovery Park (RRP) of PNP. It has a mechanical dewatering system that can operate under any weather with minimal skilled labour.

1.1. The Need for Positioning FSTPs as Resource Centres

Often, there is a negative perception about waste treatment plants, and they are associated with odour, dust and noise. Leveraging the fact that fecal sludge treatment plants (FSTP) are a relatively new concept, it could be developed as a resource centre, to encourage learning about fecal sludge management (FSM). This will not only help change public perception but also help address other environmental concerns.

This can be achieved through the following:

- Proper landscaping and improving the aesthetic appeal of the premises and providing proper circulation which allows pedestrian and vehicle movement within the premises.
- Visitor-friendly premises with adequate gender-segregated toilets
- A dedicated space/room for communication materials such as hoardings, wall paintings and if feasible, an audio-visual display

Additionally, if appropriate sanitation and washing facilities are provided, FSTPs can serve as a place enhancing the safety and well-being of de-sludging operators (DSOs). It can also be a potential place for them to socialise and relax, as well as a platform to create awareness about safety, and disseminate information on various social and health schemes available for them.

To this end, the document will serve the following purposes:

- Provide generic guidance on landscaping and enabling site analysis;
- Offer guidance to make FSTPs user-friendly by providing details on site circulation (vehicular & pedestrian) and gender-segregated toilets;
- Provide suggestions and sample material to position FSTPs as a resource centre to disseminate information about the facility, its functioning and the full cycle of sanitation;
- Provide guidance to make FSTPs as places to create awareness among sanitation workers about their safety and welfare; and
- The suggestions from this document can be modified and applied for other treatment facilities such as STPs and decanting stations as well.

2 Components of the Package

2. Components of the package

TNUSSP has envisioned FSTPs to have a simple landscape with indigenous plants which could be maintained with the treated water from the facility. The site must include toilets with a changing room for the staff and de-sludging operators, as well as space for pedestrian and vehicle movement. It has also been proposed to set up a visitor's engagement centre with relevant communication resources related to the FSTP as well as the various aspects of sanitation.

The framework for the landscaping and aesthetic uplift of FSTPs in Tamil Nadu is as below:

I. Landscaping:

- Selection guide for landscape and hardscape, and plants according to soil type and paver material; and
- Site analysis guide to understand the basic drainage patterns, wind direction, location of existing site features (other buildings, trees, walkways, driveways, etc.), location of existing utilities (septic tank, sewer lines, underground power lines, etc.) to help decide desirable views (point arrows in the direction of each good view; also indicate views that need screening) and identifying undesirable features of the property or of an adjoining property, if any.

II. User friendly Design:

- Gender-segregated toilets at the site;
- Options, layouts and indicative costs for toilets and containment structures; and
- Guide to plan the vehicular and pedestrian circulation in the site including conceptual functional diagram for 20, 30 and 40 KLD FSTP layouts indicating public space, utility space, service/work area, gathering space, circulation space and landscape areas.

III. Positioning FSTP as a Resource Centre:

- Sample set of communication material including hoardings, posters, wall paintings, and details on visitor engagement centre.

IV. Facilities for Sanitation Workers:

The package can be customised according to the site context of FSTPs. The following components have been detailed based on the generic 20, 30 and 40 KLD FSTP layouts, which can be structured according to the profile of the site, soil conditions and availability of space. These can also be modified and applied to other FSTPs, STPs and decanting stations where co-treatment is implemented/planned.

2.1. Landscaping

2.1.1. Site Analysis Guide

Every site is unique, and understanding its topography, drainage pattern, wind direction, existing buildings and vegetation, access points, vehicular and pedestrian circulation pattern, and the FSTP components will influence the design and layout of the landscape, and user movement. The checklist for site analysis is presented below:

Table 2.1: Site Analysis Check List			
No	**Theme**	**Outcome**	**Parameters**
1	General *[For basic understanding of the site, to help plan the landscape and zones.]*	• To understand existing open spaces and identify 'pockets' for landscaping • To suggest modifications in the pedestrian and vehicular movement • To understand the existing utilities on the site and identify needs (e.g.: toilets)	i. Site boundary ii. Entry & exit points – vehicle and pedestrian access iii. Existing buildings (including FSTP) iv. Location of existing site features (trees, site circulation routes - walkways, and driveways) v. Location of existing utilities (septic tank, sewer lines, or underground power lines) vi. MSW site/RRP details
2	Topography *[To decide the kind of landscape and related facilities.]*	• To plan the landscape and choose the types of plants • To design storm water drains as required	i. Slope ii. Drainage pattern iii. Wind direction iv. Soil type v. Water table vi. Climatic conditions
3	Other features *[To decide the pedestrian and vehicular circulation pattern in the site.]*	• To plan the movement of visitors on site – public zone, restricted zone etc.	i. Lines of view ii. Areas to use/expose iii. Areas to improve iv. Areas to hide/no go zones
Source: TNUSSP, 2020			

2.1.2. Prioritise Landscape Needs and Consider Maintenance Requirements

FSTPs, regardless of their size, require robust operation and maintenance (O&M) activities to ensure long-term functionality. It is recommended that the landscaping plan does not call for very high maintenance and labour costs and fits in the framework of optimum O&M costs envisioned for the FSTP.

2.1.3. General Guidance for Landscaping

Some general considerations for landscaping design and choice of plants, site circulation design and materials are listed below:

a. The empty patches within the site must be demarcated into active landscape areas (areas including pedestrian movement) and passive landscape areas (plant/tree patches with no pedestrian access).

b. The active landscape areas can be used as public spaces with seating areas and allow gatherings. They should also provide access to the wall paintings showcasing awareness messages about the full cycle of sanitation and the FSTP.

c. The softscape and hardscape can be interspersed with each other to create an interesting user experience. Placing plants by height (short or medium), will improve visual cohesion. The existing trees must be integrated into the landscape plan.

d. The landscape areas can be segregated into medicinal patch, tree patch, decorative patch, crop patch, etc., for easier maintenance.

e. It is recommended to study the predominant wind direction and keep the active landscape areas away from the windward side to prevent diffusion of odour from the sludge drying beds.

f. After understanding the soil type and the groundwater table, indigenous plants that require low maintenance and those suited to the climate are to be selected for the softscape. The plants/trees according to major soil types in Tamil Nadu are listed in **Annexure 1.**

g. If placing additional trees in the FSTP site, the location must be carefully designated. Trees must be avoided near the maturation pond and sludge drying beds, as leaves might fall into them, giving cause for additional maintenance.

h. Dust-resistant/dense shrubs must be considered to line the vehicular pathways within the FSTP premises.

i. For the hardscape, locally-available porous paver blocks can be laid alongside the softscape to enable percolation. If the soil is firm, the earth can be rammed and layered with gravel and can be used as pedestrian pathways.

2.2. Making FSTP User Friendly

2.2.1. Circulation

a. It is recommended that the pathway for vehicular and pedestrian circulation be separate to ensure minimal crossovers and pedestrian safety. A zoning plan must be developed to define vehicular sand pedestrian access areas. The pedestrian access areas must begin from the visitor's engagement centre, and lead to the active landscape areas, and small gathering and seating spaces. It must also be connected to the visitors' toilet facilities.

b. It is recommended to form a kerb lined with stones or concrete to separate the pedestrian pathway from the roadway. The pathway should be at least 15 cm above the road level.

c. The active landscape areas and pedestrian pathways must have adequate lighting and directional signage.

