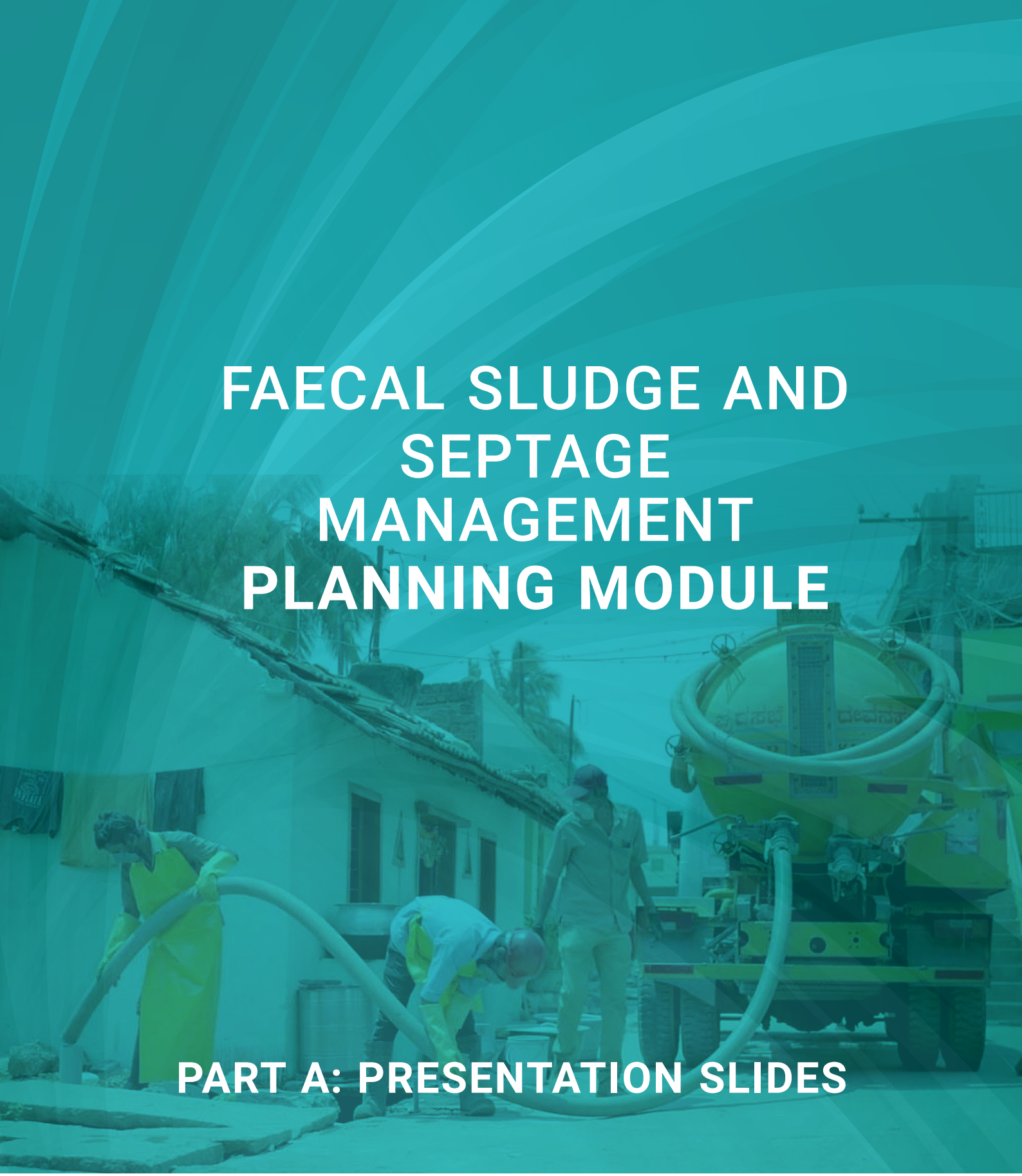
FAECAL SLUDGE AND SEPTAGE MANAGEMENT PLANNING MODULE



PART A: PRESENTATION SLIDES

National Institute of Urban Affairs

NFSSM Alliance

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FAECAL SLUDGE AND SEPTAGE MANAGEMENT PLANNING MODULE

PART A:
PRESENTATION SLIDES

Collaborative Effort Under Training Module Review Committee (TMRC)

National Institute of Urban Affairs

NFSSM Alliance

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TITLE

Faecal Sludge and Septage Management – Planning Module (Part A: Presentation Slides)

PUBLISHER

National Institute of Urban Affairs, New Delhi

RESEARCH PROJECT

Sanitation Capacity Building Platform (SCBP)

GRAPHIC DESIGN

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Year of publishing: 2021

CONTENT

The module has been developed with the collaborative effort of NFSSMA partner organisations under Training Module Review Committee (TMRC) anchored by NIUA.

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Foreword

Acknowledgements

ABOUT NATIONAL FAECAL SLUDGE AND SEPTAGE MANAGEMENT ALLIANCE (NFSSMA)

The 'NFSSM Alliance' was formed with a vision to "Create an enabling environment which amplifies scaling of safe, sustainable and inclusive FSSM through knowledge, partnerships and innovative solutions by 2024."

Convened by Bill and Melinda Gates Foundation in 2016, the Alliance is a voluntary body that aims to:

- Build consensus and drive the discourse on FSSM at a policy level, and
- Promote peer learning among members to achieve synergies for scaled implementation and reduce duplication of efforts

The Alliance currently comprises 32 organizations across the country working towards solutions for Indian states and cities. The Alliance works in close collaboration with the Ministry of Housing and Urban Affairs (MoHUA) and several state and city governments through its members to support the progress and derive actions towards mainstreaming of FSSM at state and national level. The NFSSM Alliance works on all aspects of city sanitation plans to regulatory and institutional frameworks across the sanitation value chain. The NFSSM Alliance working in collaboration with the Ministry of Housing and Urban Affairs has been instrumental in the passage of India's First Policy on FSSM launched in 2017. This resulted in 19 out of 36 states adopting guidelines and policies for FSSM in India.

The strength of the Alliance lies in its diverse membership, which includes research institutes, academic institutions, think-tanks, quasi-government bodies, implementing organizations data experts, consultants and intermediaries. This enabled a multi-disciplinary view of urban sanitation, with members building on each other's expertise. The alliance has had enormous success in championing FSSM as a viable solution to the Government of India by broadly focussing on:

1. Influencing and informing policy
2. Demonstrating success through innovation and pilots
3. Building capacities of key stakeholders across the value chain

The collaborative effort continues to work towards promoting the FSSM agenda through policy recommendations and sharing best practices which are inclusive, comprehensive, and have buy-in from several stakeholders in the sector.

NFSSM Alliance

- ASCI
- Athena Infonomics
- BBC Media Action
- BMGF
- Borda
- CEPT University
- CSTEP
- CDD
- CPR
- CFAR
- CSE
- Dasra
- EY
- GIZ
- IIHS
- ISC
- IWMI
- KPMG
- NIUA
- PSI
- RTI International
- Tide Technocrafts
- UMC
- UNICEF
- USAID
- WASHi
- Water Aid
- World Bank Group

ABOUT TRAINING MODULE REVIEW COMMITTEE (TMRC)

To ensure quality control in content and delivery of trainings and capacity building efforts, a **Training Module Review Committee (TMRC)** was formed with the collaborative effort of all Alliance partners. TMRC which is **anchored by National Institute of Urban Affairs (NIUA)**, has the following broad objectives:

- Identification of priority stakeholders and accordingly training modules for Capacity Building
- Development of a Normative Framework – For Capacity Building at State Level
- Standardization of priority training modules – appropriate standardization of content with flexibility for customization based on State context
- Quality Control of Trainings – criteria for ensuring minimum quality of training content and delivery
- Strategy for measuring impact of trainings and capacity building efforts.

ABOUT THE PLANNING MODULE

Title	**Faecal Sludge and Septage Management - Planning Module**
Purpose	To build the capacities of ULB and state officials on planning of faecal sludge and septage management. This course will introduce the target audience to components of FSSM planning starting with approach and methodology for state and city level FSSM planning, aspects of FSSM, stakeholder's engagement, treatment approaches, financial aspects and O&M mechanisms. This module is crucial for officials of cities to be able to achieve the objectives under SBM-U 2.0 and AMRUT 2.0..
Target Audience	Decision makers from state and ULBs, experts/sector partners working as TSU/ PMUs, faculties from nodal training institutes with professional experience in Faecal Sludge and Septage Management.
Learning Objective	1. Understand the approaches and methodologies for preparing a state investment plan for FSSM. 2. Linking city level planning approaches with citywide inclusive sanitation. 3. Understanding the steps involved in carrying out the situation or feasibility assessment. 4. Leverage various funding avenues and understand business models for FSSM at city level. 5. Comprehend the aspects of FSSM, stakeholder's engagement, treatment approaches and financial and sustainability aspects.
Structure of the Module	The training module is based on case methodology where sessions are complemented with exercises based on real-life scenarios. This will help trainees to apply the knowledge grasped during the session and reinforce it further in their work. The module is structured and divided into the following parts: **1. Part A: This contains the slides used during the session in the presentation format.** 2. Part B: This is a comprehensive compilation of the all the session briefs and further reading material which helps to strengthen the learning. 3. Part C: This contains the exercise developed for training based on the real-life cases.
Duration	In a face-to-face training format, this training is conceptualized for two days without site visits and can be adopted for including the site visits depending upon the city where it is being conducted.

FAECAL SLUDGE AND SEPTAGE MANAGEMENT (FSSM)

Advanced Planning Module

AGENDA

Time Duration (Hours)	Session Title
Day 1	
9.00 - 09.30	Registration
9.30 - 10.00	Introduction, setting ground rules, Understanding Expectation, Aims and Objectives of the training
10.00 - 11.00	Introduction to Urban Sanitation and Policies and Programmes
11.00 – 11.15	**Tea Break**
11.15 - 12.15	Approaches and Methodology of Planning
12.00 - 13.15	State Level Approaches for FSSM Planning
13.15 - 14.00	**Lunch Break**
14.00 - 14.45	Exercise on State Level FSSM Planning
14.45 - 15.45	City level approaches for FSSM Planning
15.45 - 16.00	**Tea Break**
16.00 - 17.00	FSSM: An Overview of Key Concepts

Time Duration (Hours)	Session Title
Day 2	
9.30 - 10.30	Stakeholders Engagement – Tools and Programs
10.30 - 11.00	Exercise on Stakeholders Analysis and Engagement
11.00 - 11.15	**Tea Break**
11.15 - 12.15	Situation Assessment – Introduction to Feasibility Assessment
12.15 - 13.15	Treatment approaches in FSSM
13.15 - 14.15	**Lunch Break**
14.15 - 15.15	Exercise on FSS Planning
15.15 - 15.30	**Tea Break**
15.30 - 16.00	Financial Aspects of FSSM
16.00 - 16.45	O&M Aspects of FSSM
16.45 - 17.00	Wrap-up & Way forward

Contents

Session

01

Introduction to Urban Sanitation and Policies and Programmes

Learning objectives

- To understand urbanization and its associated challenges in India
- To analyse the national urban sanitation policy framework
- To know the funding opportunities in FSSM

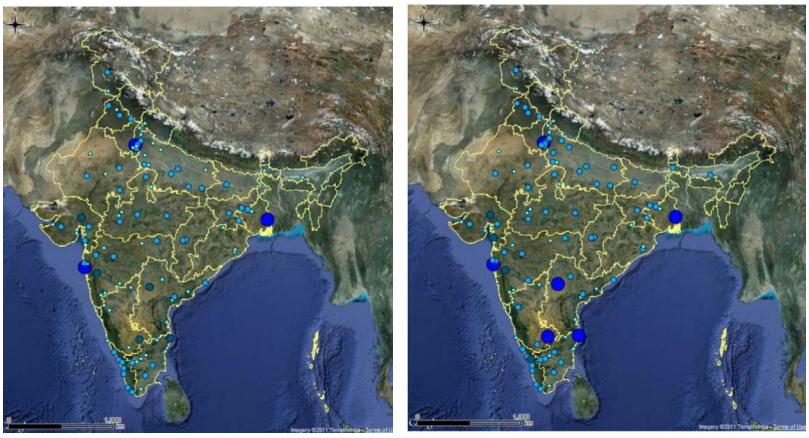
Contents

- Urban Sanitation – National trend
- Issues and Challenges Urban Sanitation Sector in India
- Urban Sanitation Policy and Programs in India
- Funding opportunities for FSSM

1.1 Challenges in Sanitation Planning in Urban India

Urbanization in India

- 1/3rd of India lives in urban settlements.
- Share is expected to grow to 50% by 2041



