Tamil Nadu Urban Sanitation Support Programme (TNUSSP) Trichy Phase - I

Key Findings

March, 2018

TECHNICAL SUPPORT UNIT:

iihs™
INDIAN INSTITUTE FOR HUMAN SETTLEMENTS

IN ASSOCIATION WITH:

Keystone

Gramalaya

CDD Consortium for DEWATS Dissemination Society

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.

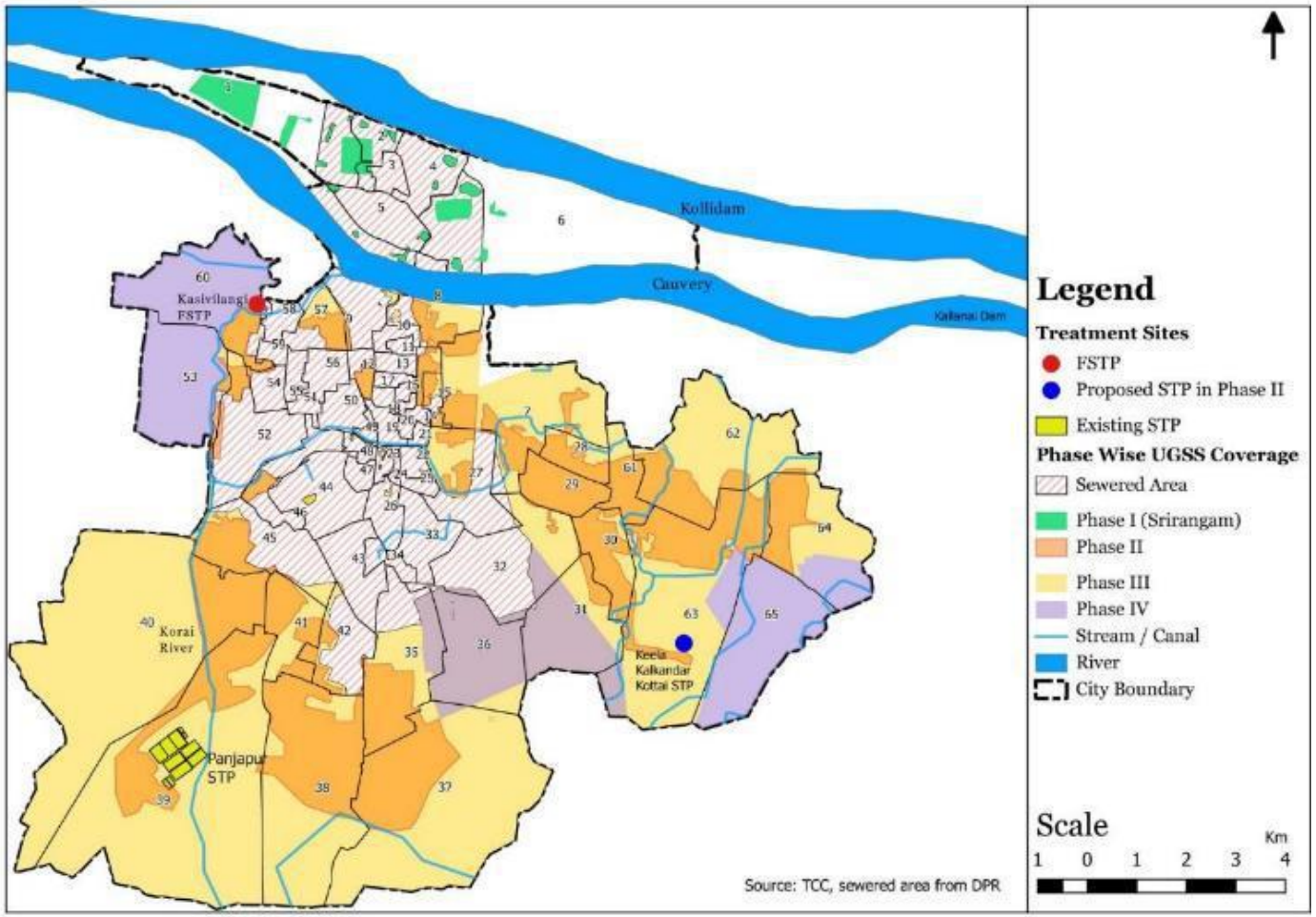
- 154 notified and 108 non-notified slums
- Fourth largest Municipal Corporation in Tamil Nadu
  - ✓ Headed by a Commissioner
  - ✓ 4 Assistant Commissioners
  - ✓ 1 City Health Officer
  - ✓ 29 Engineers belonging to JE / AEE / EE / CE cadre
  - ✓ 7 departments with Public Health & Engineering departments mainly dealing with sanitation

TRICHY – KEY INTERVENTIONS

- Demonstration of co-existence of networked systems and FSM

- Building on City's Strengths

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



TRICHY – KEY INTERVENTIONS

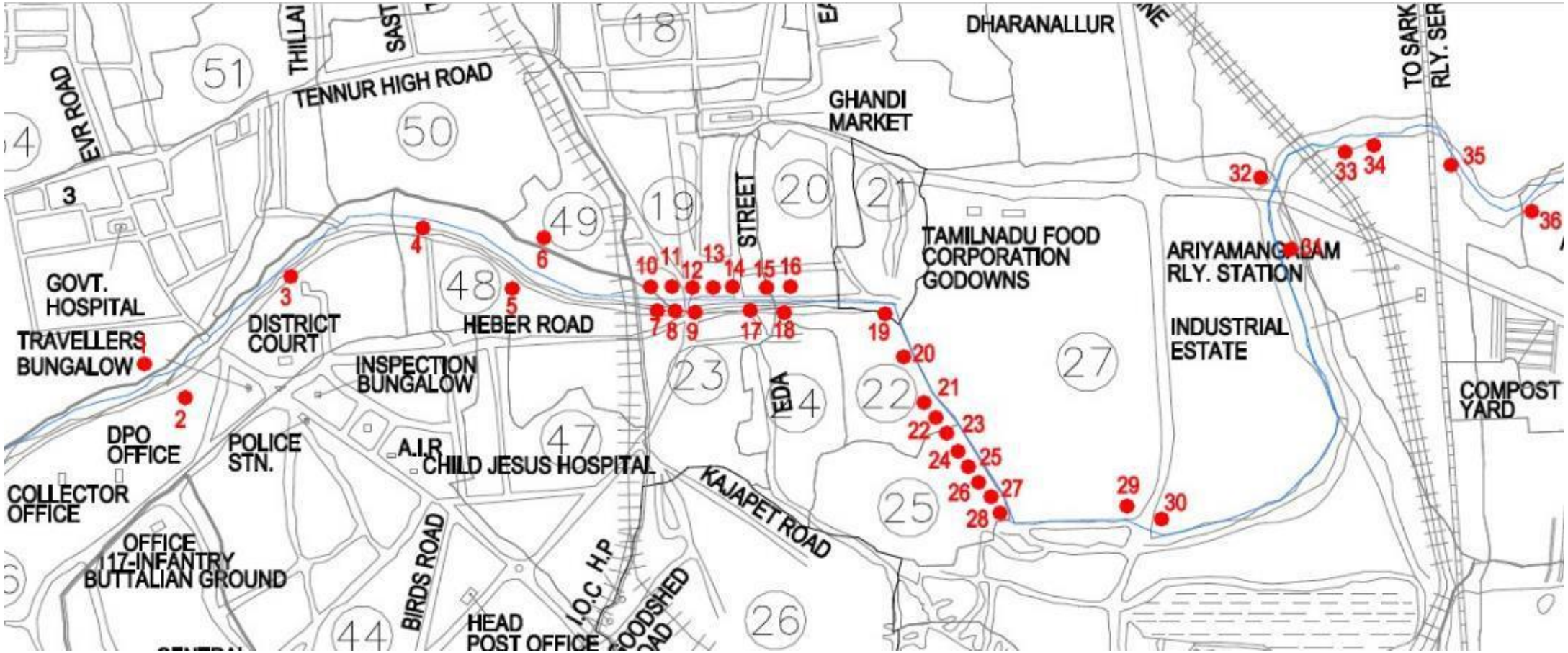
1. Improving access to individual household toilets through Swachh Bharat Mission – Urban (SBM-U)
2. Uyyakondan pollution study underway
3. Improvements to decanting stations
4. Proposal for improvements to STP
5. Design and construction of FSTP
6. Sustainable O & M models under preparation
7. Orientation and training of stakeholders: masons, de-sludging operators
8. Stakeholder engagement: Working Group meetings , Sanitation and Hygiene Education (SHE) Teams in slums / low income areas etc.