The conceptual functional diagram for 20, 30 and 40 KLD FSTP layouts used in Tamil Nadu indicating public space, utility space, service/work area, gathering space, circulation space, landscaped areas are attached in **Annexure 2.**

2.2.2. Provision of Toilets

a. In case toilets are not part of the existing FSTP site plan, they must be provided for visitors, FSTP staff and de-sludging operators.

b. Separate toilets for men and women, with washing and changing facilities for staff and DSOs must be provided.

c. Prefabricated options which can be easily assembled on site with indicative costs for toilets and containment structures are attached in Annexure 3 and 4.

2.3. Positioning FSTP as a Resource Centre

The GoTN envisions the upcoming FSTPs as resource centres to disseminate information not only about the facility and its functioning, but also on the full cycle of sanitation.

a. The FSTPs can potentially serve as a well-planned and landscaped public space for citizens to learn about safe sanitation.

b. They can be used for trainings on FSM and related events, and also for exposure visits to stakeholders including government officers, sanitation workers, schoolchildren, professionals working in the FSM sector, media personnel, etc.

There are two main suggested mechanisms –hoardings and wall paintings, and a dedicated room(s) to serve as a visitor centre.

2.3.1. Hoardings and Wall Paintings

Hoardings (in English and Tamil) will help understand the various aspects of the FSTP. The following types of hoardings are prescribed for the FSTP premises:

a. Type A: Describing the salient features of the FSTP, the project and the schematic layout of the premises (facility, active and passive landscape areas) with circulation details (pedestrian and vehicular pathways)

b. Type B: Describing the FSTP layout and treatment process

c. Type C: Describing the reuse, co-composting and landscaping details

Wall paintings to create awareness about the facility and the full cycle of sanitation have also been developed and can be found in **Annexure 5.**

2.3.2. Visitor Centre

A Visitor Centre (VC) at the FSTP can be the focal point of the resource centre, where visitors can learn more about the FSTP and safe sanitation. The VC can be clubbed with the FSTP office as well. It can host communication material such as brochures, leaflets and posters (samples in **Annexure 6**).

Besides, AV tools can be used to enhance the presentation of the FSTP. Currently, a virtual reality tool (VR) that showcases the FSTPs in Dhenkanal, Odisha, and Karunguzhi and Kangeyam in Tamil Nadu is operational. The video was created to provide an in-depth understanding of the design and constructional aspects of an FSTP. Originally intended for government officials, this VR tool can provide a realistic, 360-degree view of the FSTP, and its operation and maintenance to potential contractors. This video can be made available at the visitor's centre.

There can also be a static dashboard, showing the location of all the FSTPs in Tamil Nadu along with their photographs.

2.4. Facilities for Sanitation Workers

The FSTP is a place where sanitation workers, especially desludging operators regularly visit. Hence, it can be used as an effective platform to create awareness and reinforce the need for their personal safety and protection during de-sludging operations. The facility can also be used to disseminate information on the various health and social welfare schemes available to them.

Hoardings and wall paintings have been prepared for the same in the enlisted categories and can be found in **Annexure 7**.

a. Valorising their service to the FSTP as well as the environment

b. On safety and personal protection (preferably near unloading ramp/screen chamber)
    - Personal protective equipment
    - Dos and Don'ts of desludging at the source
    - Dos and Don'ts of emptying in the facility
    - Graphical representation of the need to empty the sludge in the facility.
    - Awareness on health check-ups and available facilities at ULBs
    - Awareness about health hazards caused by drinking/smoking

Separate toilets with washing and changing facilities must be provided for the sanitation workers. Spaces for them to rest and socialise must be a part of the landscape plan.

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TNUSSP, 2018. State Investment Plan for FSM

Annexures

Annexure 1: Types of Soil and Suitable Landscape Conditions

This table provides a summary of indigenous plants, trees and crops that are suitable for the different soil types found in the state of Tamil Nadu.

Table A1.1: Types of Soil and Suitable Landscape Options

No	Type of landscaping option	Type of soil								
		Black soil	**Red soil**	**Laterite soil**	**Red loamy soil**	**Sandy loam soil**	**Sandy coastal alluvial**	**River alluvium soil**	**Forest and mountain soil**	**Sandy loam and red laterite soil**
1	Crops	Cotton, Bengal gram, Mustard, Millets, Pulses, Sunflower, Safflower Jowar, Linseed, Cereals, Rice, Sugarcane, Tobacco	Groundnut, Millets, Pulses, Gingelly, Castor, Cassava	Rubber, Pepper, Spices, Pineapple, Avocado, Coconut, Cashew, Coffee	Potatoes, Groundnut, Maize, Soybean, Bengal gram, Pigeon pea, Castor, Green gram, Jute, Ginger	Carrot, Radish, Potatoes, Lettuce, Tomatoes, Zuccini, Corn, Watermelons, Cucumbers		Paddy	Neolamarkia cadamba, Wheat, Maize, Barley, Coffee, Tropical fruits, Temperate fruits	
2	Medicinal	Sida acuta, Citrus	Pterocarpus santalinus, Phyllanthus emblica, Butea monosperma	Asparagus racemosus	Gloriosa, Andrographis paniculata, Asparagus racemosus	Thyme, Rosemary, Oregano, Lavender, Ambroma augusta, Andrographis paniculata, Ocimum tenuiflorum	Calophyllum inophyllum	Bacopa monnieri, Vitex negundo		Aloe, Nerium oleander, Hibiscus, Ocimum tenuiflorum, Solanum nigrum

Table A1.1: Types of Soil and Suitable Landscape Options										
No	**Type of landscaping option**	**Type of soil**								
		Black soil	**Red soil**	**Laterite soil**	**Red loamy soil**	**Sandy loam soil**	**Sandy coastal alluvial**	**River alluvium soil**	**Forest and mountain soil**	**Sandy loam and red laterite soil**
3	Trees	Morinda tinctoria, Azadirachta indica		Citrus, Areca nut, Sapota, Mango,	Mandarin, Syzygium cumini, Guava, Mimusops elengi, Cashew, Banana, Papaya, Mango	Butterfly bush, Siberian pea shrub, Rose of Sharon, Red chokeberry, Flowering quince, Alstonia scholaris, Wrightia tincoria, Cassia fistula, Bauhinia racemose, Trema orentalis, Callistemon, Aegle marmelos		Dalbergia sisoo, Terminalia arjuna, Alstonia scholaris		Lagestromia speciose, Tamarindus indica, Mangifera indica, Azadirachta indica, Gmelina arborea, Melia dubia, Barringtonia acutangula, Neolamarkia cadamba
Sample image of soil										
Source: Tamil Nadu Agricultural University[3]										

[3] TNAU 2011, Retrieved from http://eagri.org/eagri50/AGRO101/lec08.pdf

Annexure 2: Conceptual function plans for 20, 30 and 40 KLD

The plans below depict the active and passive circulation areas along with the circulation pathways. They also depict the gathering spaces and the utilities.