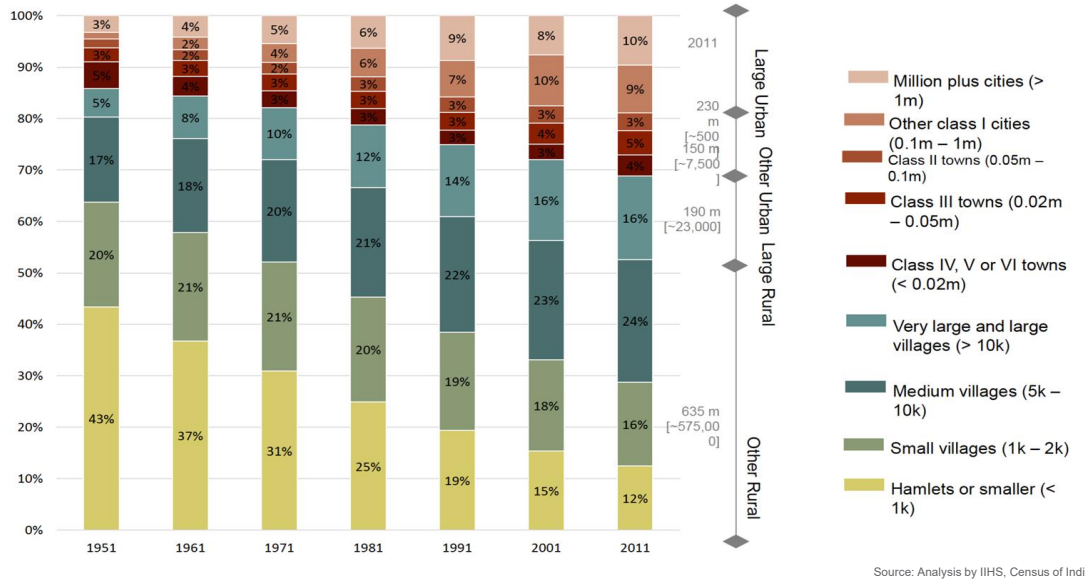
Urban India: 2011 2031

It is important to note that urbanisation is an inevitable process and urban areas will continue to grow demographically and spatially.

All the places with a local governing body having a minimum of 5,000 population, at least 75% of the male working population in non-agricultural pursuits and population density of at least 400 persons per sq. km is defined as urban. As per the 2011 census reports, one third of the Indian population resides in urban areas. The share of urban population has risen by 3% to 31% in 2011 since 2001. This is expected to grow to 50% in the next three decades. With the increase in the urbanization and rapid increase of population in the urban conglomerates, the ULBs face challenges with providing essential environmental sanitation services (water supply, solid and liquid waste).

In 2011, there are population greater than 10 million and 53 cities with population greater than 1 million. By 2031, it is projected that there will be 6 cities with a population greater than 10 million. Currently, one third of the Indian population lives in the urban India. The share of urban population has been increasing due to mainly rural – urban migration. The urbanization of the Indian cities is happening rapidly. With the increasing population, the cities are under stress to provide essential environmental services to maintain balance between the built and natural environment. It is estimated that by 2041, 50% of the Indian population will be living in Urban India.

Population Distribution



Source: Analysis by IIHS, Census of India (1951-2011)

According to the 2011 census, out of the 31% of the total population residing in urban India,10% live in metro cities, 9% live in Class I cities and the rest 12% live in the Class II and below cities. The figure shows that the population is migrating from smaller hamlets to the large villages and cities. In India, majorities of the land are still under rainfed. Due to uncertainties in the rainfall, the rural population is shifting to small towns in search of better employment opportunities. Although the portion of urban population is increasing, the decadal growth rate in India has been decreasing. The decadal growth rate has decreased from 21.5% during 1991-2001 to 17.6% during 2001-2011. The rate of growth has majorly reduced in the three urban agglomerations – Delhi, Mumbai and Kolkata as these cities are reaching their horizontal and vertical limits of expansion. The million plus cities have witnessed the highest growth rate of 48%.

Sanitation planning

- Cities are engines of economic & social development
- Urban development relies on good infrastructure and reliable service provision
- Sanitation systems are only considered partially
- Inadequate & unachievable regulations lead to choice of unsustainable solutions
- Failures or unsustainable solutions put huge financial burden on ULBs

City Sanitation Infrastructure

- Water Supply
- Sanitation blocks
- Liquid waste management
- Solid waste management
- Stormwater management

Cities are engines of economic growth and social development. Good infrastructure and reliable service provision are key aspects to sustain urban development. The water and sanitation planning should go hand in hand. With increase in the water supply, the generation of wastewater also increases resulting in poor environmental sanitation. The sanitation systems are often only considered partially.

The sanitation systems should be considered for all the stages – user interface (access to toilets), containment (septic tank followed by soak pits), collection and conveyance (cesspool vehicles, sewers), treatment and reuse or disposal of the end products. Often the infrastructure projects are aimed only at one of the components of the sanitation system. Additionally, local business opportunities, as well as demand and potential use of waste resources, such as water, nitrogen or biosolids, are given little attention in such projects which are necessary for introducing a circular economy and financial stability. Failures or unsustainable solutions put a huge financial burden on municipalities.

Challenges at city level

- Rapid population growth and urbanisation
  - By 2030, 3/5 of the population will be in urban cities of developing countries
- Weakness of local utilities
  - Lack of adequate water and sanitation provision
  - Two principal constraints: cost recovery and inadequate O&M
- Low-income settlements
  - Inadequate water and sanitation provision
  - From non notified to notified




The population in developing countries is rising rapidly. It is estimated that by 2030, approximately 60% of the world population will be residing in the urban centres of the developing countries. This puts the national governments and the ULBs under tremendous pressure. The governments have often expressed concern about their inability to provide basic services for their rapidly growing urban populations, including safe drinking water, sanitation, affordable housing, and public transport. The ULBs have to ensure adequate access to water and sanitation to this rising population. As per the assessment carried out by WHO and UNICEF, cost recovery and inadequate O&M are the two of the main challenges in providing environmental sanitation services. Low-income settlements have been one of the major concerns in case of city sanitation. Once the settlement has been notified as a slum, the ULB has to provide basic services to its residents. However, the cost recovery is very low putting a huge burden on ULB for O&M of the services.

Challenges faced by small towns

- Out of 7933 towns in India, 6300 towns have a population between 5,000 to 50,000 (class 3, 4 and 5). Source: Census 2011
- These cities are most affected by population growth and urbanisation.

Lack Professional Capacity
To plan and develop the appropriate infrastructure

Management Gap
To operate and maintain the infrastructure through steady financial income

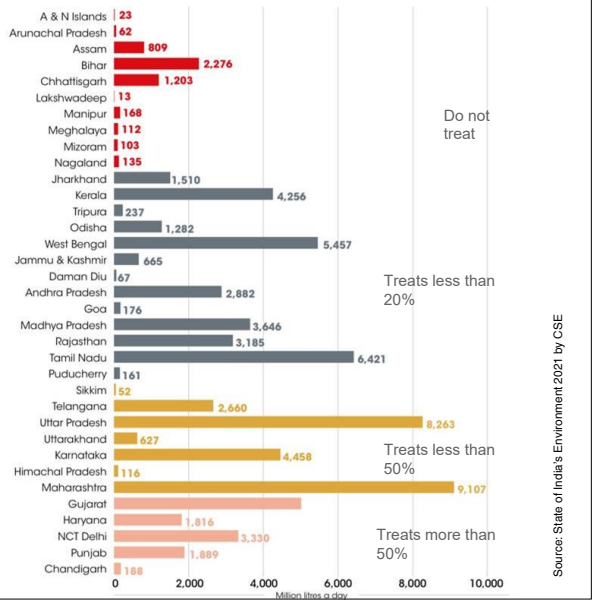
According to Census of India 2011, any town having a population between 5,000 to 50,000 is considered as a small town. India currently has 6300 small towns. The challenges faced by small towns are different when compared with the medium or large towns. Problems faced in such small towns are: (a) there is a lack of professional capacity in the ULB and the region. The ULBs do not have adequate qualified officials to plan, implement and operate the systems. The private companies are reluctant to bid for the tenders of small towns for operational issues. (b) the population density is not high enough for economically viable design of systems. These towns have lower tax collection efficiency making it challenging to do O&M of the project. The decentralized systems need good professional resources for planning, design and implementation of sanitation systems.

1.2 Issues and Challenges Urban Sanitation Sector in India

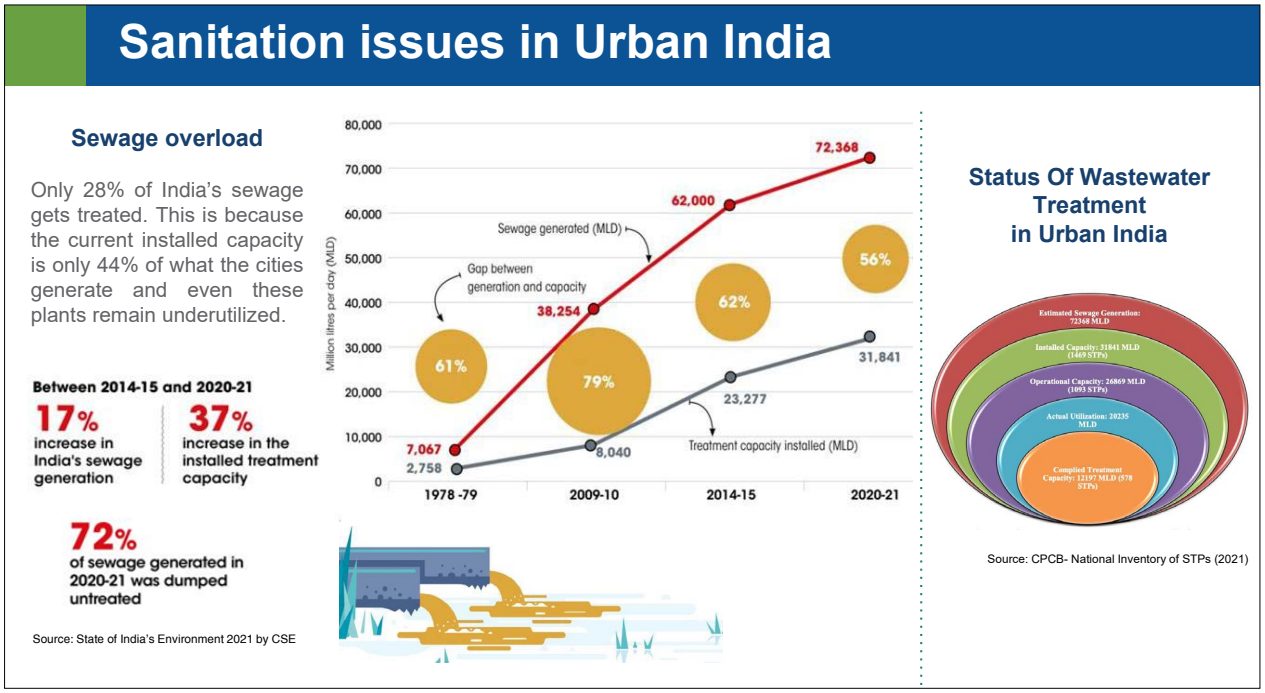
Sanitation issues in Urban India

Raising a stink

- 10 states do not treat sewage.
- 13 states treat less than 20% of their sewage.
- 7 states treat less than 50% of their sewage.
- The remaining 5 states treat more than 50%.



As per the CPCB report on National Inventory of STPs published in 2021, India has the capacity to treat only 37.5% of the wastewater which is being generated. It is evident from the figure that only 5 states have been able to treat more than 50% of its wastewater. Maharashtra and Uttar Pradesh which produce more than 8000 MLD of wastewater are able to treat between 20-50% of the wastewater. 10 states in India lack any kind of facility for sewage treatment and hence do not treat wastewater.



Sewage generation from urban centres is estimated as 72,368 MLD. There are 1631 STPs (including proposed STPs) with a total capacity of 36,668 MLD covering 35 States/UTs. Out of 1,631 STPs, 1,093 STPs are operational, 102 are Non-operational, 274 are under construction and 162 STPs are proposed for construction. The actual utilized capacity is 20,235 MLD (27.9 %). This is due to lack of infrastructure for collection and conveyance system in the form of sewers. In many cities, the STP is constructed, and the laying of sewers is incomplete. In many cities sewers have been implemented; however, the household connections are not achieved at the expected rate. Due to this, the gap between the treatment capacity installed and total wastewater generated is increasing at a faster rate as seen in the graph.

Challenges with Centralized Approach

- The rate of development of the sanitation infrastructure does not match the rate of population growth and water supply.
- Population density is not adequate in towns making centralized approach economically unviable.