ACCESS AND CONTAINMENT

1. **Improving access to individual household toilets through Swachh Bharat Mission – Urban (SBM-U)**
2. **Enforcement Drives** for conversion of insanitary toilets
3. **Good Quality Well-maintained Community Toilets**
   - ❖ 457 Community and Public Toilets including child-friendly toilets
   - ❖ Sanitation and Hygiene Education (SHE) Teams manage Community Toilets sustainably
   - ❖ Improvement for Containment Systems proposed

ACCESS AND CONTAINMENT

Uyyakondan canal pollution – Discharge points map



ACCESS AND CONTAINMENT

Uyyakondan canal pollution – Study Methodology

Micro- catchment identification and delineation

- Micro–catchment selection criteria – Manageable size for study
- Field recce to map boundaries of micro-catchment tracing back from outfall point
- Finalization of micro-catchment in consultation with TCC

Prelimary assessment and reconnaissance

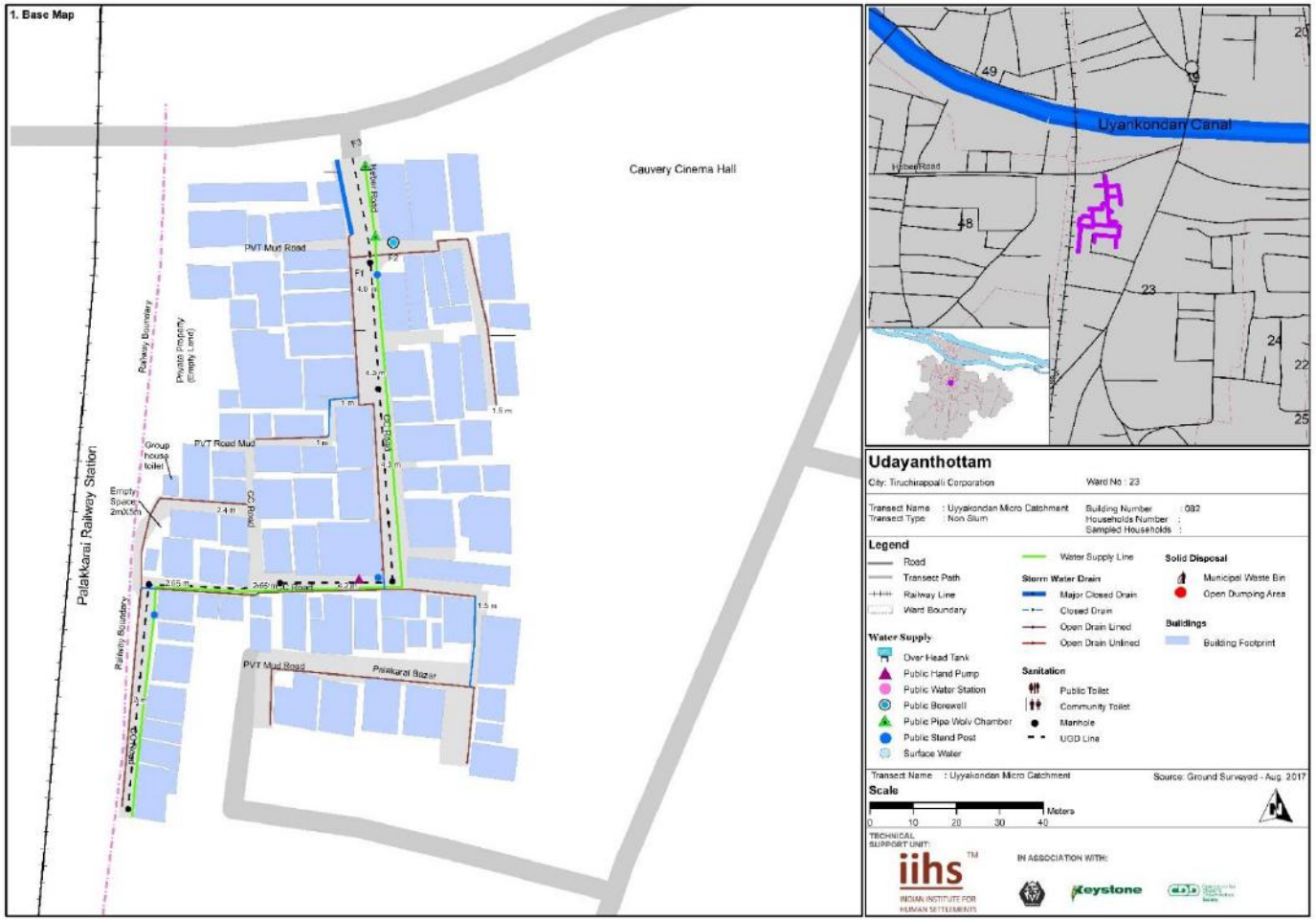
- Collection of primary information on micro- catchment – Property tax, Water supply and drainage connection data
- Creating a GIS based HH level map

Detailed Situation Analysis

- HH and Establishment level - Structured questionnaires and Water consumption pattern analysis
- Street and drain level - Observations on public/private infrastructure
- Water sampling, Wastewater flow and quality analysis at various nodes of SWD segment

ACCESS AND CONTAINMENT

Uyyakondan canal pollution – Micro-catchment



ACCESS AND CONTAINMENT

Pilot demonstration : Non-invasive Geo-physical methods for characterizing OSS

To locate OSS, measure dimensions and estimate the sludge volume contained through the application of non-invasive geophysical techniques.

> Primary objective is to identify the suitable technology that fits the field level conditions with broad parameters that can be expected / arrived at, based on such techniques.

First of its kind technology application to solve complex issue of locating & identifying structures, below the ground

Echo sounder & LiDAR: Among the three ranging sensors used, the laser sensor is most accurate due to the very low spread of its probing beam.