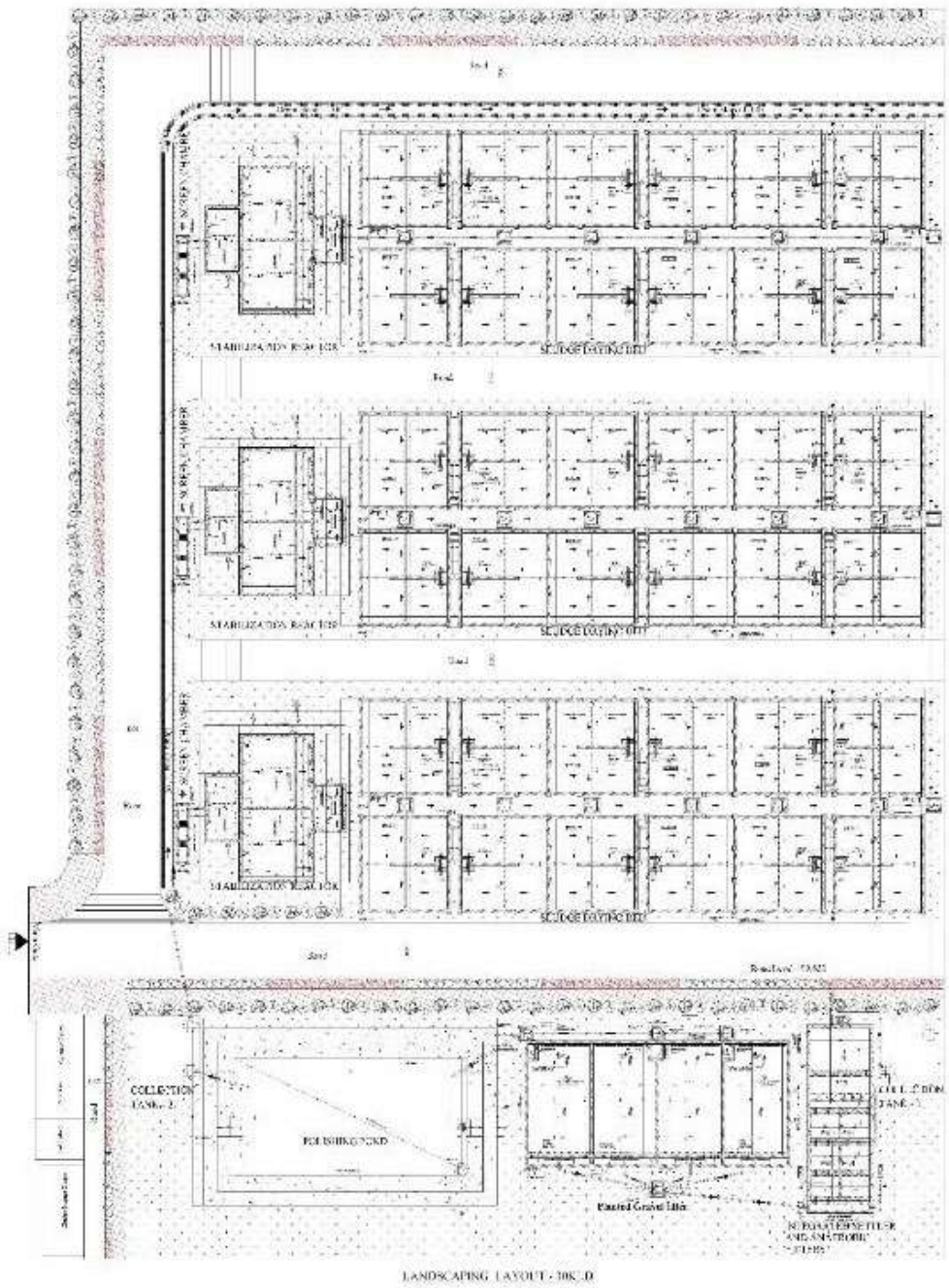
i. Landscaping layout plan sample for 20KLD plant.

Table A2.1: Landscaping layout for 20KLD plant

Source: TNUSSP, 2020

ii. Landscaping layout plan sample – 30 KLD.

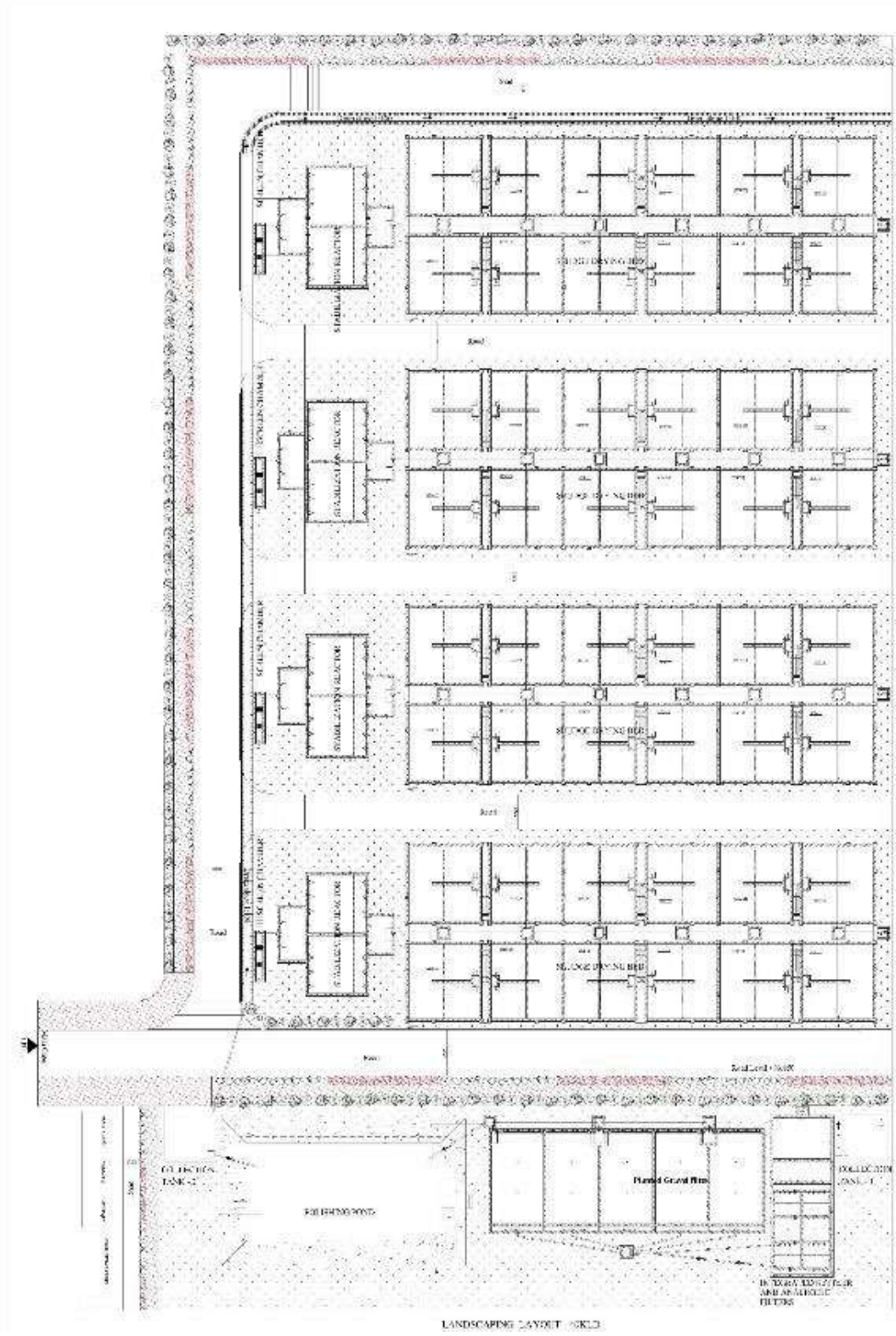
Table A2.2: Landscaping layout for 30KLD plant



Source: TNUSSP, 2020

iii. Landscaping layout plan sample – 40 KLD.

Table A2.3: Landscaping layout for 40KLD plant



Source: TNUSSP, 2020

Annexure 3: Features of Suggested Prefabricated Toilet Units available in Tamil Nadu

The table below highlights the key specifications of prefabricated toilet structures which can be chosen according to the requirement at the site.