KEY CHALLENGES

Incapacity of public utilities to keep pace with urbanisation rate in infrastructure creation	Constraints in recovering costs and O&M of infrastructure	Provision of required facilities in unplanned and informal settlements

Centralized approach towards wastewater management has proved to work in metro cities which have significantly high population densities. The same approach has faced challenges and proved to be economically non-viable in the medium and small towns. The cities are unable to plan and implement the sanitation infrastructure at the rate with which population is increasing. In many cities where the infrastructure has been developed, the population density is not as high as expected resulting in lower connection per km of sewerage. Coupled with lower tax collection efficiency, the cost recovery for O&M of the infrastructure is a challenge. ULBs also face difficulties in providing wastewater management in the lower income group communities such as slums in the city.

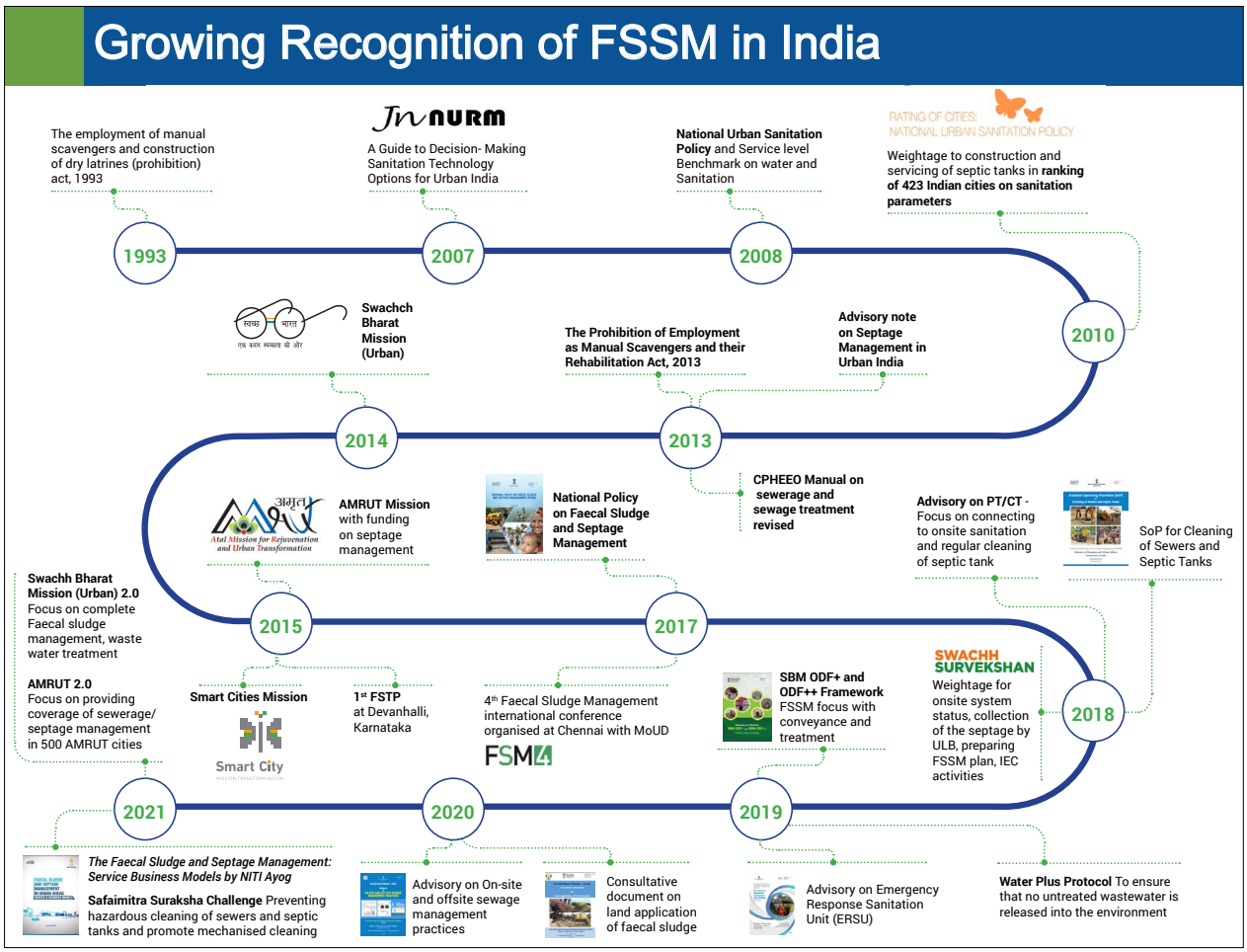
Need for a Paradigm Shift

PAST TRADITIONAL APPROACHES	PRESENT NSS/FSSM APPROACHES	FUTURE
• Master planning/ investment only for centralized systems • Financed by central government/loans • Wealthy/business districts prioritized • Limited coverage • Sustainability challenges for O&M • Resource recovery not considered • No performance management • On-site, small network not considered	• Often standalone pilots, not mainstream • NGO / pilot financed • FSM value chain/faecal sludge treatment plants • Poor communities targeted but often missed • Business models often unable to scale • Limited professional capacity	 CWIS focuses on promoting public service approaches to ensuring everyone in an urban area is served by safe, equitable, and financially viable sanitation service systems. This means systems are designed to reach the poor and to ensure human waste is safely managed along the whole sanitation service chain

Source: Asian Development Bank: Sanitation Dialogue 2021

Conventionally, a centralized approach toward sanitation planning and management are used. In India it has worked in mega cities such as Delhi, Mumbai, Kolkata, Bengaluru etc. had large populations and were growing rapidly. The economic growth of the cities was matching pace with the increasing population. However, as the new urban centres started developing, many small – medium towns popped across India. Soon, it was realized that the centralized approach cannot be used for sanitation planning in such towns. Non Sewered Sanitation of FSSM is a solution which works in towns with low population density and is affordable too. However, many cities in India could not achieve Non Sewered Sanitation in its pure form. The septic effluent and the grey water were still being discharged into the surface drains. To tackle the gap, Citywide Inclusive Sanitation (CWIS) is the identified solution. CWIS promotes co-existence of sewered and non sewered sanitation in a town with a focus on reaching to the last denominator. Being a public service approach, it helps in establishing safe, equitable and financially viable sanitation services. Thus, ensuring marginalized and vulnerable groups can also benefit with sanitation services.

1.3 Urban Sanitation- Policies and Programmes



FSSM is fast gaining traction in India. In 2007, under JNNURM, a guide to decision making sanitation technology options for urban India was launched under which onsite sanitation systems were recognised. In 2010, under the National Urban Policy, rating of 423 Indian cities was done on various sanitation parameters. In 2013, 'The Prohibition of Employment as Manual Scavengers and their Rehabilitation Act' came which focussed on safety protocols of sanitation workers. Also,

the CPHEEO guidelines were revised from sewerage and sewerage treatment to sludge treatment and septage management and an advisory note on septage management was launched. In 2014, sanitation gained momentum with the launch of Swachch Bharat Mission and Amrut Mission with funding on septage management by the government. In 2015, the first FSTP was setup in Devanahalli, Karnataka. In 2017, National Policy of Faecal Sludge and Septage Management was launched. In 2018, under the Swachch Sarvekshan, weightage for onsite system status, collection of septage by ULBs, preparation of FSSM plans and IEC activities were considered. In 2019, MOHUA launched the SBM ODF+ and ODF++ framework with a focus on conveyance and treatment. An advisory on on-site and off-site sewage management was launched in 2020 thriving the FSSM momentum continuously.

Swachh Bharat Mission (SBM) was launched in the year 2014 to eliminate open defecation and improve solid waste management. In first phase, it had aimed to achieve 100% ODF status for Urban and Rural areas by 2nd Oct 2019. The objectives of the first phase of the mission also included eradication of manual scavenging, generating awareness and bringing about a behaviour change regarding sanitation practices, and augmentation of capacity at the local level. The second phase of the mission (SBM 2.0) aims to sustain the open defecation free status and improve the management of solid and liquid waste. The mission is aimed at progressing towards target 6.2 of the Sustainable Development Goals (SDGs) established by the United Nations in 2015.

In continuation to SBM(U), the Ministry of Housing and urban Affairs launched **SBM(U) 2.0** in 2021 with a focus on complete faecal sludge management, wastewater treatment, source segregation of garbage, reduction in single use plastic, reduction in air pollution by effectively managing waste from construction and demolition activities, and bio-remediation of all legacy dumpsites. At the end of the mission, it is aimed that all statutory towns in India will become ODF+ certified.

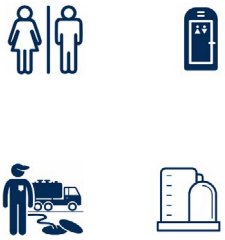
Open Defecation Free

ODF

- At any point of the day, not a single person is found defecating in the open

ODF+

- All CTs and PTs are functional and well maintained



ODF++

- Faecal sludge/septage and sewage is safely managed and treated

Swachh Bharat Mission was launched in 2014 and one of its focus in was making urban and rural habitation open defecation free (ODF). To do this the policy specifically mentioned that all the households should have access to toilets in the form of Individual Household Toilet (IHHL) or a Community Toilet (CT). It also mentioned that all the insanitary latrines- toilet having single pits or which are directly connected to drains should be converted into sanitary toilets by linking them to twin pits (soak pit) or a septic tank.

Creating infrastructure in the form of toilet and containment system is one part, however soon the government realized that maintenance of the infrastructure is also equally important if one needs to realize the ultimate of becoming of sustaining ODF status. This was termed as ODF +. At the same time, it was also realized that without the management of the waste originating from the households and containment units the objective of sanitation cannot be ensured. Hence ODF ++ was concept was brought forward, which said that faecal sludge, septage and sewage should also be safely managed at the local government level.

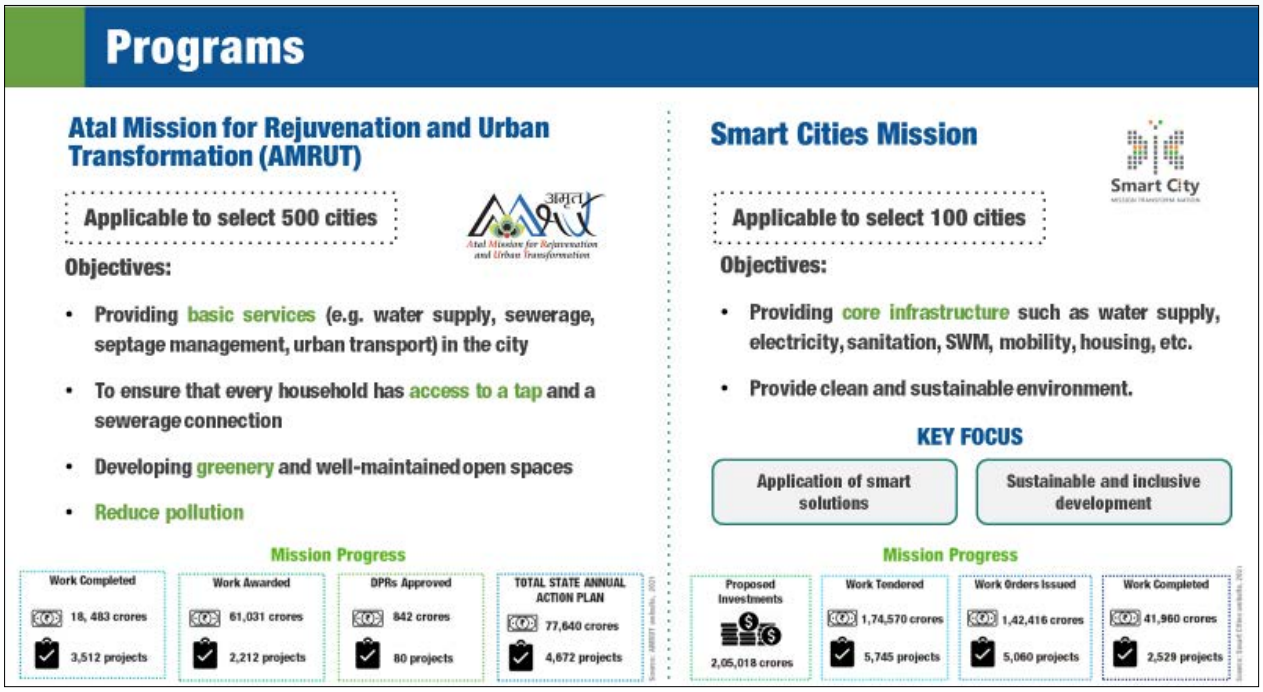
Programs

Water Plus Protocol

- Focuses on ensuring that no untreated wastewater is discharged into the open environment, in addition to ODF++
- Highest Certification which a city can achieve in terms of sanitation
- Assessment by third party agency
- 9 assessment indicators
- ULB needs to have STP catering to wastewater generated by 70% of existing population
- Faecal Sludge conveyance system for non sewered areas
- O&M of FSTP to be recovered from dedicated revenue stream

ODF+
ODF++
WATER+

The water plus protocol demands that in addition to the ODF++ status, the city shall focus on ensuring that no untreated wastewater is discharged into the environment. Currently, it is one of the highest certification which a city can achieve in terms of sanitation by focusing on recycle and reuse of treated wastewater. The assessment of the city will be done by a third party appointed by the state and national government. There are 11 locations and nine indicators which the third party assessors are going to check during the assessment in the city. As per the protocol, (a) the ULB shall have sewage treatment capacity to cater to 70% of its current population, (b) the ULB shall have adequate equipment for faecal sludge and septage conveyance from the non-sewered areas and (c) the O&M cost of the FSTP shall be recovered from the pre-defined revenue streams such as tipping fee and sale of by products such as methane gas or treated end products such as soil conditioner and treated water.