SP survey: Found effective for locating ‘leakages’. However need to confirm these with water quality testing to confirm the same

ACCESS AND CONTAINMENT

- **Objective** is to design simple, cost-effective a non-invasive method/s to

1. Locate hidden septic tanks
2. Estimate the volume of sludge to be evacuated and
3. Identify and locate septic leakages

- **Methods tested:**

1. Electric resistivity imaging techniques
2. EM ground conductivity survey
3. Self Potential survey
4. Shallow seismic survey
5. Echo sounding of the septic tank
6. LiDAR (Light detection and ranging) sensors

Leakage	Sludge depth (cm)	Tank lateral dimensions (feet)	Tank bottom (feet)	Remarks
No	50	7' x 15'	13'	Dimensions of tank and sludge top measured & Tank Bottom identified

3 dimensions + Sludge Top	2 dimensions + Sludge Top	Only Sludge Top	Leakage
7	12	25	26

From the 30 sites surveyed

ACCESS AND CONTAINMENT

Technology	Possibilities (inception stage)			Actual performance in the field		
	Location & Dimensions	Leakage	Sludge Volume	Location & Dimensions	Leakage	Sludge Volume
Resistivity Survey	High	High	Low	High	High	Moderate
EM survey	High	High	Low	Not suitable	Not Suitable	Not Suitable
SP survey	Moderate	Moderate	NP	NP	High	NP
Shallow seismic	High	NP	NP	Moderate	NP	NP
Ultrasound	NP	NP	High	High	NP	Moderate^^
LiDAR System	High	NP	Moderate^	High^	NP	Moderate^^

^ in conjunction with Ultrasound readings

^^ integrated probe

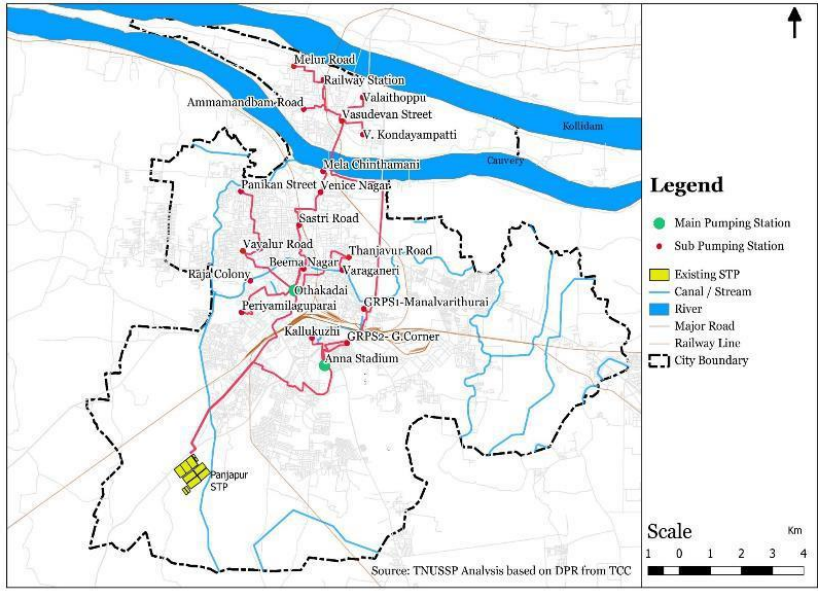
COLLECTION AND CONVEYANCE

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

- 32 operators; 41 vehicles licensed in the year 2017-18
- Tank capacities range from 4000 L to 10000 L; common size is 6000 L



	Per load price in Rupees	
Tank capacity	**Within TCC limits / Periphery areas**	**Peripheral Areas (20 -30 Kms)**
4000 – 5000 L	1000 - 1200	1800 - 3000
6000 L	1200 - 1500	
8000 – 10000 L	1600 - 2000	

COLLECTION AND CONVEYANCE

Decanting station- Present State / Conditions

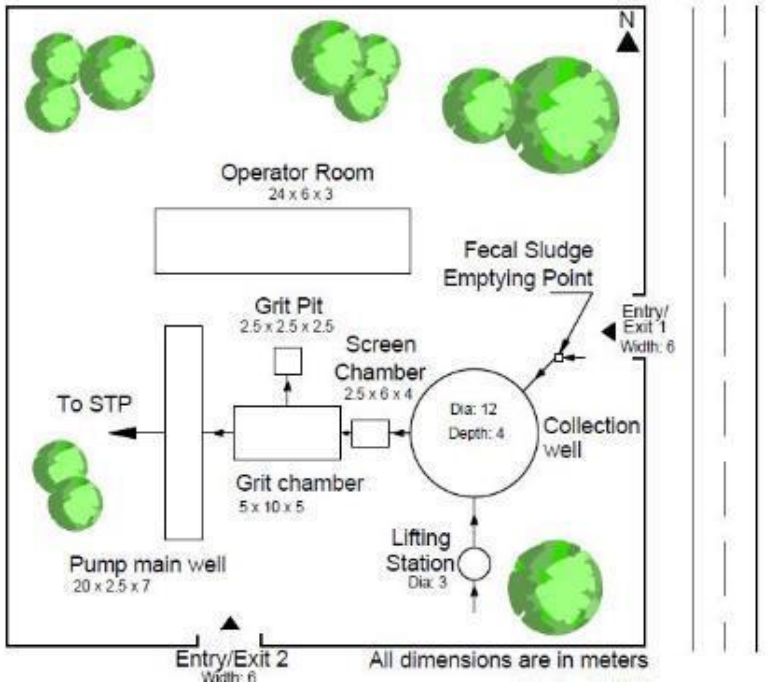
1. No control or record of the origin of septage. For example, grease and industrial solvents can be discharged to the receiving pit with no controls
2. No mechanism or procedure for sampling and analysis of suspect loads
3. Bar screens & grit removal systems -either inoperable or not in use
4. Health and hygiene - No proper hand wash facilities for drivers, and no guard rails on open pits.
5. Number of trucks is recorded but no volume
6. No monitoring during night hours