No	Item	Table A3.1: Type of Prefabricated toilets			
		Type A	**Type B**	**Type C**	**Type D**
1	Model	Portable MS toilet unit with CR(Cold Rolled) sheet wall	MS Container toilet with UPVC sheet wall	MobiNest (MS Portable Toilet Cabin with GI sheet wall)	MS Portable toilet with V Board wall Model: GA-GAEIUW105
2	Sample Image				
3	Specification	**Size-15’x 10’x8’.6** • Four commodes and two urinals, one changing in-room, one mirror and cloth hanger • Panelling Outside-Specially Grooved CR Sheet-1.2 mm thick	**Size-20x8’x8.6** • Three toilet set, two wash basins, two urinals • PVC Sheet inside • UPVC outside	**Size-15x10’x8.5** • Fixed partition, attached toilet, Men’s Urinal, Washbasin • Panelling Outside-Specially corrugated 1.2mm thick sheet	**Size-14.5x9.5’x7.5** • EWC closet – 2 nos • IWC closet – 2 nos • Urinal- 2 nos • Wash Basin-2 nos

No	Item	Table A3.1: Type of Prefabricated toilets			
		Type A	**Type B**	**Type C**	**Type D**
		• CR sheet-1.2 mm thick roof • 19mm plywood PVC Carpet bottom flooring • 9mm OSL Particle board false ceiling • Sliding aluminium powder coated window size-4'x3' with safety grills & weather shed, qty-3 nos • MS Door with Rock wool insulation • Wiring-PVC insulated copper wire (FR grade) of ISI Polycab make • Electrical fittings 220-240 V AC 50 HZ • 5 Amp Switches Sockets 4nos, 16 Amp Ac point • Necessary lighting in each compartment	• Square pipe panelling • MS safety door • PVC door • Bulked Light Tatting • MCB Circuit • Extractor fan • Tiles (vitrified) • Plumbing (Hindware, Jaqure) -Western and Indian models • Tap and all fittings • Tank 500 ltr sintex • External painting (Dulux)	• Internal Wall Panelling-9mm thick pre laminated particle board (OR) MDF Board • Roof Outside-1 mm thick GI Sheet • Aluminum Sliding Windows-Double shutter sliding aluminum powder coated windows of 1.2mm Thickness with 4mm thick glass for all windows and safety grills • Bottom Flooring- 18 mm thick Bison panel, i.e. Cemented bonded fiber sheets shall be fixed by means of self-taping screw & 1.5mm thick PVC vinyl Carpet shall be fixed on the panel. (100% water, termite & dimensional proof with vinyl carpet) • Door-external opening type made out of pre laminated particle board (OR) MDF Board.	• Health faucet-02 nos • Wall: V BOARD • Structure: MS Square pipe • Flooring: V-Board • Vinyl Flooring. • Roof: V-Board ('FLAT') Electrical fittings • Light holder-1 no • Switches- 1 no • Door: 1 no (V BOARD) • Water tap – 4 nos • Ventilation-front & top back • Towel & Soap Dish-05 sets

No	Item	Table A3.1: Type of Prefabricated toilets			
		Type A	**Type B**	**Type C**	**Type D**
		• 1 coat of primer with two coats of paint as per your choice • Specially formed hooks for easy lifting and shifting.		• Insulation-Glass wool density of 32 kg/m3 with insulation for top &12mm foam on side walls. • Wiring-PVC insulated copper wires • One coat of primer & 2 coats of corrosion free paint i.e. synthetic Enamel paint • Specially formed hooks for easy lift & shift.	
4	Cost (Indicative) in INR	Rs.2,07,500/-	Rs.2,90,000/-	Rs.2,61,600/-	Rs.2,25,000/-
Source: Vendor websites as mentioned					

Annexure 4: Features of Suggested Prefabricated Containment Units available in Tamil Nadu

The table below highlights the key specifications of prefabricated containment structures which can be chosen according to the requirement at the site.

No	Item	Table A4.1: Types of Containment - Septic Tanks		
		Type A	**Type B**	**Type C**
1	Model	Sintex Septic Tank Black	Polyethylene Septic Tank	Precast Septic Tank
2	Sample Image			
3	Capacity	5000Ltr	6000Ltr	8400Ltr
4	Specification	• Model-PWTS-AM—300-01 • Diameter-1830mm • Height-1880mm • Inlet/Outlet pipe dia-100mm • Vent pipe-50mm	Type V 100 flush per day • Colour (UV stabilised)-Terracotta/black • Diameter-1600mm • Length-3200mm • Thickness-16mm • No. of chambers-3 • No. of manholes-2	Size- 8'3" x 5'3" x 7'0" • M40 grade concrete • Outer Wall thickness-175mm @ Bottom & 150mm @ top • Inner baffle walls 2 nos-75mmthk • Top & Bottom slab thickness 150mm • M40 Grade Concrete

No	Item	Table A4.1: Types of Containment - Septic Tanks		
		Type A	Type B	Type C
			• Size of manholes-550mm (Dia.) • Dia of inlet and outlet pipe-160mm • Air vent-50mm	• Fe500 grade reinforcement -10mm, 8mm (double layer) steel • Manhole size-600mm x 600mm • Baffle wall thickness-100mm (inlet and outlet holes shall be provided at site as per condition)
5	Cost (Indicative) in INR	Rs.1,16,820/-	Rs.1,07,500/-	Rs.1,21,800/-
Source: Vendor websites as mentioned				

Annexure 5: Hoardings on the FSTP and Wall Paintings on Full Cycle of Sanitation

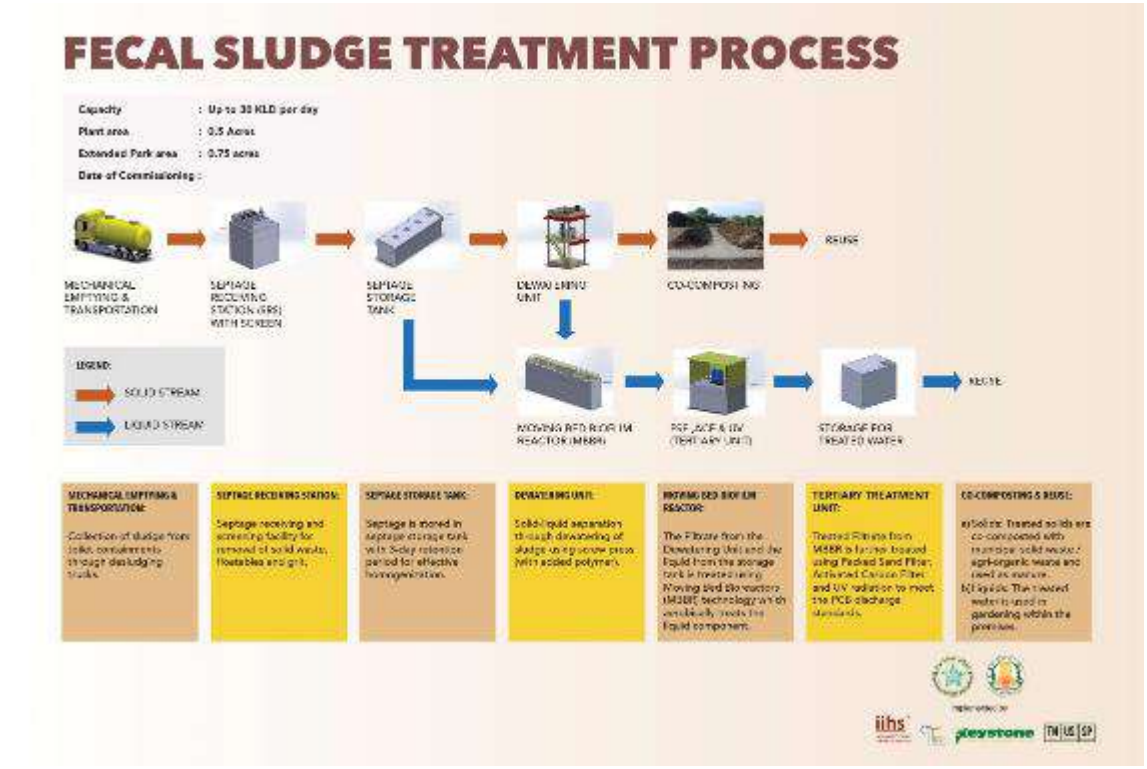
This hoarding depicts the salient features of the FSTP along with the layout map

Figure A5.1: Salient Features of FSTP with Layout Map

Source: TNUSSP, 2020

This hoarding depicts the fecal sludge treatment process at the FSTP.