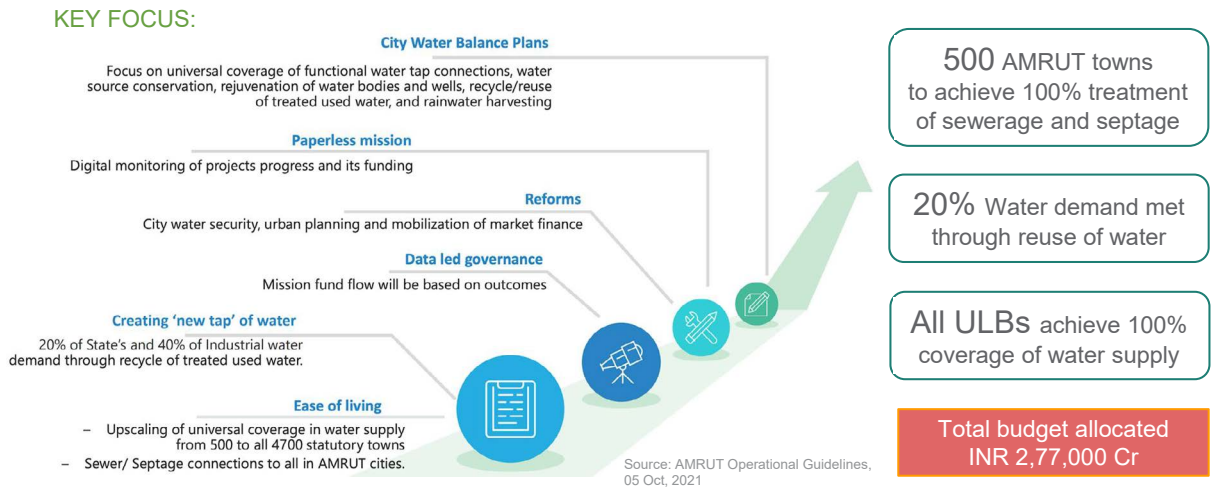


The Atal Mission for Rejuvenation and Urban Transformation (AMRUT) mission was initiated in June 2015 which aimed to provide the basic utility services (e.g., water supply, sewerage, septage management, urban transport) to households and build amenities in cities which will improve the quality of life for all. The purpose of Atal Mission for Rejuvenation and Urban Transformation (AMRUT) is to ensure that every household has access to a tap with the assured supply of water and a sewerage connection, to increase the amenity value of cities by developing greenery and well-maintained open spaces (e.g., parks) and to reduce pollution by switching to public transport or constructing facilities for non-motorized transport (e.g., walking and cycling). All these outcomes are valued by citizens, particularly women, and indicators and standards have been prescribed by the Ministry of Housing and Urban Affairs (MoHUA) in the form of Service Level Benchmarks (SLBs).

Smart City Mission was initiated in June 2015 and aimed to promote cities that provide the basic infrastructure with a view to give a decent quality of life to its citizens, a clean and sustainable environment and application of 'smart solutions'. The focus is on sustainable and inclusive development. The underlying idea is to look at compact areas, create a replicable model which will act like a lighthouse to other aspiring cities. The core infrastructure elements in a 'Smart City' would include adequate water supply, assured electricity supply, sanitation, including solid waste management, efficient urban mobility and public transport, affordable housing, especially for the poor, robust IT connectivity and digitalization, good governance, especially e-Governance and citizen participation, sustainable environment, safety and security of citizens, particularly women, children and the elderly, and health and education.

Programs

Atal Mission for Rejuvenation and Urban Transformation (AMRUT) 2.0



AMRUT 2.0 is a new initiative of Ministry of Housing and Urban Affairs launched in 2021 which focuses primarily on providing universal coverage of water supply to all urban households. Under AMRUT 2.0, the estimated gap of 2.68cr household taps and 2.64cr sewer connections/septage in 500 AMRUT cities is proposed to be covered.

Its key objectives are:

- To ensure the rejuvenation of water bodies and urban aquifer management will be undertaken to augment sustainable fresh water supply.
- To promote circular economy of water through development of city water balance plan, focusing on recycle/reuse of treated sewage, rejuvenation of water bodies and water conservation. 20% of water demand to be met with reused water by development of institutional mechanism.
- To start a technology sub-mission for water that will leverage latest global technologies in the field of water.
- To initiate an IEC campaign to spread awareness among masses about conservation of water.
- To conduct Pey Jal Survekshan to ascertain equitable distribution of water, reuse of wastewater and mapping of water bodies with respect to quantity and quality of water through a challenge process.
- To protect fresh water bodies from getting polluted to make natural resources sustainable.
- Cities having million plus population to take up PPP projects worth minimum of 10% of their total project fund allocation which could be on Annuity/ Hybrid Annuity / BOT Model.

In addition to the key objectives, the mission has a reform agenda having focus on strengthening of urban local bodies and water security of the cities. Major reforms are reducing non-revenue water to below 20%; recycle of treated used water to meet at least 20% of total city water demand and 40% for industrial water demand at State level; dual piping system; unlocking value and improving land use efficiency through proper master planning; improving credit rating & accessing market finance including issuance of municipal bonds and implementation Online Building Permission System under EoDB.

Programs

Atal Mission for Rejuvenation and Urban Transformation (AMRUT) 2.0

Source: AMRUT Operational Guidelines, 05 Oct, 2021

The Mission also seeks to promote AatmaNirbhar Bharat through encouraging Start-ups and Entrepreneurs with an aim to promote GIG economy and on-boarding of youth & women.

Programs

15th Finance Commission

Funding for Million Plus Cities

- MoHUA as Nodal Ministry
- INR 38,196 Cr funds as Million Plus City Challenge Fund
- 33.33% Grant for improving air quality
- 66.66% Grant for improving water and sanitation services (drinking water, RWH, recycling, sanitation and solid waste management)

Funding for ULBs (< 1 Million Population)

- INR 82,859 Cr for ULBs (< 1 Million)
- 30% Grant for sanitation and solid waste management and attainment of star ratings (as developed by the MoHUA)
- 30% Grant for drinking water, rainwater harvesting and water recycling

Fund allocation under 15th Finance Commission

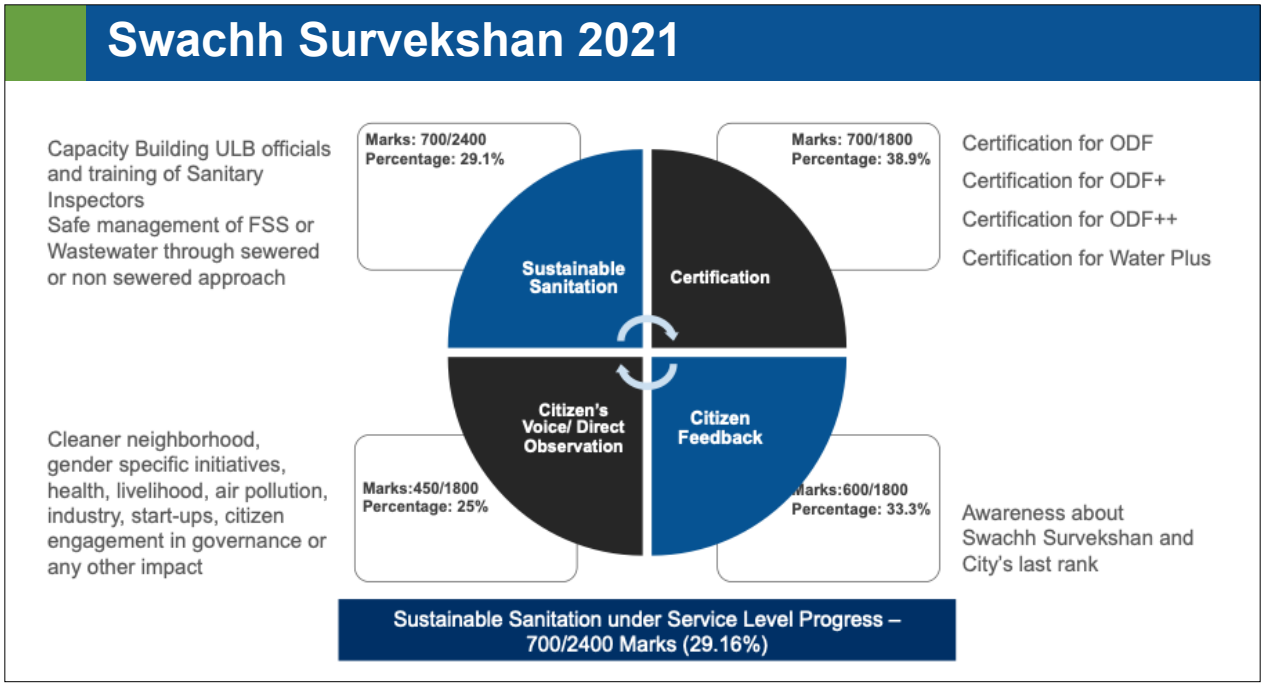
To cater to the needs of the growing urbanisation needs of the country, the 15th Finance Commission has recommended a total of Rs.1,21,055 crore for the urban local bodies for the period of 2021-26. Among the states and among the ULBs the fund will be primarily be distributed with a weightage of 90% on population and 10% on area.

Funds for Million Plus Cities UAs

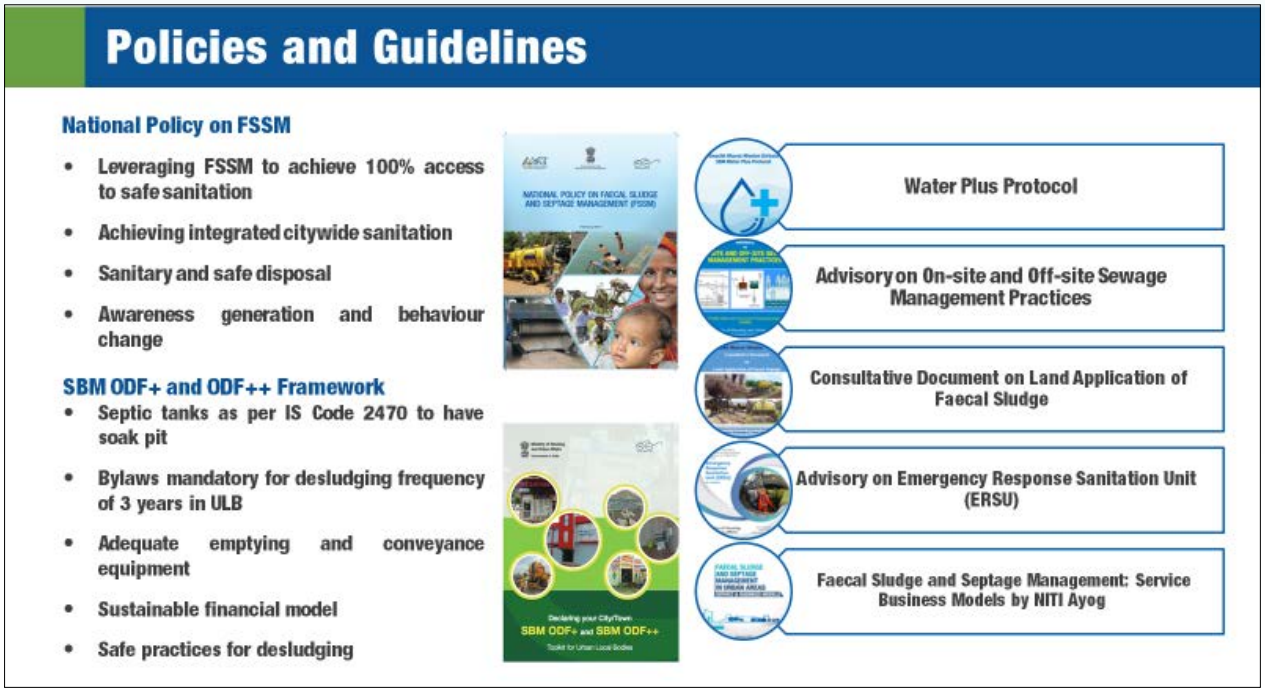
Fifty urban centres with million plus population have been identified. They consist of forty-four urban agglomerations (excluding Delhi, Chandigarh and Srinagar) and six cities Jaipur, Visakhapatnam, Ludhiana, Faridabad, Vasai- Virar City and Kota. For these cities, during its five-year award period, grants have been recommended to the tune of INR. 38,196 crore in the form of a Million-Plus cities Challenge Fund (MCF). Each urban centre shall have one ULB as a nodal entity which will be made responsible for achieving the performance indicator for the whole UA. One third of the total MCF of each city is earmarked for achieving ambient air quality. The balance two thirds of the city-wise MCF is earmarked for achieving service level benchmarks for drinking water (including rainwater harvesting and recycling) and solid waste management. The MoHUA shall act as a nodal ministry for determining the urban agglomeration eligible to get MCF funds for drinking water (including rainwater harvesting and recycling), sanitation and solid waste management criteria under service level benchmarks.