COLLECTION AND CONVEYANCE

Improvements in Decanting Stations

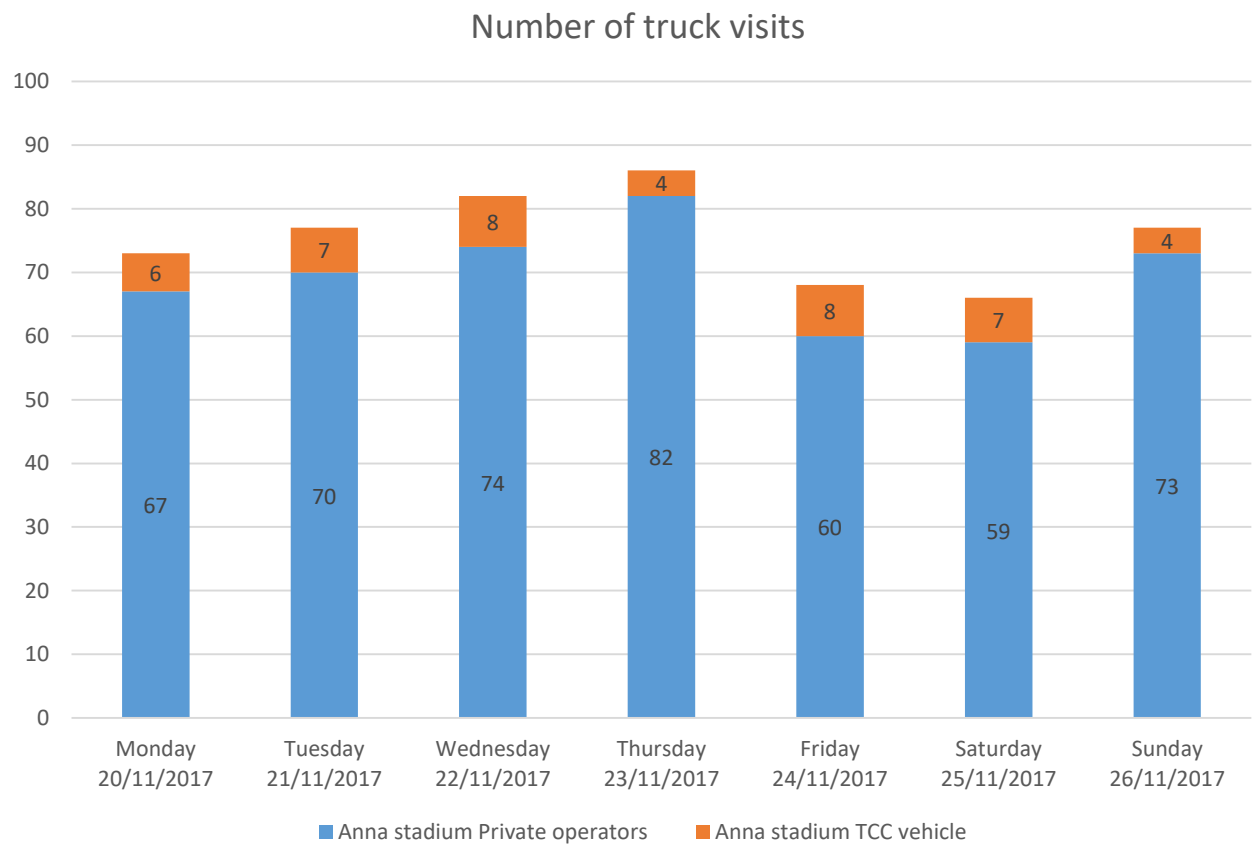
- Infrastructure: a ramp/platform/collection tank at or below ground level to ensure the complete emptying of FS; Placement of screens at an angle for the ease of removal screenings, reducing the spacing of bars in screens provided
- O & Maintenance: Conditioning the grit removal motors to working status, Regular removal of screenings and grit
- Establish a system to monitor FS quality, monitor night hours operations
- Worker health and safety