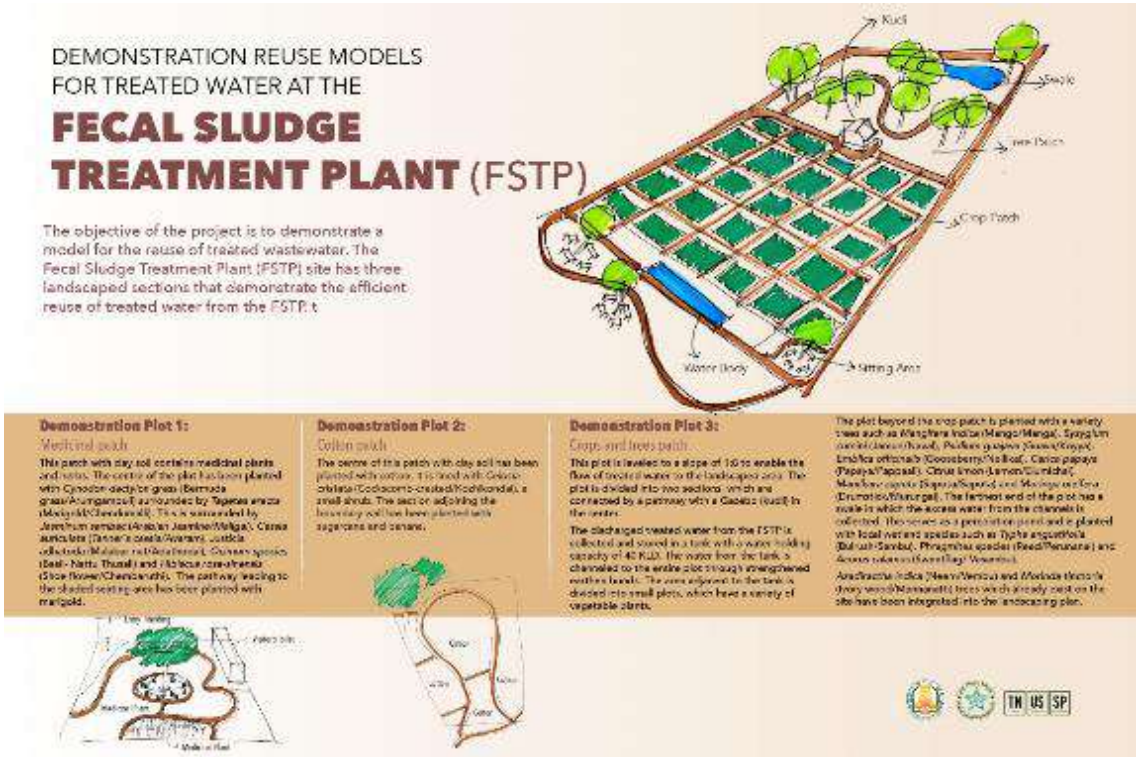
Figure A5.2: Fecal Sludge Treatment Process at FSTP

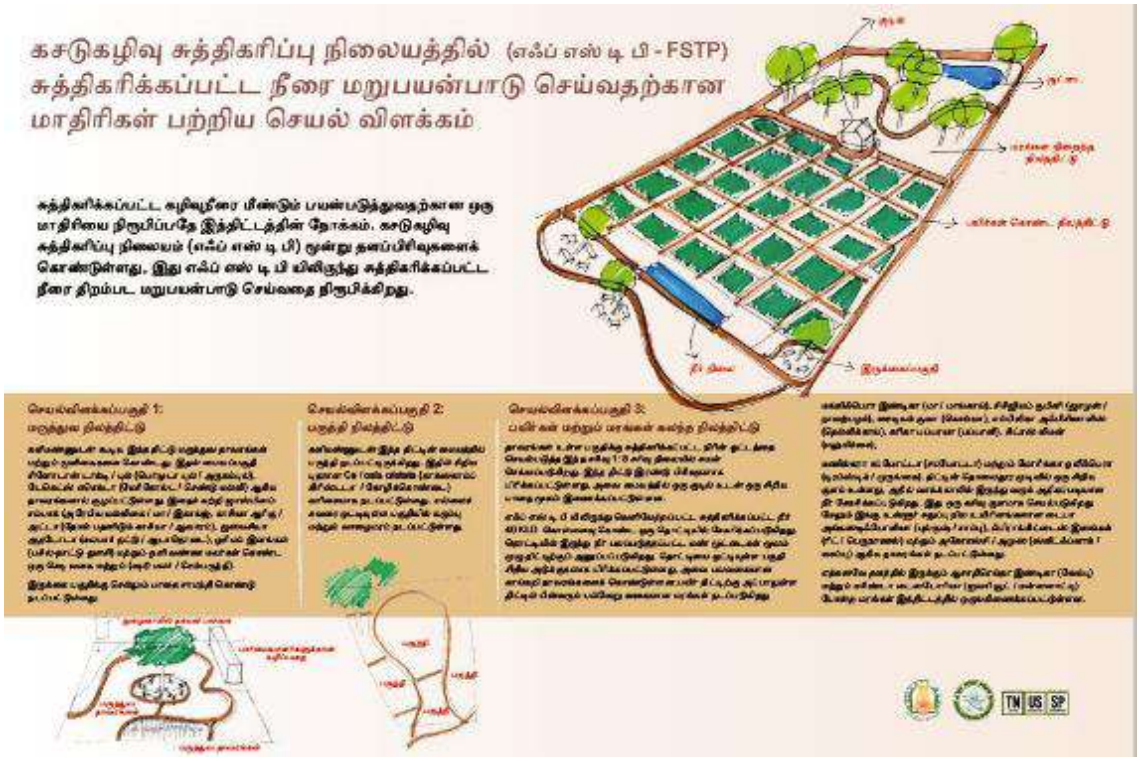


Source: TNUSSP, 2020

This hoarding depicts details of the landscape plan and reuse models for treated water at the FSTP.

Figure A5.3: Details of the Landscape Plan and Reuse Models for Treated Water at the FSTP





Source: TNUSSP, 2020

The wall paintings below depict the importance of the treatment facility and illustrate the full cycle of sanitation.