Grants for ULBs (less than Million Plus)

The other than Million-Plus cities/towns shall get the grants as per population. Thirty per cent of the total grants to be disbursed to urban local bodies shall be earmarked for sanitation and solid waste management and attainment of star ratings as developed by the MoHUA. In addition, 30 percent of the total grants to be disbursed to urban local bodies shall be earmarked for drinking water, rainwater harvesting and water recycling. However, if any urban local body has fully saturated the needs of one category and there is no requirement of funds for that purpose, it can utilise the funds for the other category.



The Government of India also validated the work done under the flagship program of Swachh Bharat Mission and AMRUT through Swachh Survekshan. Swachh Survekshan also includes parameters pertaining to FSSM as shown in the diagram above.

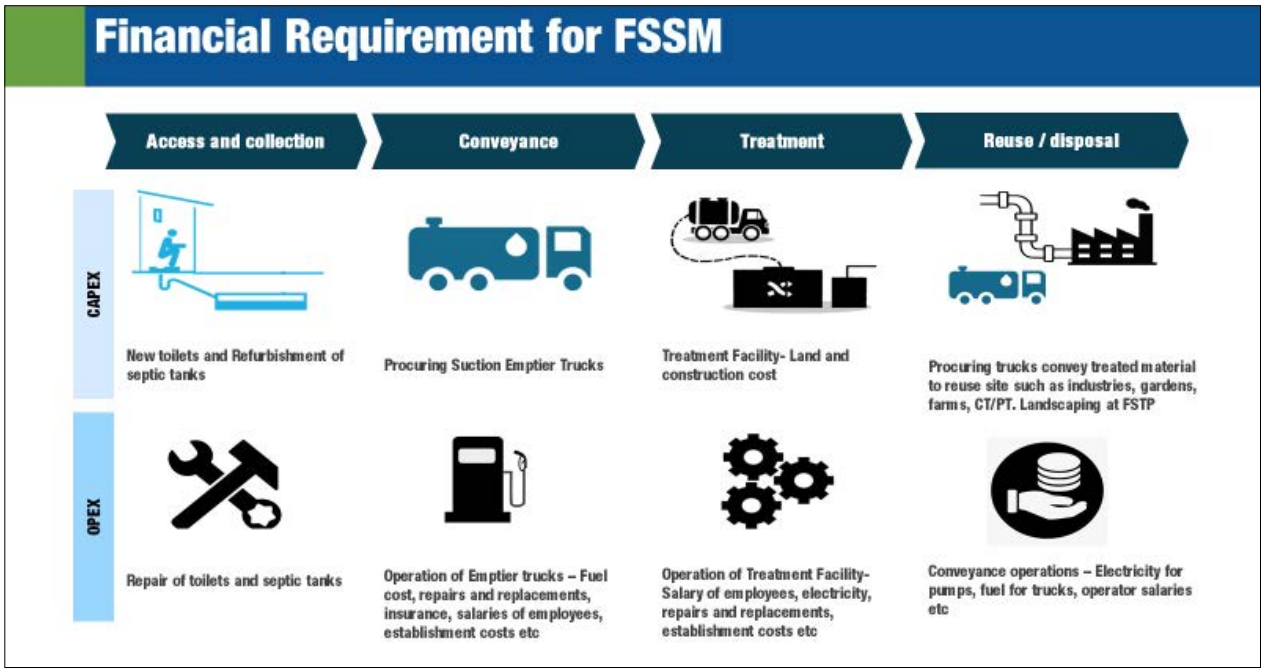


National Faecal Sludge and Septage Management (FSSM) Policy was released in 2017 to set the context, priorities, and direction for and to facilitate nationwide implementation of FSSM services in all ULBs such that there will be safe and sustainable sanitation approach at city level. The key objective of the policy is to mainstream the FSSM in urban India by 2019 and ensure that the all benefits of wide access to safe sanitation accrue to all citizens across the sanitation value chain with containment, extraction, transportation, treatment, and disposal / re-use of all faecal sludge, septage and other liquid waste and their by-products and end-products. Another objective of the policy is to enable and support synergies among relevant central government programs such as SBM, AMRUT and the Smart Cities Mission to realise safe and sustainable sanitation for all. The FSSM policy expects to mitigate gender-based sanitation insecurity directly related to FSSM, reducing the experience of health burdens, structural violence, and promote involvement of both genders in the planning for and design of sanitation infrastructure.

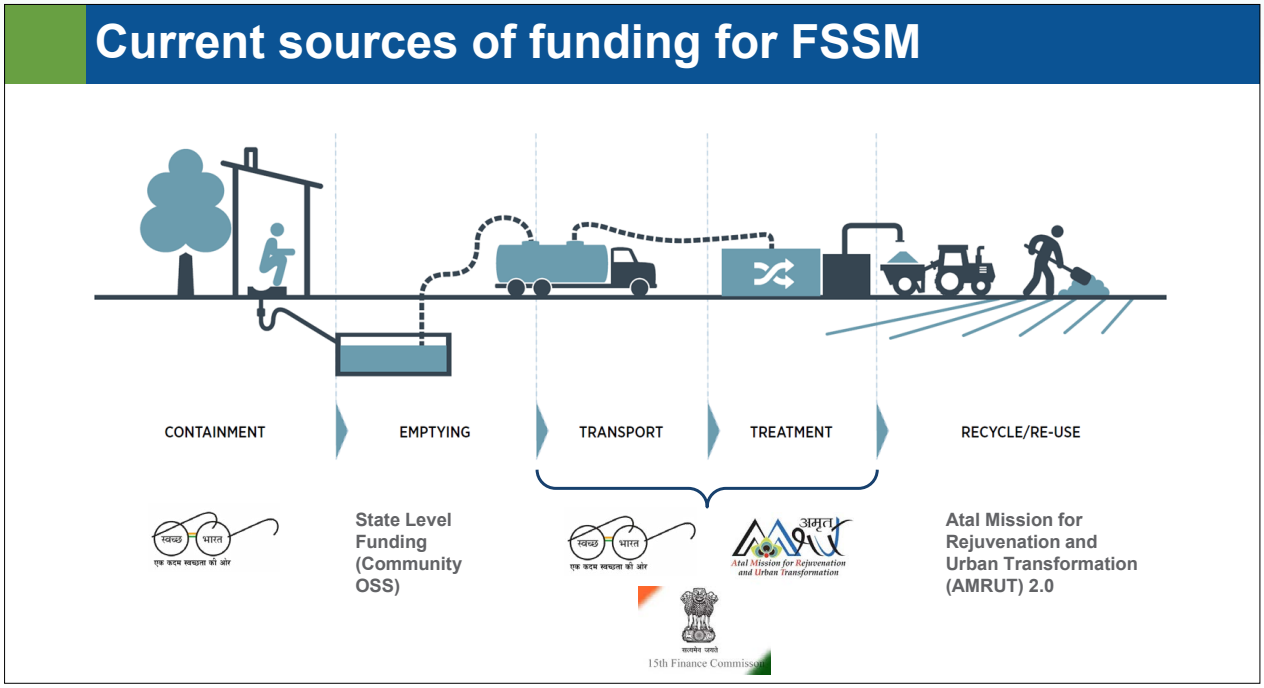
Swachh Bharat Mission ODF+ and ODF++ Framework was released in 2019 with a purpose to provide a readiness check and guideline for cities and towns that have already achieved Open Defecation Free (ODF) status and are working towards ensuring sustainability of the ODF status to ensure proper maintenance of toilet facilities- SBM ODF+, and safe collection, conveyance, treatment and disposal of all faecal sludge and sewage- SBM ODF++, in order to achieve safe sustainable sanitation for all. This toolkit serves as a readiness checklist for all ULBs / Development Authorities / Cantonment Boards to prepare themselves and their concerned stakeholders in achieving either SBM ODF+ and/or SBM ODF++ status and officially declare the same, followed by certification.

Water plus: The purpose of this toolkit is to provide a readiness check and guideline for cities and towns that have already achieved Open Defecation Free (ODF)/ODF+ /ODF++ status as per the existing protocols prescribed by the Ministry of Housing and Urban Affairs (MoHUA) and to work towards ensuring sustainability of sanitation status, hereby referred to as SBM Water Plus in order to achieve safe sustainable sanitation for all, by ensuring that no untreated waste water is discharged into the open environment. This toolkit provides the detailed SBM Water Plus protocol laid down by MoHUA, along with declaration formats to be obtained from various stakeholders, that wards / work circles (in case under jurisdiction of development authority) and cities are required to submit, as part of the SBM Water Plus declaration and certification process.

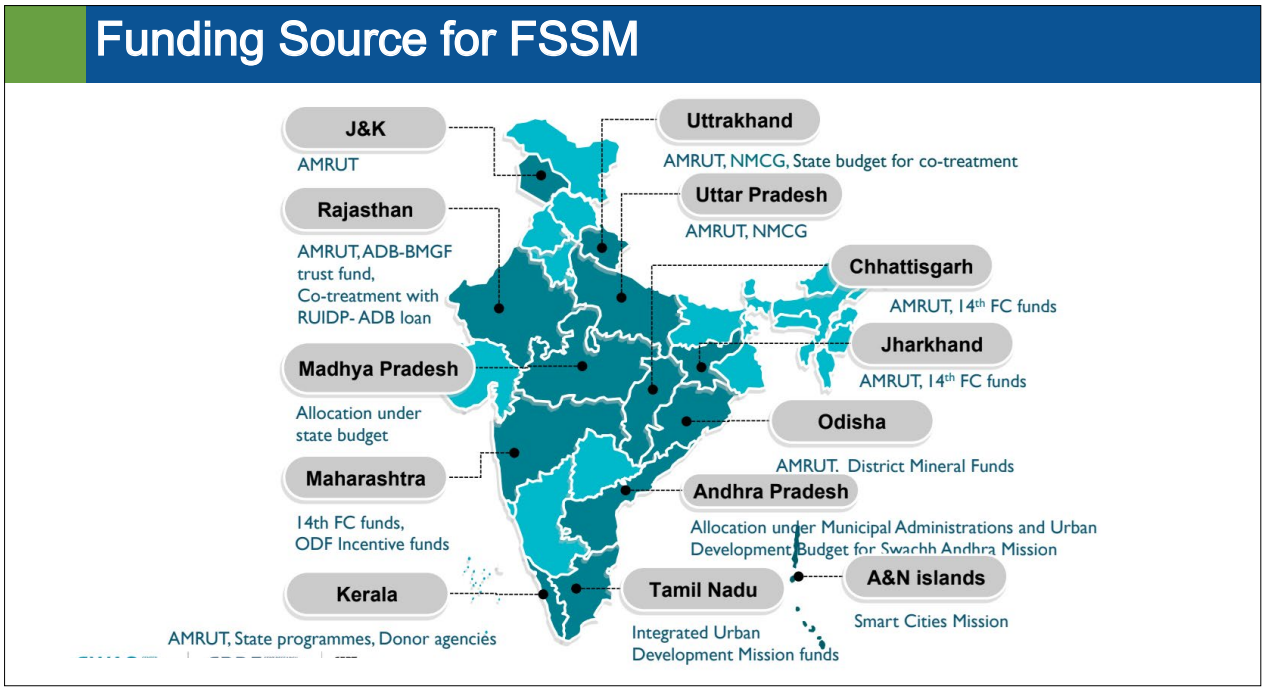
1.4 Financing Opportunities for FSSM



Funds are required at every stage of the sanitation service chain in FSSM. The funds can be classified into CAPEX and OPEX. In case of user interface and containment, funds are required for constructing new facilities and operating and maintaining them. Funds are required for procuring the cesspool vehicles and providing desludging services to the households. The main expense in providing the services is that of human resources and fuel. At the treatment stage funds are required to set up the treatment facility and then to carry out its O&M. If planned well, the disposal of the treated end products should not require any capital or operational expenditure. However, in cases where reuse is being planned, certain infrastructure is required. Funds are required for setting up the infrastructure and for operating it.