Layout of existing Decanting station



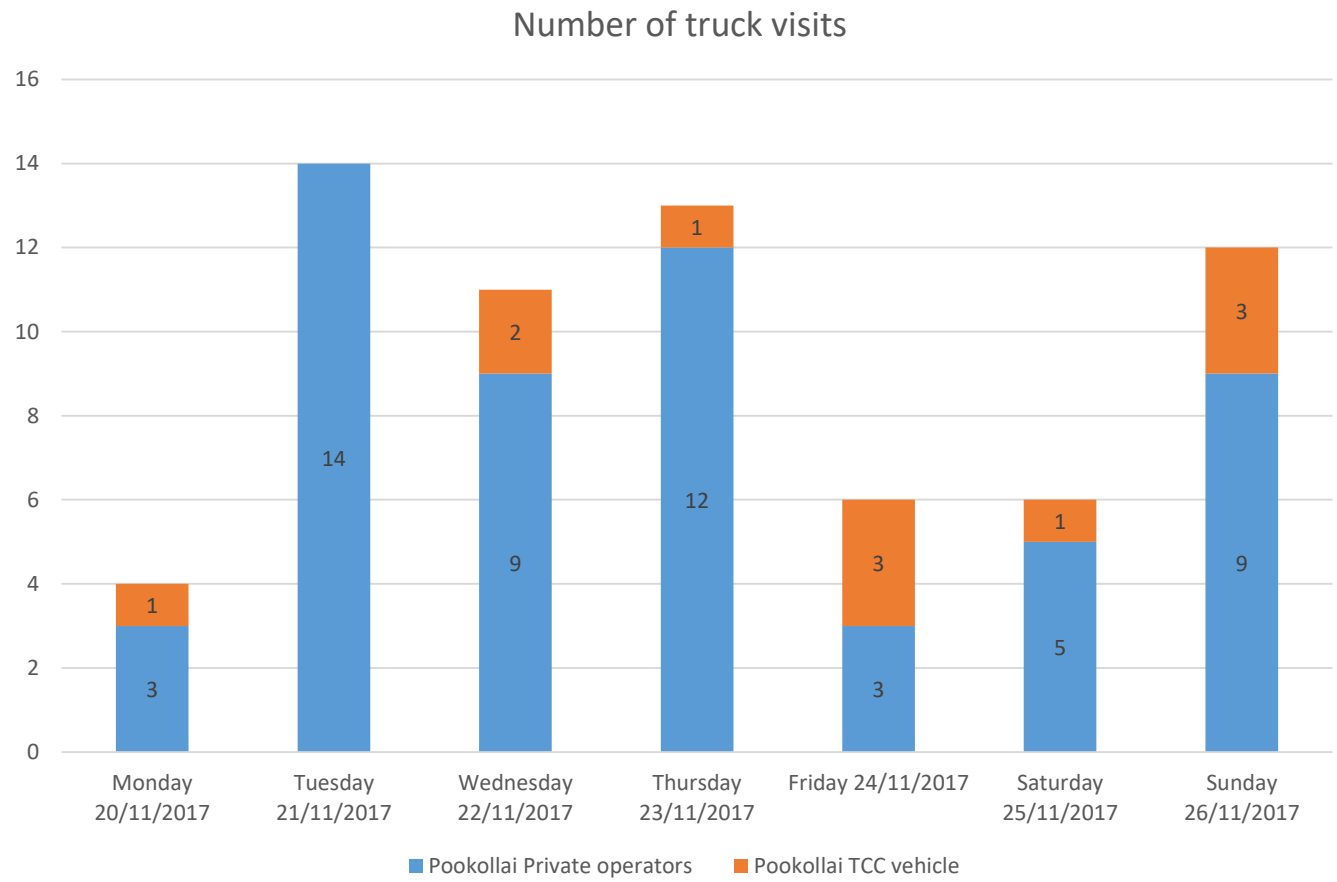
COLLECTION AND CONVEYANCE

Decanting station – Monitoring of truck visits at Anna stadium



COLLECTION AND CONVEYANCE

Decanting station – Monitoring of truck visits at Pookollai



COLLECTION AND CONVEYANCE

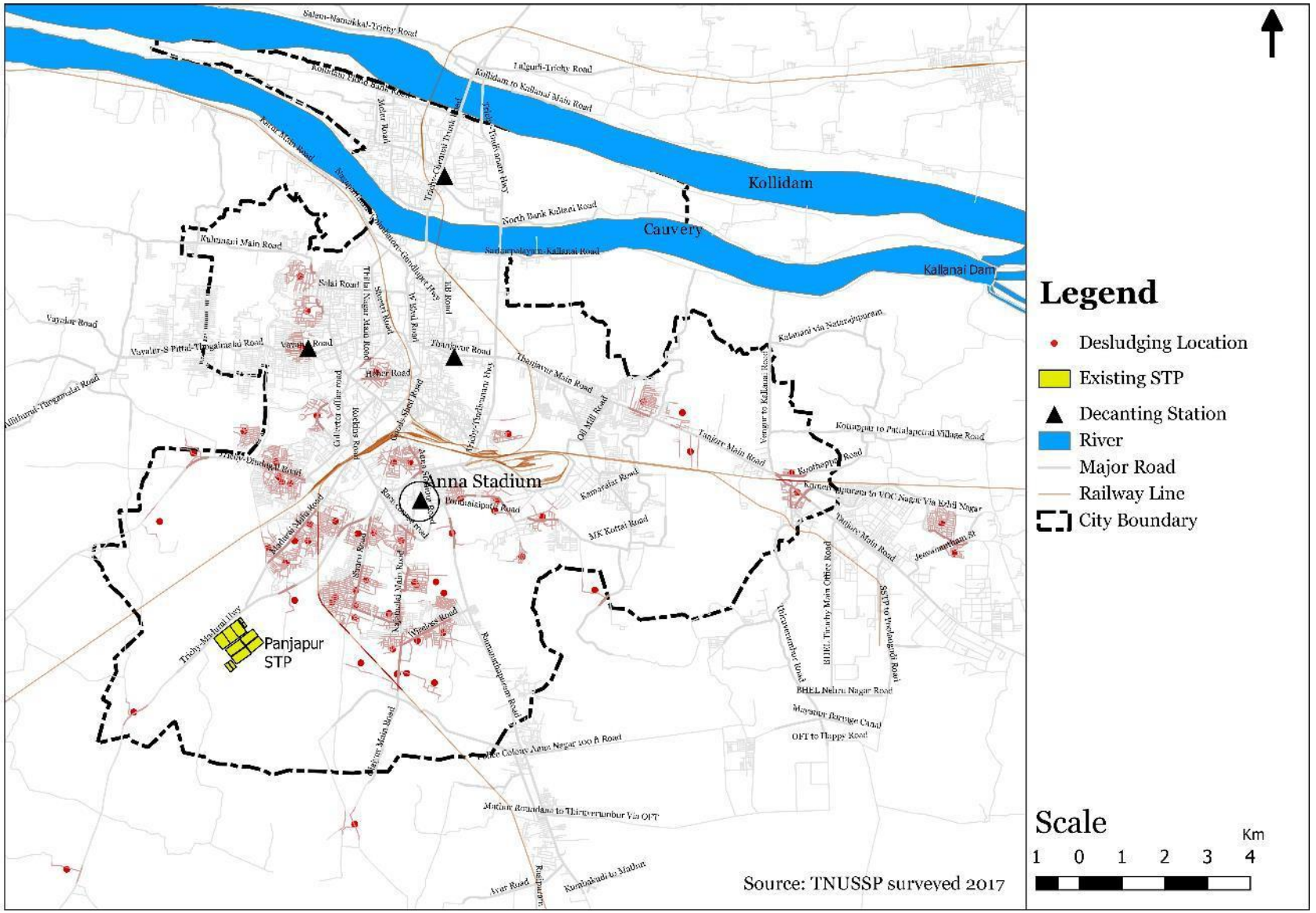
Decanting station monitoring – Customer types served

Customer Category	Overall		Excluding Large Apt	
	Number of loads	%	Number of loads	%
Household (Individual / Apartments)	468	78.66%	274	68.33%
Institutional (College, Schools , Hospital)	16	2.69%	16	3.99%
Commercial (Hotel / Lodge, Eateries, Marriage halls)	37	6.22%	37	9.23%
Community / Public Toilet	54	9.08%	54	13.47%
Industry / Factory	20	3.36%	20	4.99%
	595		401	

- Average of 25-30 loads per day by a Large apartment complex
- Majority of the Establishments and Institutions recorded more than one truck visit (*load*) to the decanting station which points to larger size containment structures