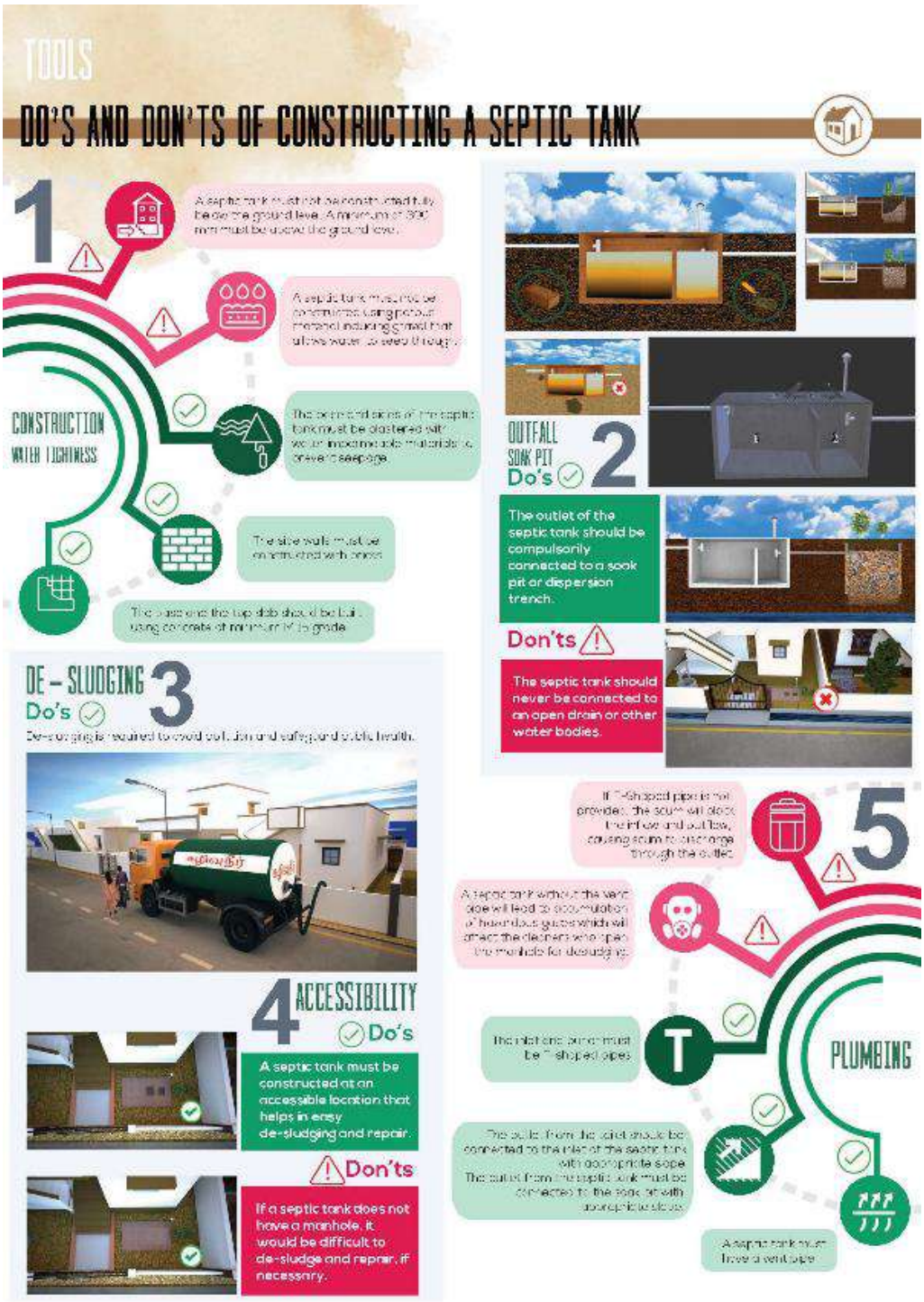
Figure A5.4: Wall Paintings depicting the importance of the Treatment Facility and Illustrating the Full Cycle of Sanitation

Source: TNUSSP, 2020

Annexure 6: Sample Posters for the Visitor's Centres

These sample posters depict information on the full cycle of sanitation, particularly FSM. They can serve as a resource for the visitors.