There are different financing options available under each functional group. There are national programs such as Swachh Bharat Mission (Urban) 2.0, Atal Mission for Rejuvenation and Urban Transformation (AMRUT) mission which covers the funding for different functional groups in sanitation service chain. There is also fund allocation for the sanitation infrastructure under 15th finance commission to the ULBs. The ULBs need to plan for improving the overall access to sanitation by taking into consideration combination of different funding opportunities.



Many state governments are progressing with state wide FSSM plans and over 700 faecal sludge treatment plants are underway across the country. The figure shows the source of funding used by different states for operationalizing FSSM.

India is signatory to the '2030 Agenda for Sustainable Development', adopted at the Sustainable Development Summit of the United Nations in September 2015. It comprises seventeen Sustainable Development Goals (SDGs) and 169 associated targets. Of these, 3 SDGs namely SDG No. 6: Ensure availability and sustainable management of water and sanitation for all, SDG No. 11: Make cities and human settlements inclusive, safe, resilient and sustainable, and SDG No. 12: Ensure sustainable consumption and production patterns, are directly related to sanitation sector. This also obligates the Government of India as well as State Governments to develop strategies to cover the entire population with sanitation facilities by year 2030.

SDG 6 relates to clean water and sanitation with the following goals:

- Target SDG 6.2: By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation. Special focus on needs of women and girls and those in vulnerable situations
- Target SDG 6.3: By 2030, improve water quality by reducing pollution and halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally

In order to achieve SDG 6, water and sanitation needs to be looked at in tandem. As gross mismanagement of wastewater leads to scarcity of good quality raw water source for drinking. Thus, India after the success of Swachh Bharat Mission Phase 1, is focusing on wastewater management in the phase 2. Grey Water Management is also one of the objectives in the AMRUT Mission.

With ambitious goals and targets, these missions aim to create large-scale impact on the ground in the water and sanitation sector, and will go a long way to reflect that all vulnerable and marginalised groups in the city are provided with safe water and sanitation facilities based on the principle of "leaving no one behind". Further, they will also help India make marked progress towards achieving targets under goal 6.2 of the Sustainable Development Goals 2030.

Summary

- By 2030 an approximate of 60% of the world population will be residing in the urban centres of the developing countries.
- Increasing urban population puts the national governments and ULBs under tremendous pressure.
- Cities are unable to plan and implement the sanitation infrastructure at the rate with which population is increasing.
- Funding for different functional group in sanitation service chain can be provided through national programmes like Swachh Bharat Mission (Urban) 2.0, Atal Mission for Rejuvenation and Urban Transformation (AMRUT) mission 2.0.

Session

02

Approaches and Methodology of Planning

Learning objectives

- Gain knowledge about the various approaches and tools used in faecal sludge management planning.
- Understand the importance of integrated planning for faecal sludge management.
- Understand what is included in the planning process for faecal sludge management.

Contents

2.1 Approaches of Planning

Concept and Definition

- An Approach could be seen as perspective, ideology, belief, set of processes, strategy for managing resources.
- Approach could be limited by policies, context, time, knowledge & skills.
- Tools are set of "instrument", "machine", "device," "apparatus", "software" or "programs" that help us in achieving the target.

An approach is a perspective and a strategy for managing resources. In this context, we are going to look at the management of liquid waste such as faecal sludge and septage. Approach is governed by policies, local context, capacity of the human and institutional resources. The approach shall also consist of tools which can be used at different stages of the project such as primary surveys, data collection, data analysis, design of the sanitation appurtenances etc. It can also include the tools for stakeholder engagement at different stages of the project.

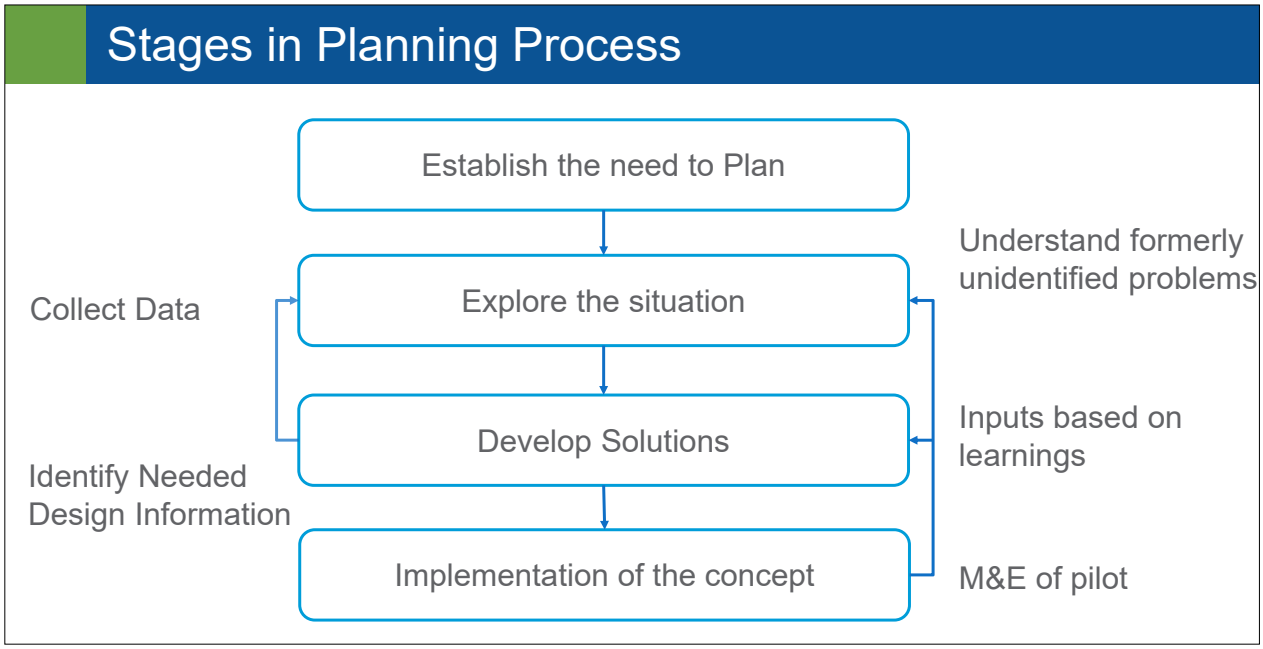
Sanitation: Approaches and Tools

- Shift from formal planning to more community-led processes.
- Diagnostic tools, used for understanding the situation (physical, political…)
- Prioritisation tools, to know what to do next, once a diagnostic is done.
- Planning and decision-making tools, used to choose technologies or financial options.

During the last 30 years, urban sanitation planning theory has evolved from an engineering focus to a more participatory, multi-disciplinary and user-focused future. This section will discuss the extent to which other ideas, such as the sanitation value chain, have increasingly been incorporated into planning approaches. There are various tools available for documenting the current situation and analysing the data. This help is needed for gap assessment in the sanitation value chain. There are also tools for prioritization of the solutions. Such tools play an important role while

preparing a phase wise plan. The planning and decision-making tools can be for selection of appropriate solutions and financial mechanisms for sustaining the solution. Consequently, over the last 30 years, several sanitation planning models have been developed which have shaped this sector.

2.2 Stages of Planning



The Figure illustrates the phases of a planning process, viz. exploring the situation (stakeholder identification; assessing existing practices, settings and problems; formulating paradigms and objectives); developing solutions (institutional, financial, technical); and implementation of concepts or measures) as applicable in urban sanitation or FS management planning, once agreement on the need has been reached.

The first step must be to develop a consensus on the need to plan FSSM. No plan will work if those responsible for its implementation are not convinced of the need to plan. It is necessary to

talk to the various stakeholders and convince them of the benefits of FSSM. The main initiative for improvements in FSSM is more likely to come from the authorities, than from the individual citizens. This is because the latter will not benefit directly from improved FSSM, but more in an indirect way, through a general environmental betterment. Therefore, the support from authorities and decision- makers will be decisive for the success of a better FSSM. However, it is essential that the other stakeholders can agree upon the need to plan too.

Explore the situation

Gather a broad understanding of the situation

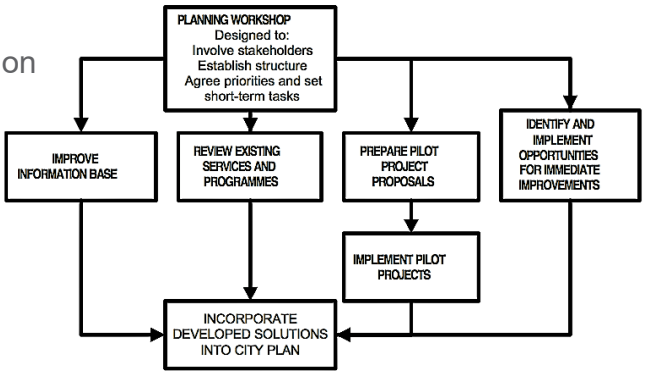
Explore the following factors:

- Geographical factors
- Socio-economic and cultural aspects
- Political and legal framework
- Sanitation infrastructure and services
- Existing plans
- Land availability

The thorough understanding of the existing situation is essential to tackle the right problems and to consider the proper constraints while developing solutions. The first approach should be to gather a broad understanding of the situation and to know about all relevant issues and the relations between them. The general conditions of the local situation set the frame within which potential solutions are possible. FSSM is a customer centric service delivery mechanism and hence there are a lot of different factors which need to be taken into consideration at the planning stage.

Develop the solutions

- Develop information base - maps and records
- Review specific services and programs
- Obtain more detailed information on specific problems identified
- Pilot projects to test ideas
  - Relatively small scale,
  - Implemented quickly
  - Monitor and evaluate



The main steps required to develop solutions to sanitation problems are shown in the diagram.

The planning workshop: The planning workshop is a key point in the process. It provides the opportunity to: 1) involve all stakeholders in problem analysis, 2) establish a structure for coordinated planning, and 3) agree priorities and assign short-term tasks.

Immediate improvements: The planning workshop is likely to identify some improvements that are obvious and affordable and can be implemented immediately, provided that there is commitment from the parties involved.

Developing a good information base: The good base maps are necessary for a number of reasons, in particular for drainage planning, mapping existing facilities and for showing the status of various areas. If initial investigation has revealed that some essential information is not available in a usable form, that information has to be produced.

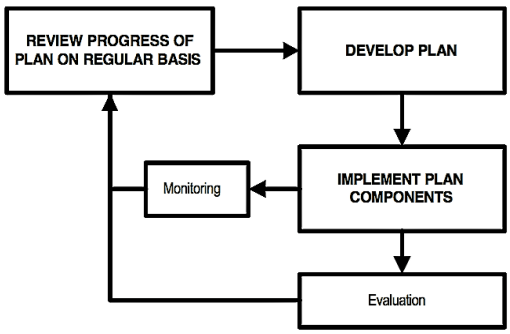
Detailed reviews of specific services: Though some improvements can be made immediately, in most cases a full review of specific services will be needed before lasting improvements can be made.

Assessing options through piloting: New ideas and approaches should not be introduced citywide until they have been tested to see if they will work, are affordable and can be managed by the staff that are available.

Linking into existing schemes: Linking the various components of the CSP with existing schemes will help to ensure that resources are available to implement the plan.