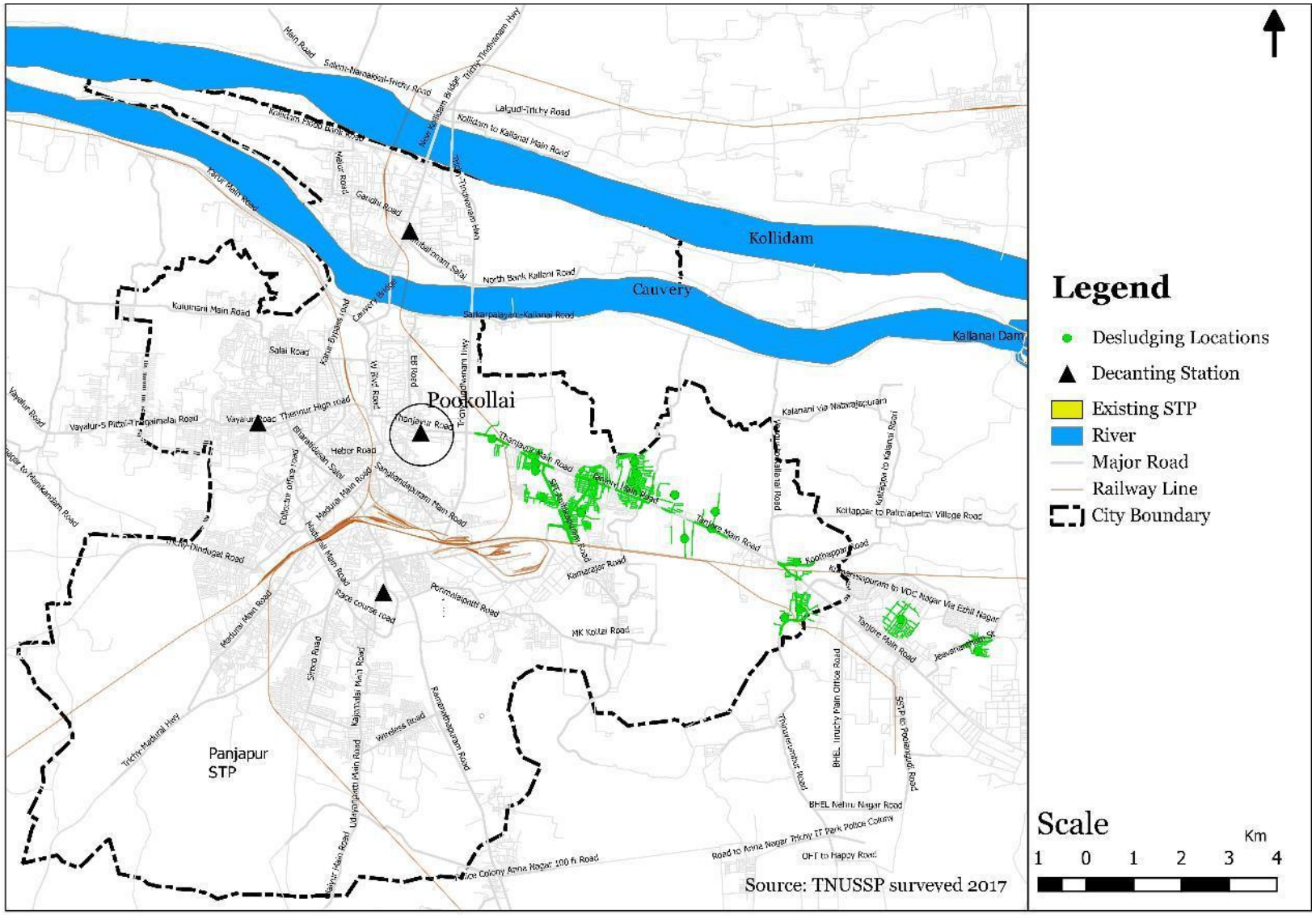
COLLECTION AND CONVEYANCE

Areas served by Anna stadium decanting station



COLLECTION AND CONVEYANCE

Areas served by Pookollai decanting station



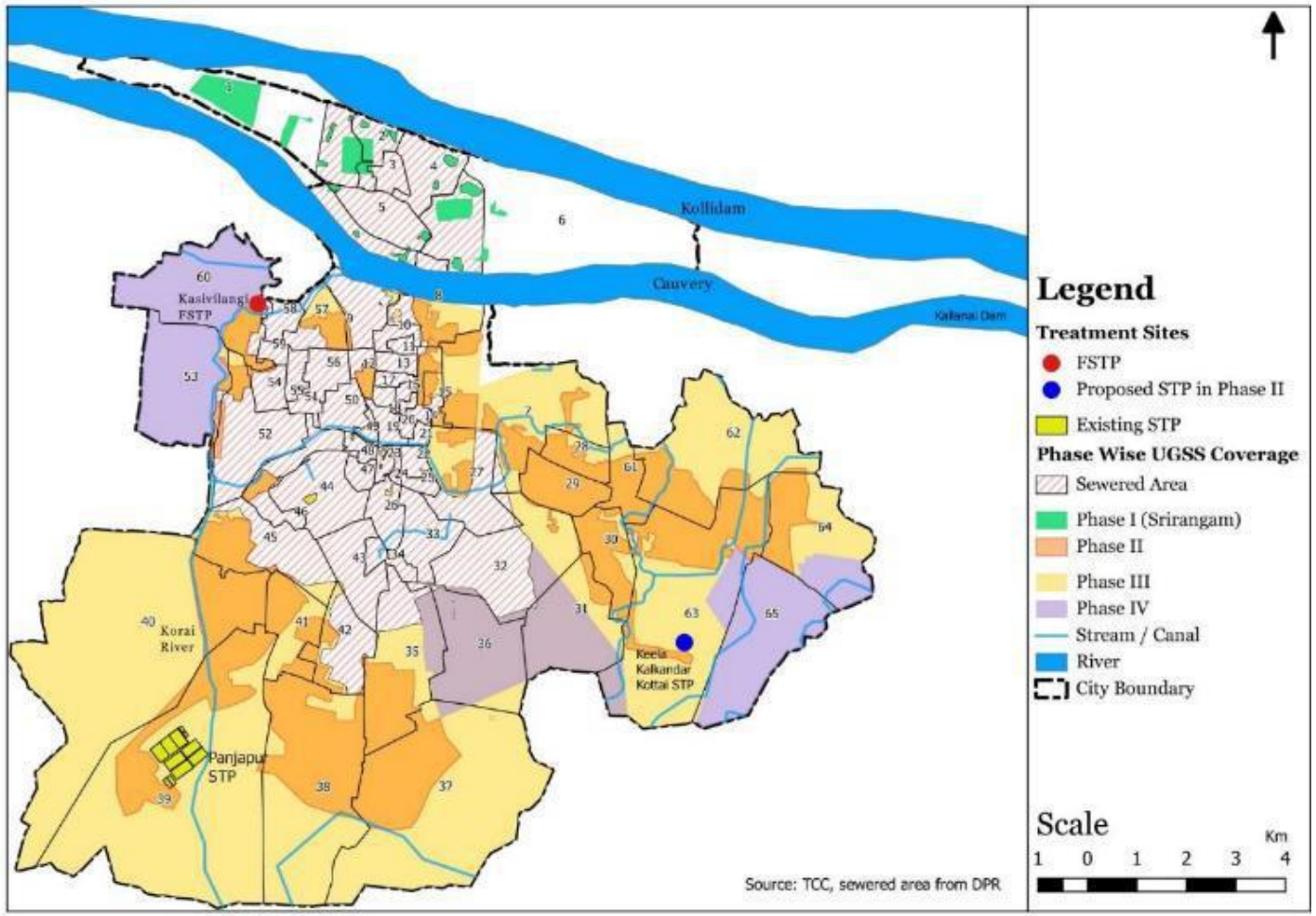
TREATMENT

Network and FSM:

- 25 wards fully covered
- 25 wards partially covered
- 15 wards un-covered

- Phased approach for networked system; FSM integrated into overall planning (under AMRUT)

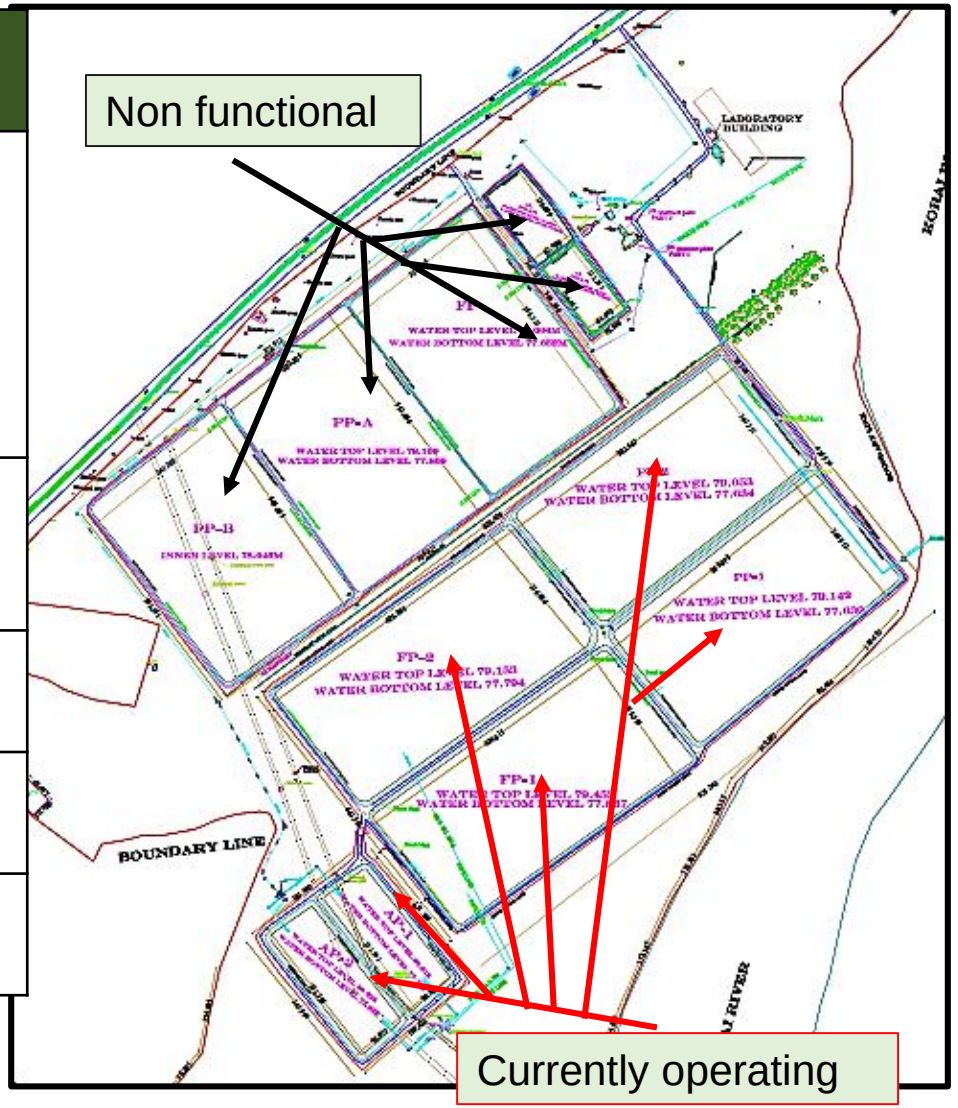
- UGSS: Phase II & III : Expected time to complete is 5 - 7 years
  - Phase III, Phase IV areas – FSM is planned