Figure A6.1: Do's and Don'ts of Constructing a Septic Tank

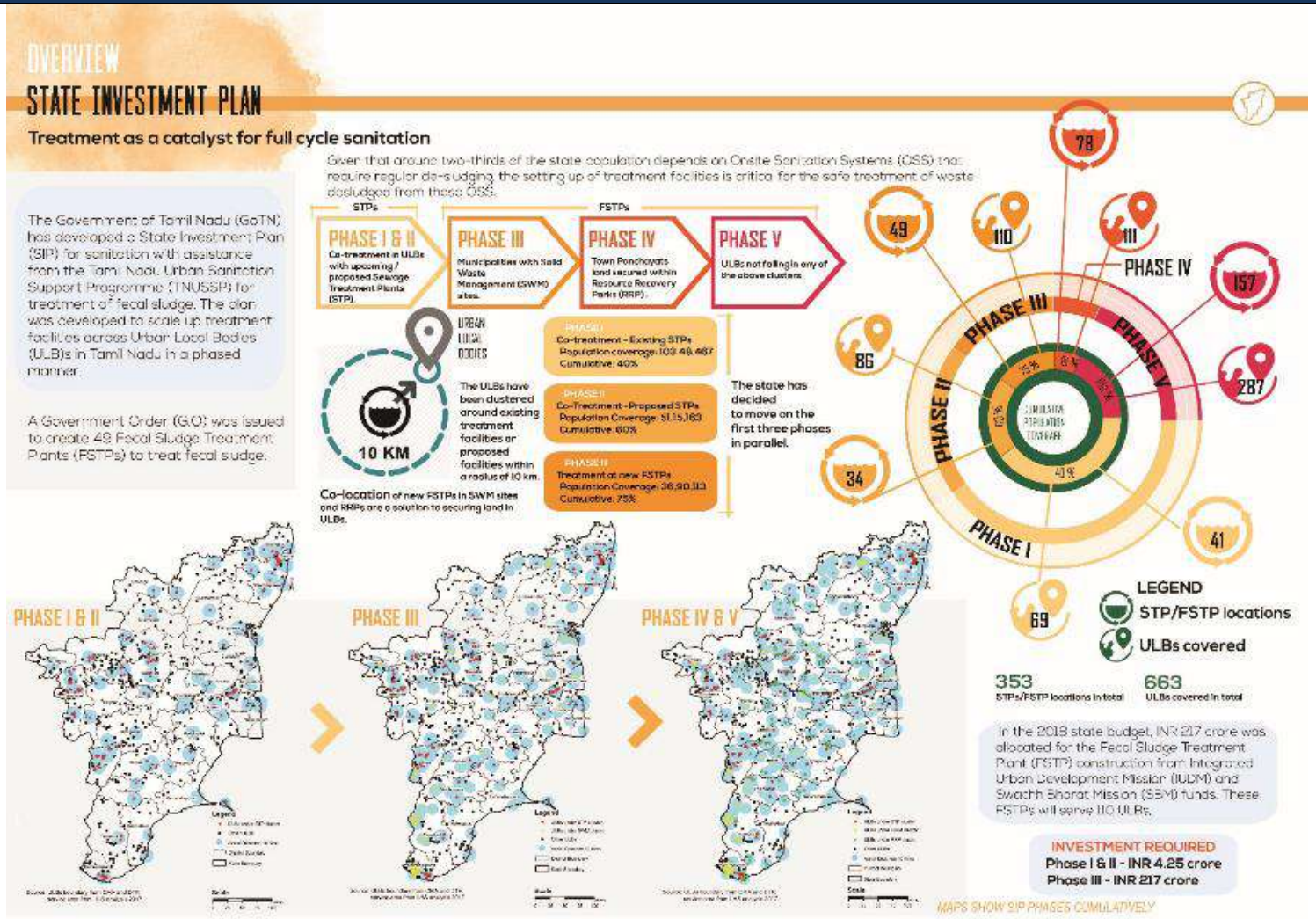


Source: TNUSSP, 2019

Figure A6.2: Occupational Safety Standards for De-Sludging

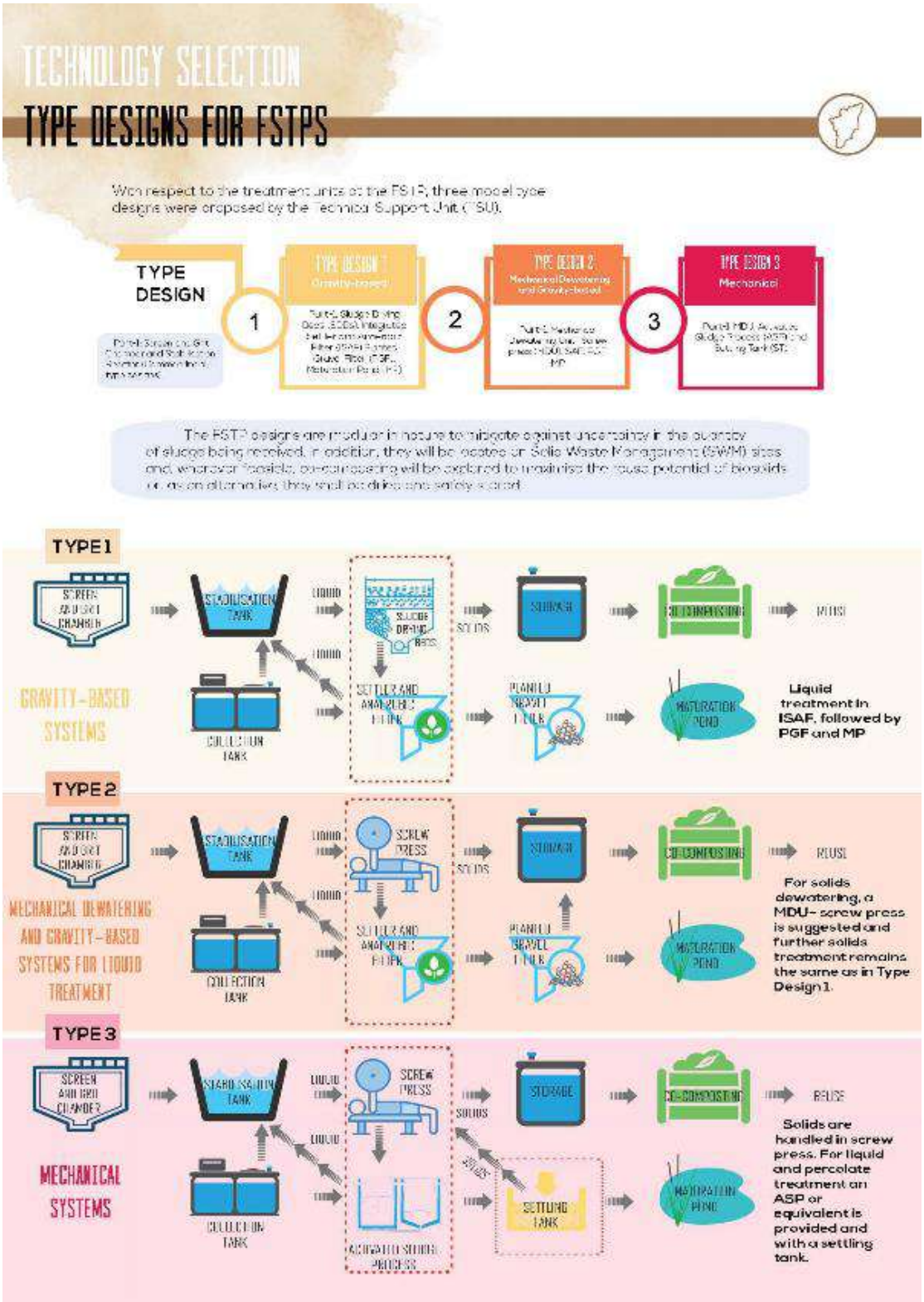
Source: TNUSSP, 2019

Figure A6.3: The State Investment Plan



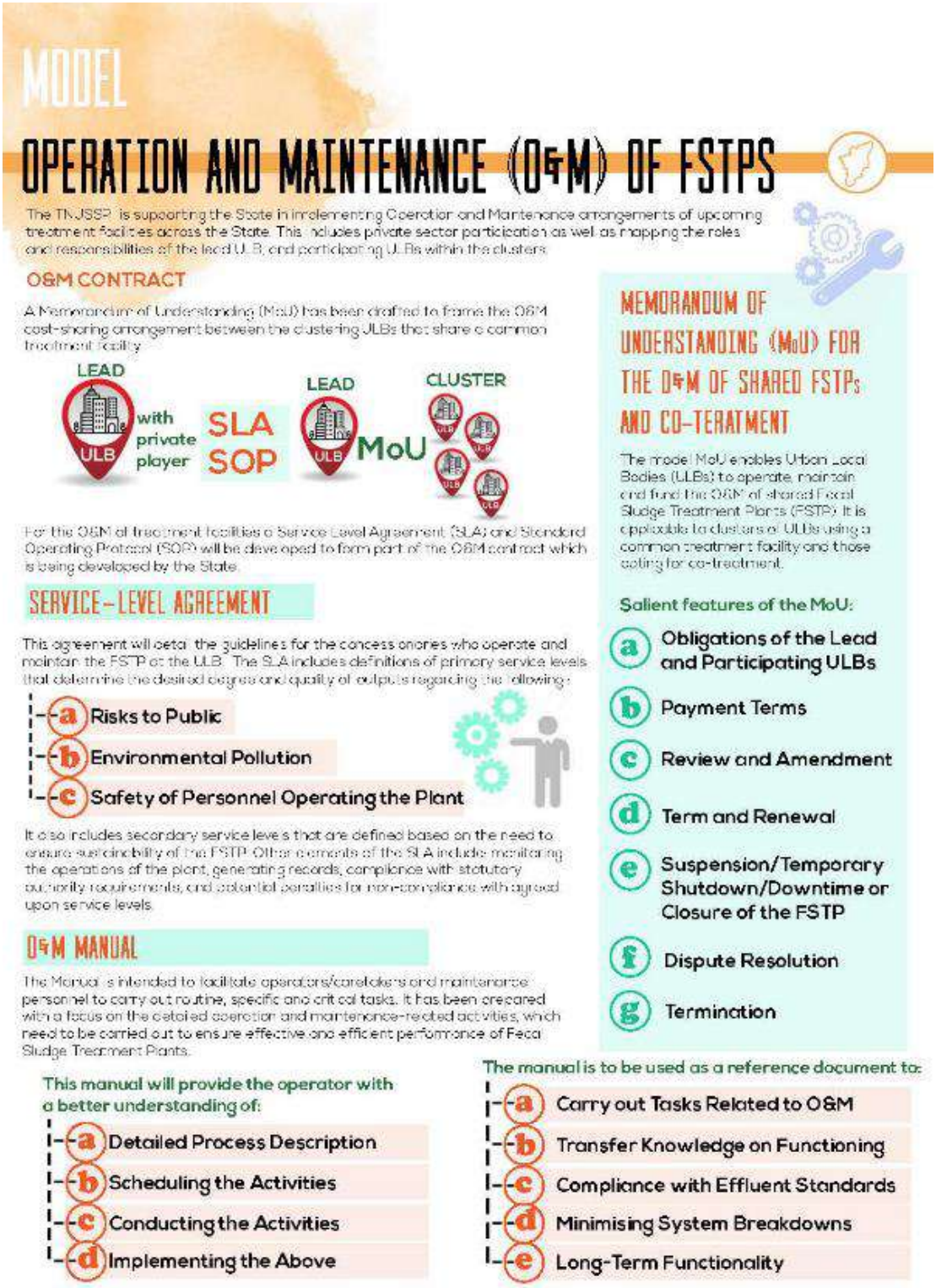
Source: TNUSSP, 2019

Figure A6.4: Type Designs for FSTPs



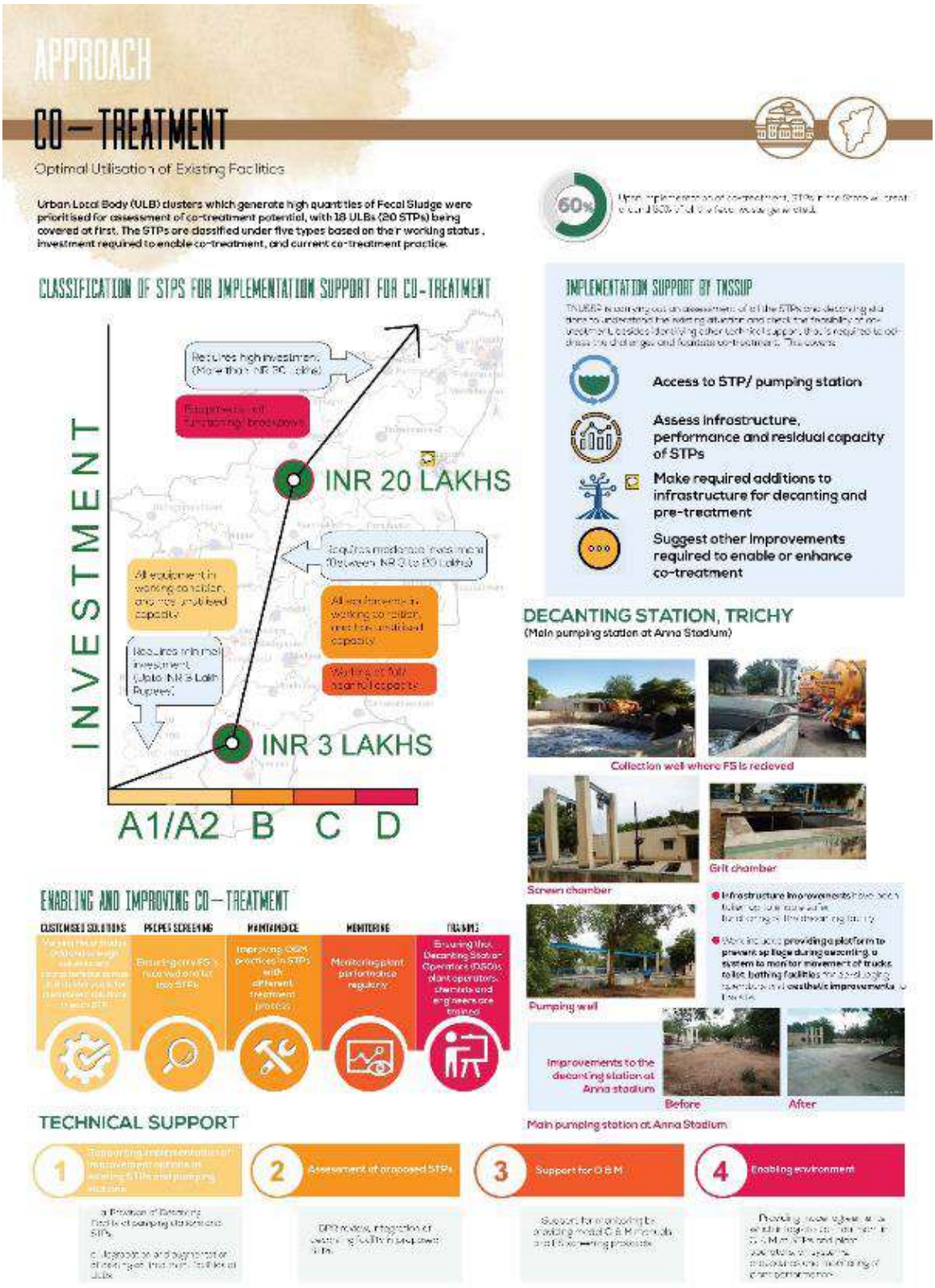
Source: TNUSSP, 2019

Figure A6.5: O & M of FSTPs



Source: TNUSSP, 2019

Figure A6.6: Co-treatment in Tamil Nadu



Source: TNUSSP, 2019

Annexure 7: Posters and Wall Paintings for Sanitation Workers

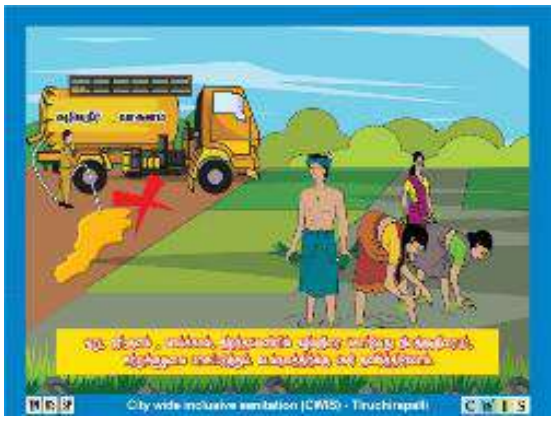
The wall painting samples attached below depict key messages on FSTP operations, emptying fecal sludge at the FSTP, personal protection of sanitation workers and the full cycle of sanitation.

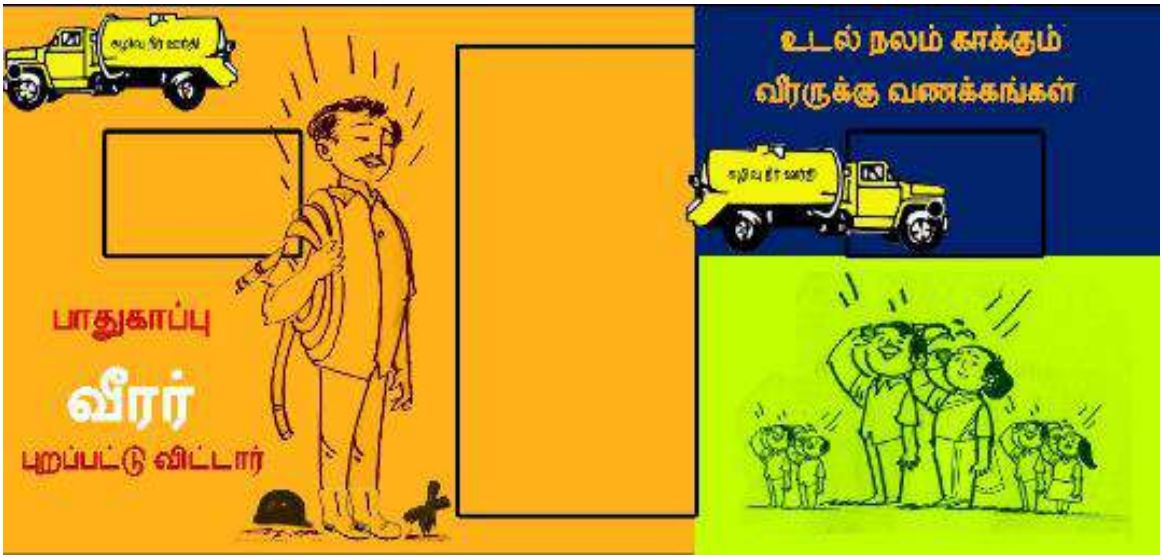
Figure A7.1: Wall Paintings with Key Messages for Sanitation Workers

Figure A7.2: Wall Paintings with Key Messages for Sanitation Workers

Source: TNUSSP, 2020

Figure A7.3: Wall Paintings with Key Messages for Sanitation Workers





Source: TNUSSP, 2020

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TAMIL NADU URBAN SANITATION SUPPORT PROGRAMME

Tamil Nadu Urban Sanitation Support Programme (TNUSSP) supports the Government of Tamil Nadu and cities in making improvements along the entire urban sanitation chain.

The TNUSSP is implemented by a consortium of organisations led by the Indian Institute for Human Settlements (IIHS), in association with CDD Society, Gramalaya and Keystone Foundation.

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IIHS CHENNAI: Floor 7A, Chaitanya Exotica, 24/51, Venkatnarayana Road, T.Nagar, Chennai-600017.
044-6630 5500 tnussp@iihs.ac.in www.tnussp.co.in www.facebook.com/TNUSSP