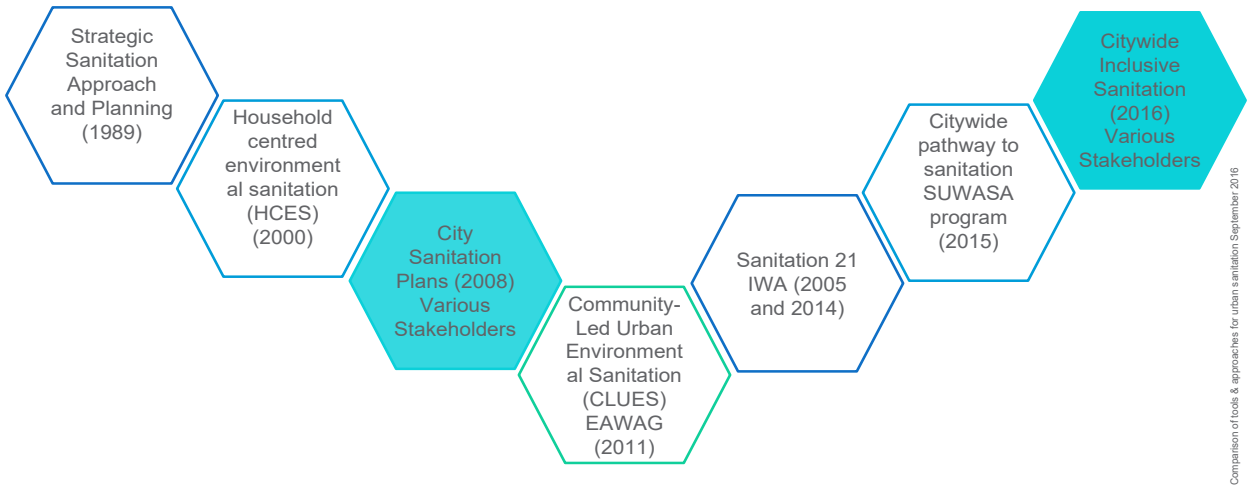
Implementation of the concept

- Develop monitoring plan for pilot project
- Feedback from beneficiaries and stakeholders
- Evaluate the collected data and develop learnings
- Learnings to feed the design of solutions
- Scale up the solutions with appropriate modification city wide.



The implementation should not be seen as the final stage of the planning process. The stakeholders will learn a lot from the process of implementation and should use the learned lessons for future initiatives. This principle should be institutionalized through fixed procedures for monitoring and evaluation of the implemented components and the use of the gained information before implementing further components. Always implement new components of faecal sludge management dependent on available resources, both for investment and for operation costs. Better is to implement small-scale components, which work sustainably, than to start too ambitious projects, which may fail soon due to lack of money for the day to day running.

Sanitation Approaches



Over the years, a number of sanitation approaches have been developed, the above slides showcase some of them, out of which few of the widely used will be explained in detail in the

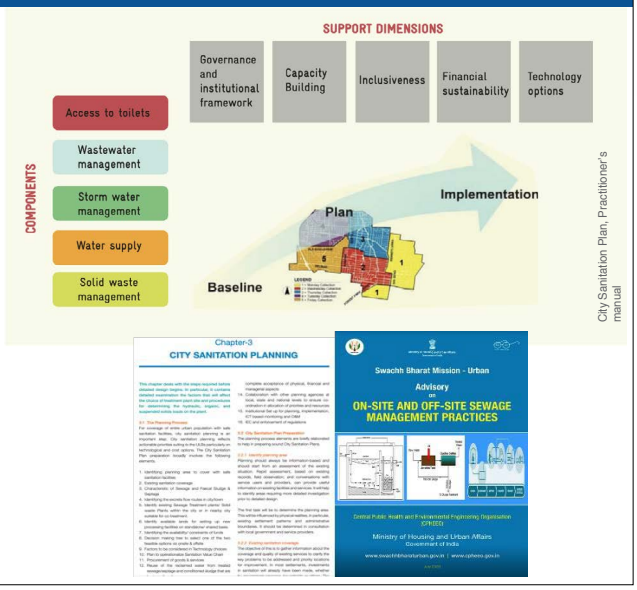
upcoming slides. The City Sanitation Plan approach introduced in 2008 focused on all aspects of environmental sanitation such as: (a) Access to water, (b) Access to toilet, (c) Wastewater management, (d) Storm water management and (e) Solid waste management. It highlighted the importance of planning across all these sectors simultaneously as issues and challenges are interdependent. City Wide Inclusive Sanitation (CWIS) is a relatively new approach which focuses on equitable and affordable sanitation services across the demography in the city.

City Sanitation Plans (CSP)

- Assessment of the current situation and
- Immediate, short, medium and long term plan

Environmental sanitation services covered;

- Access to Toilets
- Wastewater Management
- Storm Water Management
- Water Supply
- Solid Waste Management



A City Sanitation Plan is a comprehensive, holistic and city-wide plan addressing universal access, safe collection, treatment and disposal of 100% liquid and solid waste. With the launching of the National Urban Sanitation Policy, the Government of India encouraged all Urban Local Bodies to prepare their CSP, providing them with a Framework to assist them in the process. The City Sanitation Plan should contain an assessment of the current situation and an immediate, short, medium- and long-term plan for improvement of the following services and aspects.

Access to Sanitation Facilities (toilets): Plan for ensuring 100% sanitation access to different socio-economic groups.

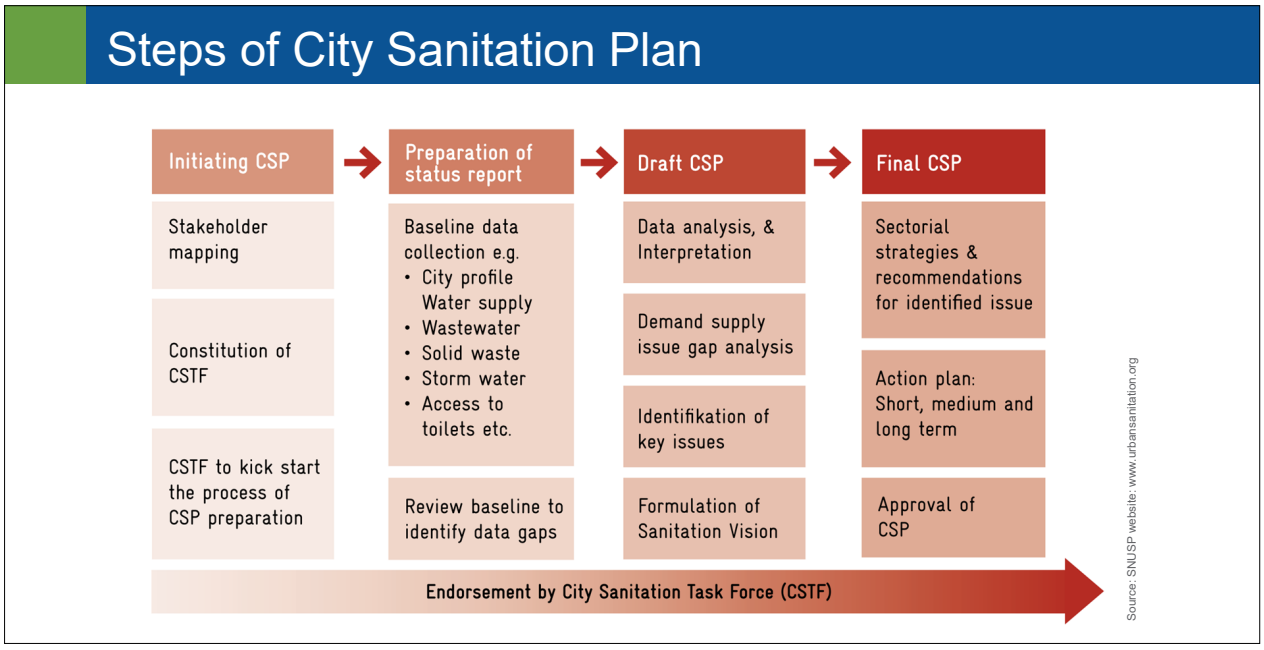
Wastewater and Solid Waste: Plan for safe collection, conveyance and treatment of sanitary wastes, considering the use of low energy-intensive decentralised wastewater treatment technologies.

Water Supply and StormWater: Plan for the provision of potable water and to improve the resilience of the city, considering diminishing water resources and the impact of climate change.

Institutional Aspects: Plan for developing institutions in charge of sanitation, and their roles and responsibilities This section should include manpower issues such as adequate remuneration, hazardous nature of work, employment on transparent terms and conditions, use of modern and safe technology and provision of adequate safety equipment.

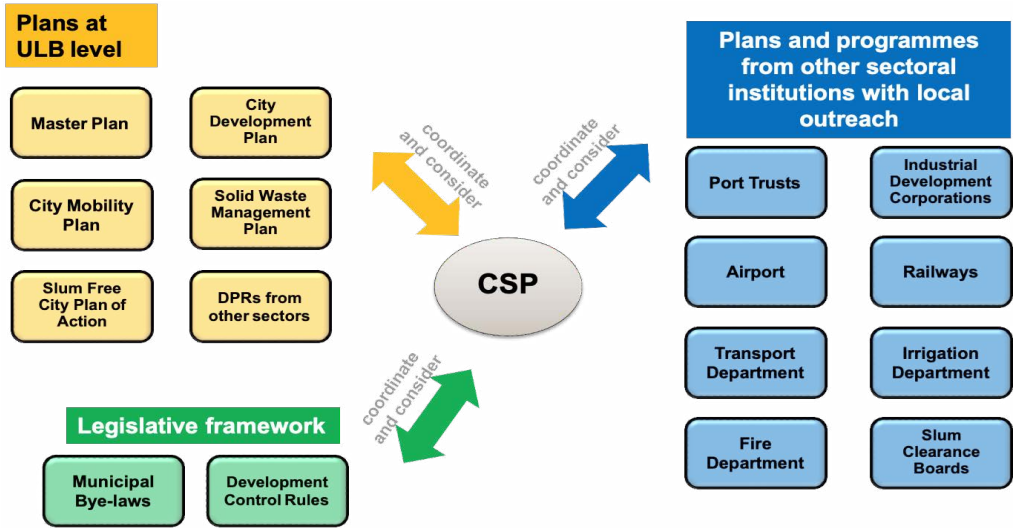
Financial Aspects: Plan for capital investments and operation and maintenance costs. A section has to be included which spells out the costs and tariffs for service provision, which needs to be emphasised as a means of ensuring accountability as well as financial sustainability.

In 2020, CSP was also recognized in the advisory by CPHEEO on 'Onsite and offsite sewage management practices.'



CSPs were aimed as living documents to be used by cities to make informed decisions about sanitation investments. Such blueprint documents require city governments to have adequate technical capacity and to take ownership of the preparation. Due to the lack of both, in many cases the preparation was outsourced to consultants with little or no ownership of city government; hence, the CSP was developed only for checklist purposes limiting the intended benefits of the process itself to catalyse change, capacity development and awareness. A comprehensive CSP needs leadership and adequate funding, time, effort, and expertise for preparation, which are often limiting factors. Some of the successful CSPs have been developed only with external support from international development agencies. In order for the CSP to be useful, it needs to be followed by funding (e.g., from national schemes) for implementation, otherwise it risks being only a reference document.

Embedding CSP into Urban Planning



For the success of CSP it is important that there is a buying from various organisations, corporations. such as for the desludging of septage we need trucks thus the transport department should be taken into consideration. Further CSP should be in line with the various plans at national, state and city level and also considered in the legislative framework.

CSP- Kochi Case example

The City Sanitation Plan for Kochi is prepared by Kochi Municipal Corporation (KMC) in 2010-11 as a complete city level planning document on sanitation sector under NUSP Guidelines

After CSP Preparation

- Constituted CSTF and approved by KMC and State Government in 2011
- Independent Septage Management Plan as city depends on OSS
- Used CSP as base document for sanitation planning & implementation on ground
- Developed DPR on implementing a phased investment program for waste-water management in Kochi Urban Agglomeration
- Put forward clear institutional structure, strategic dimensions & softer implementation aspects (including communication and stakeholder participation)
- Designated nodal accountability within its department & at the State level
- Raised awareness among various stakeholders
- Escalated attention to sanitation issues within KMC

Source: http://www.susana.org/_resources/documents/default/2-1582-city-sanitation-plan-for-kochi.pdf

In India, GIZ in partnership with CSE in 2014 took the initiative of providing handholding support to the ULBs of 3 states AP, Kerala and Telangana and later made CSPs for Uttarakhand. In this endeavour more than 35 ULBs participated to prepare CSPs. One of the case examples showcased is CSP of Kochi.

Citywide Inclusive Sanitation (CWIS)

CWIS is an approach to urban sanitation that involves the following:

- Adequate sanitation service delivery for every citizen
- Safe management of human waste along the whole sanitation service chain
- Selection of appropriate sanitation systems & technology solution with consideration of resource recovery & re-use.

Access to all

Whole service chain

Thriving economy

Working Partnership

Each town has a different built and natural environment. This environment is very specific to the town and features such as topography, population density etc. varies largely. Thus, the kind of sanitation infrastructure and services shall also vary a lot. Sanitation projects have been largely considered as an infrastructural project. For wastewater management, a centralized approach with gravity sewers and STP at the end of the pipe has been considered as the ultimate solution. However, achieving equitable and just sanitation service delivery is not possible with a single approach. Thus the 'one size fit all' approach is not possible.