TREATMENT

Assessment of Fecal Sludge and Sewage- Overview

Sl. 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	Total capacity of ponds		577,716	m^3	Topographical Survey
4	No. of Households covered by sewerage network		45000	No.	TCC
5	Amount of fecal sludge received (Max)		480	m^3 per day	Decanting station survey



TREATMENT

Improvements in Sewage Treatment Plant - Panjappur

Capacity: 88 MLD | Current sewage flow :43 MLD | Technology: Waste Stabilisation ponds

- Infrastructure: requirements such as flow measurements, proper outlet structures for ponds to restrict the carryover of algae or solids.
- Infrastructural 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).

TREATMENT

Improvements in Sewage Treatment Plant - Panjappur

Capacity: 88 MLD | Current sewage flow :43 MLD | Technology: Waste Stabilisation ponds

- Maintenance: reconditioning the valves, screen and grit removal systems, field measurements and laboratory analysis, establish sludge management
- Performance Improvements and Capacity Enhancement: Installation of aerators/baffles to reduce short-circuiting, improve BOD and Nitrogen removal
- Record keeping and reporting: Establish daily/monthly and annual report keeping of observations, analysis and plant maintenance

TREATMENT

Non Network: Fecal Sludge Treatment Plant

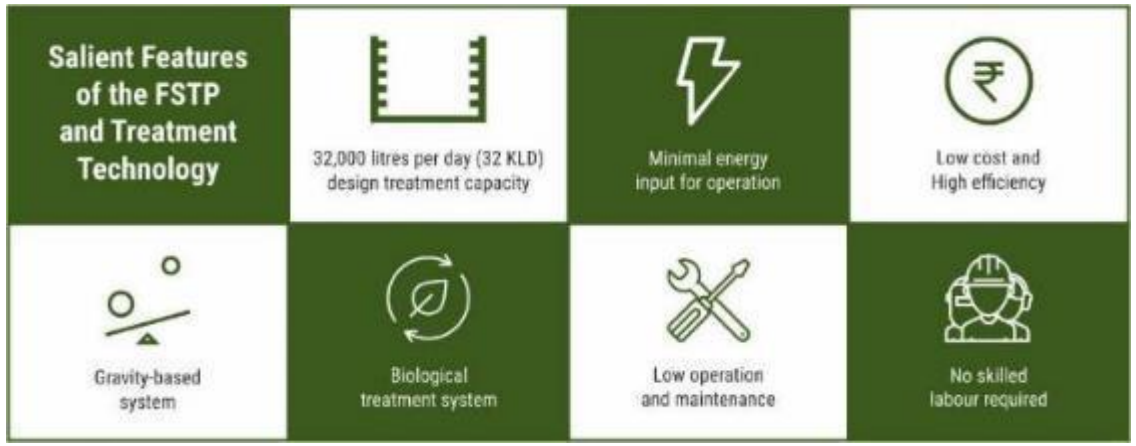
Design Capacity 32 m^3/ day

Key units:

- Stabilisation Tank,
- Sludge Drying Bed,
- Integrated Settler and Anaerobic Filter
- Planted Gravel Filter
- Collection Tank

CAPEX: Rs. 3.8 Cr; OPEX : Rs. 20 Lakhs per annum

Clearances: TNPCB. LPA



Re-use Options

- Treated water used for plantation within site and buffer zone
- Co-composting of sludge, develop market for compost

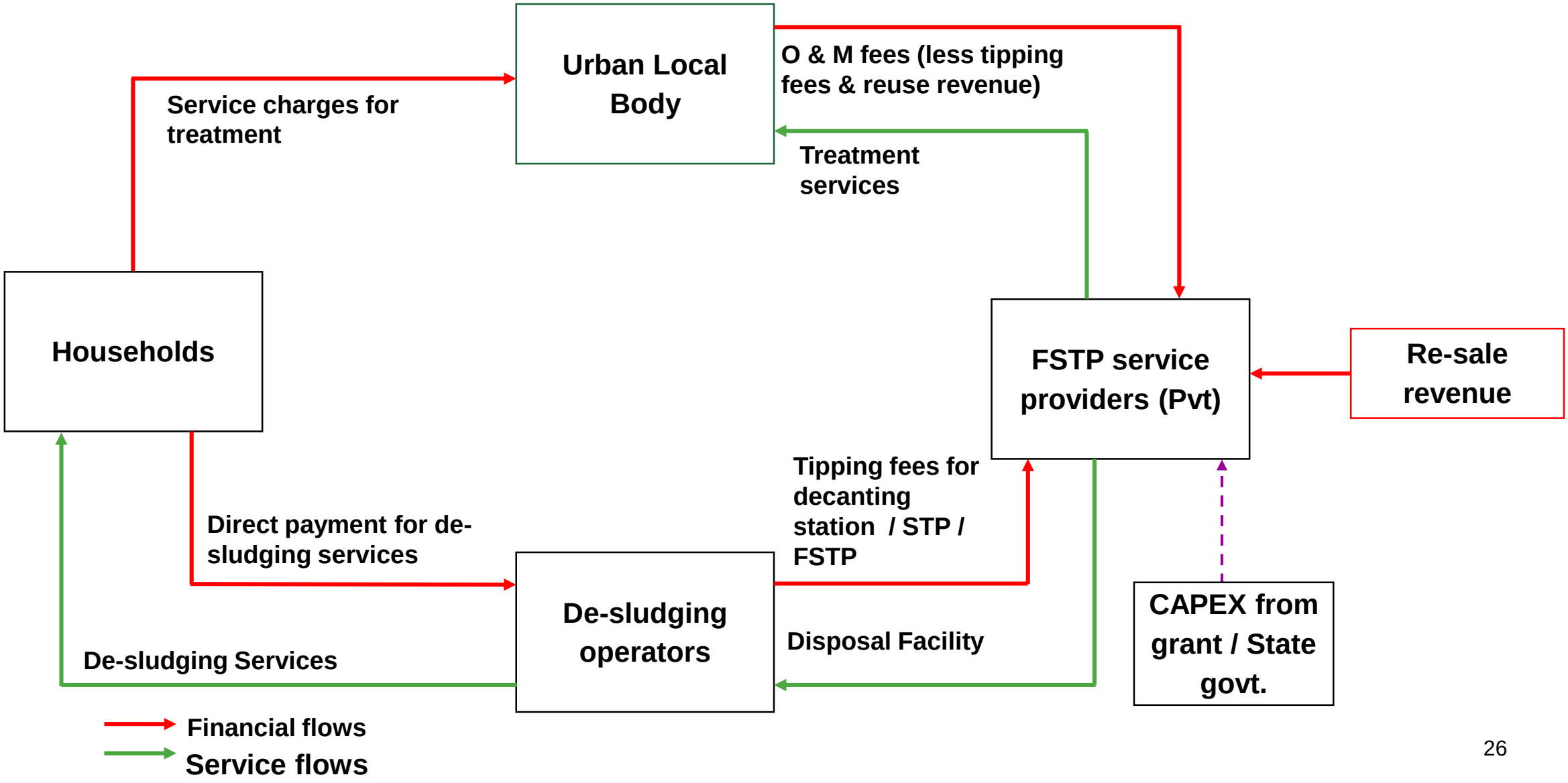
TREATMENT

Non Network: Fecal Sludge Treatment Plant Site Environmental Baseline

1. A baseline study quantifying and characterizing current environmental conditions is essential to assess the environmental impacts
2. Adherence to Consent to Establish conditions
   - Assessment of air, ground water and surface water quality.
3. To perform voluntary impact assessment.
   - Baseline assessment of soil and noise quality
4. Environmental Baseline completed

- Air and Noise: at three locations within site for two days per week for two weeks
- Ground water and Surface water: at two locations (upstream and downstream)
- Soil: Composite sampling done at site, considering likely locations for the sludge storage and spill

O & M MODEL FOR FSTP



CAPACITY BUILDING

Orientation / Training	Date	Participants covered
Masons Training on construction of On-site Systems – Batch I	November 2016	32 Masons
Masons Training on construction of On-site Systems – Batch II	June 2017	38 Masons + Training of Trainers

CAPACITY BUILDING

Orientation / Training	Date	Participants covered
Sludge Operator's Orientation Programme	August 2017	22 Operator Owners and Workers based out of Thiruverumbur
Domestic Exposure to Devanahalli for TCC Officials	August 2017	City Engineer, Executive Engineer and 4 Junior Engineers
Engineers training on FSM	December 2017	Seven Junior Engineers covered

BEHAVIOUR CHANGE AND COMMUNICATION

World Toilet Day 2017- KAKKAMAN Campaign Launch

World Toilet Day 2016- Signature Campaign

STAKEHOLDER ENGAGEMENT

AWASH committees

Zone	AWASH Committees setup	Wards covered
Srirangam	19	10
Ariyamangalam	23	13
Golden Rock	20	6
K-Abishekapuram	25	10
Total	87	39

Association for Water, Sanitation and Hygiene

- 20 member committee – 10 men and 10 women
- Active since April 2017

Roles & Responsibilities

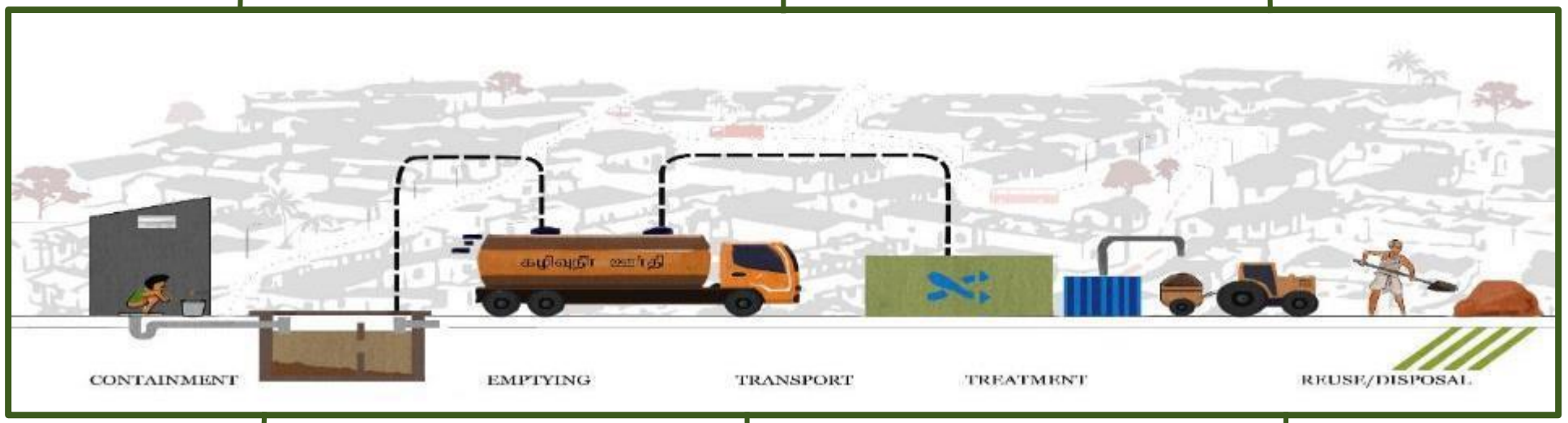
- Monitoring public infrastructure – Water sources / Community toilets in their respective areas
- Reduce Open defecation in their neighborhood
- Promoting IHHL based on space availability
- Raise awareness about Sanitation and Hygiene
- Facilitate communication between ULB and area residents

STRENGTHS AND CHALLENGES

- Adequate individual Toilets
- Adequate CT/ PT in place
- CT/PT improvements
- Most places accessible

- Adequate truck operators
- Vehicles in fairly good condition

- Adequate treatment facility
- Decanting stations in place



- Quality of containment structures for HH and Bulk Generators
- CT/ PT Quality

- Open Dumping
- Lack of PPE

- Improvements in Treatment Facilities
- Re-use non-existent

SUMMARY

1. Build on existing strengths
    a. Community and Public toilets
    b. Private truck operators
    c. Decanting and co-treatment
2. Consider multiple options for sanitation planning
    a. Co-existence of network and FSM
3. Reduction of untreated waste
    a. Decentralized FSTP
4. Sustainable O & M Model
5. BCC, Capacity Building

City Wide Inclusive Sanitation (CWIS)

Trichy selected as CWIS city

City Wide Inclusive Sanitation (CWIS) City

Investments with cities that are intended to improve overall service delivery systems' ability to deliver sanitation services that are: financially sustainable, inclusive, and safe.

1. Inclusivity and a focus on the poor
2. System integration of service provision across technologies and along the full value chain of sanitation functions, from containment, conveyance, through complete treatment
3. Helping cities embrace new technologies
4. Taking risks and showcasing innovation
5. Rigorous measurement and learning
6. Flexibility and leveraged investments
7. Using convening power
8. Access to a strong and growing community of practice

CWIS Principles

CWIS Principles

Thank You!