Citywide Inclusive Sanitation is an approach to urban sanitation, where all members of the city have access to adequate and affordable sanitation services through appropriate centralized and decentralized systems, without any contamination to the environment along the sanitation value chain. CWIS is based on the four pillars that are: a) Human right of all; b) Thriving urban economy; c) Partnerships (Stakeholder involvement); and d) Deliver safe sanitation.

CWIS: A public service approach

- Paradigm shift in the urban sanitation
- Adopting more contextual, sustainable and equitable solutions
- Includes soft institutions as much as hard infrastructure

Comprehensive process includes;

- Policies, institutions, regulations
- Involves all stakeholders – both users and providers
- Contextually considers all appropriate technical options
- Makes an inclusive and equitable decision

CWIS brings various evolved thinking of urban sanitation under one umbrella

A public service approach to planning and implementing urban sanitation systems to achieve the outcomes of SDG6

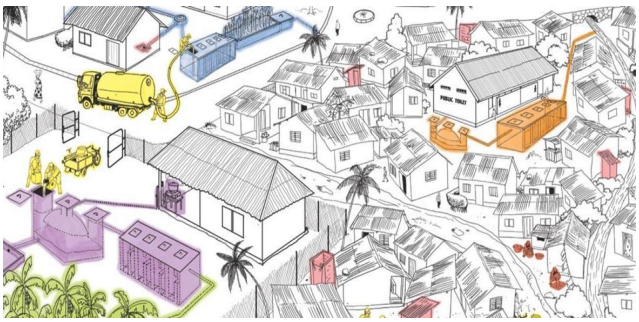
Source: Schrecongost, A., et al. (2020). Citywide Inclusive Sanitation: a public approach for reaching the urban sanitation SDGs

CWIS is a public service approach to planning and implementing urban sanitation systems to achieve outcomes of SDG 6: safe, adequate, equitable, and sustainable sanitation for everyone in an urban area, paying special attention to the needs of the poor, the marginalized, and of women and girls.

Principles of CWIS

CWIS principles that help in achieving objectives of sanitation systems:

- Equity
- Environment & public health
- Availability and affordability of technologies
- Comprehensive planning
- Monitoring & accountability
- Mix of business models



Conventional Sewers – where economy of scale works

Decentralised systems – areas dictated by topography, population density

Faecal Sludge Management – areas where access is an issue

Adopting a one-size-fits-all sanitation approach will fail in achieving the aim of protecting the health of the environment and of residents. Adopting principles of CWIS is useful for cities where a combination of on-site and sewered solutions exist, either or both centralized or decentralized systems should be adopted for providing adequate sanitation services to everyone in the city.

CWIS – Warangal, India

Enabling conditions and actions

01 Non-sewer Sanitation – Policy & Regulatory Framework
First city in India to notify FSSM Regulations, 2016

02 Institutional Accountability
Roles and Responsibilities
Agencies and Coordination Mechanisms

03 Public Private Partnerships with well defined service level agreements
- Toilets (Public toilets, toilets at fuel station, SHE toilets)
- Sanitation Resource Park (SRP) -FSTPs
Two pilots (15 & 10 KLD) on CSR
150KLD on DBOT

Public Toilet


SHE Toilet


Sanitation Resource Park

Source: Chary V. S., Online ADB Sanitation Dialogue 2021

Initially BMGF chose 8 CWIS cities globally, four from India: Warangal, Andhra Pradesh; Narsapur, Telangana, Wai, Maharashtra; Trichy, Tamil Nadu.

Below are the steps taken to make Warangal a CWIS city:

Enabling conditions and actions

1. Non-sewer Sanitation – Policy & Regulatory Framework- **First city in India to notify FSSM Regulations in 2016**
2. Institutional accountability: Sanitation is a public service thus Clear assignment of roles to:
   - City government – Policy (pro-poor), regulation, finance, standards, citizen including mainstreaming gender
   - Service delivery – private sector under various business model like DFBOT, HAM
   - Oversight & Citizen Participation – City sanitation task force – multi stakeholder group / 50% women participation, gender subgroup including representation of third gender.
   - Citizens – compliance with regulations, payment for service
   - Others – third party agencies for monitoring, technical support organizations for guidance and capacity building, corporates & philanthropic organization to support innovations

Agencies

- City Council led by the mayor; guided by state sanitation vision
- Municipal Commissioner (Chief City Manager) - Strategy, Coordination, Monitoring and Budget
- Public Health Department under the Municipal Corporation (MC) - CWIS planning and execution
- Officer on special duty for slum sanitation, Community engagement department (MEPMA) – Inclusion
- Engineering department under MC- Procurement

Citywide Inclusive Sanitation – Warangal, India

Enabling conditions and actions

04 Citizen Engagement: Sanitation Helpline (S-line)

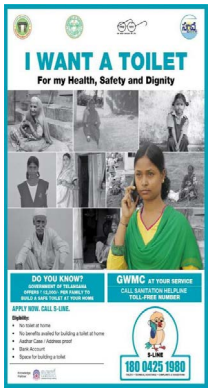
05 Engaging citizens: BCC campaigns

06 Gender Mainstreaming in Sanitation

07 Innovations & Technology Transformation

08 ICT based monitoring for sustainability and impact

09 Capacity building for sustainability



Source: Chary V. S., Online ADB Sanitation Dialogue 2021

Citizen engagement

- » A single point contact for gaining access to new Individual household toilets, receives applications, verifies as per eligibility etc
- » Provides desludging service to the citizens
- » Receives sanitation related grievance redressed by the citizens
- » Provides assistance in technical matters related to design of septic tanks and toilets, masons and contractor details, registration, identity
- » Deals with the status of applications received

Gender Mainstreaming in Sanitation

- » Public Toilet construction work orders issued to SLF members
- » Training program for Slum Level Federation (SLFs) on Operations and maintenance of PTs
- » O&M contact for Public Toilet issued to transgender community SHG

Innovations & Technology Transformation

Use of various technologies such as DWWTs at hospitals, housing units

Information and communication technologies (ICT) based recordkeeping and tracking of all assets–PTs/CTs, DWWT, FSTPs, Desludging activities

Videos on CWIS

- Citywide Inclusive Sanitation in Wai City
- Towards City Wide Inclusive Sanitation - Dhaka
- Towards City Wide Inclusive Sanitation – Manila, Philippines
- Towards City Wide Inclusive Sanitation – Kathmandu
- Towards City Wide Inclusive Sanitation - Kampala
- Towards City Wide Inclusive Sanitation – Lusaka

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Summary

- Out of the many planning approaches, CSP and CWIS based approach is very comprehensive.
- CSP considers all the environmental services (utilities) and their interdependence.
- CWIS promotes social and economic equitable planning including centralized and decentralized approach.
- SFD is a good tool for communicating the need to planning in a project and brings the stakeholder together.
- Stages in planning with pilot projects helps to mitigate the risk of failure of infrastructure project.

Session

03

State level Approaches for FSSM planning

3. State level Approaches for FSSM planning

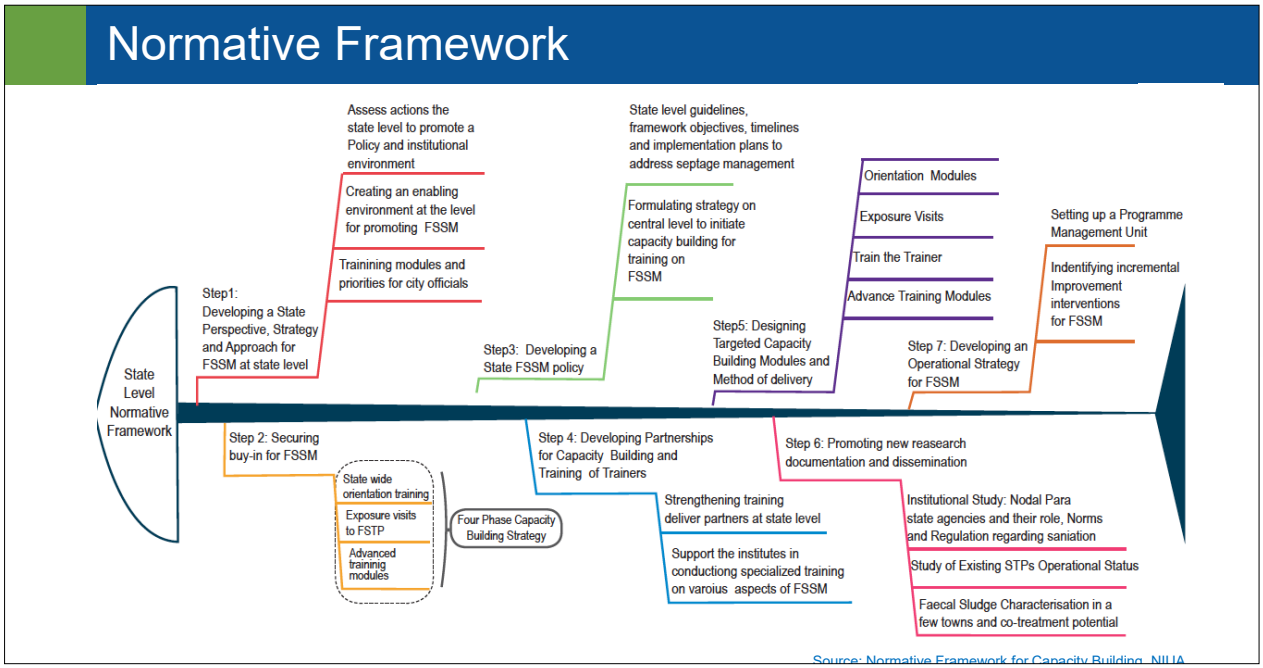
Learning objectives

- To understand the approaches for state-wide scale-up for FSSM
- To understand the steps involved in implementation of FSSM across all ULBs

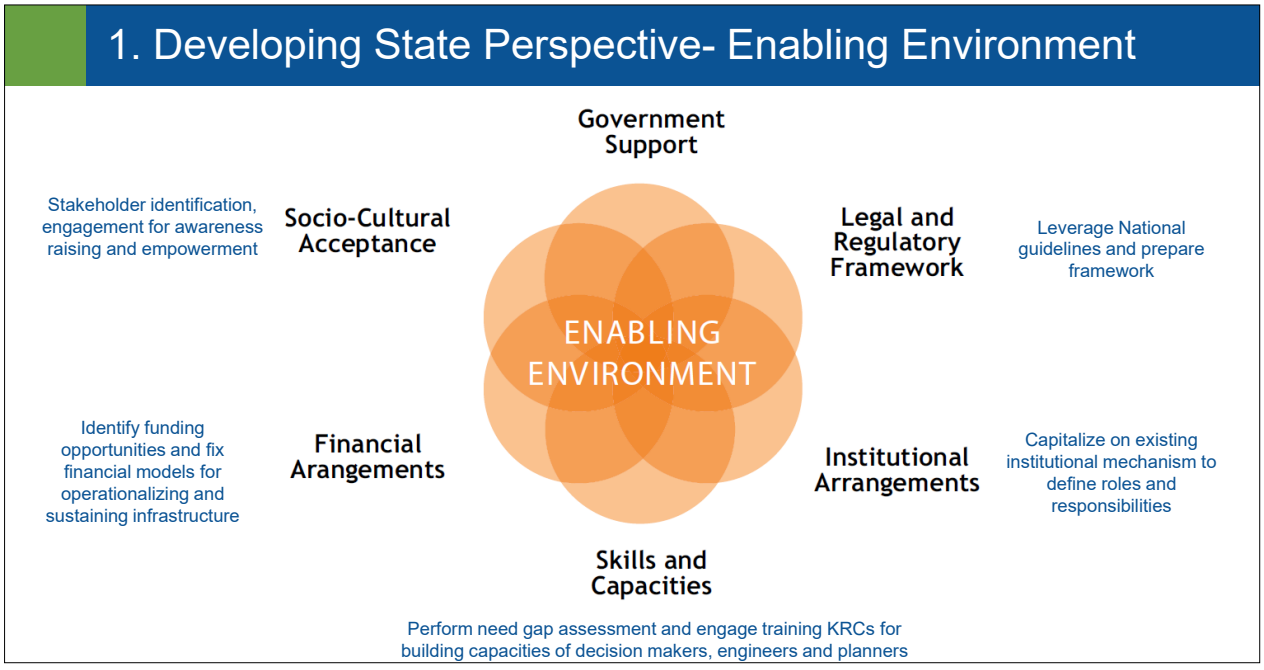
Contents

- State level implementation of planning approaches for FSSM
  - Enabling environment
  - Securing buy in for FSSM
  - Policy and regulation
  - Capacity building and content
  - Research, documentation and dissemination
  - Operational plan
- State Scale Up Plan

3.1 State level planning of FSSM

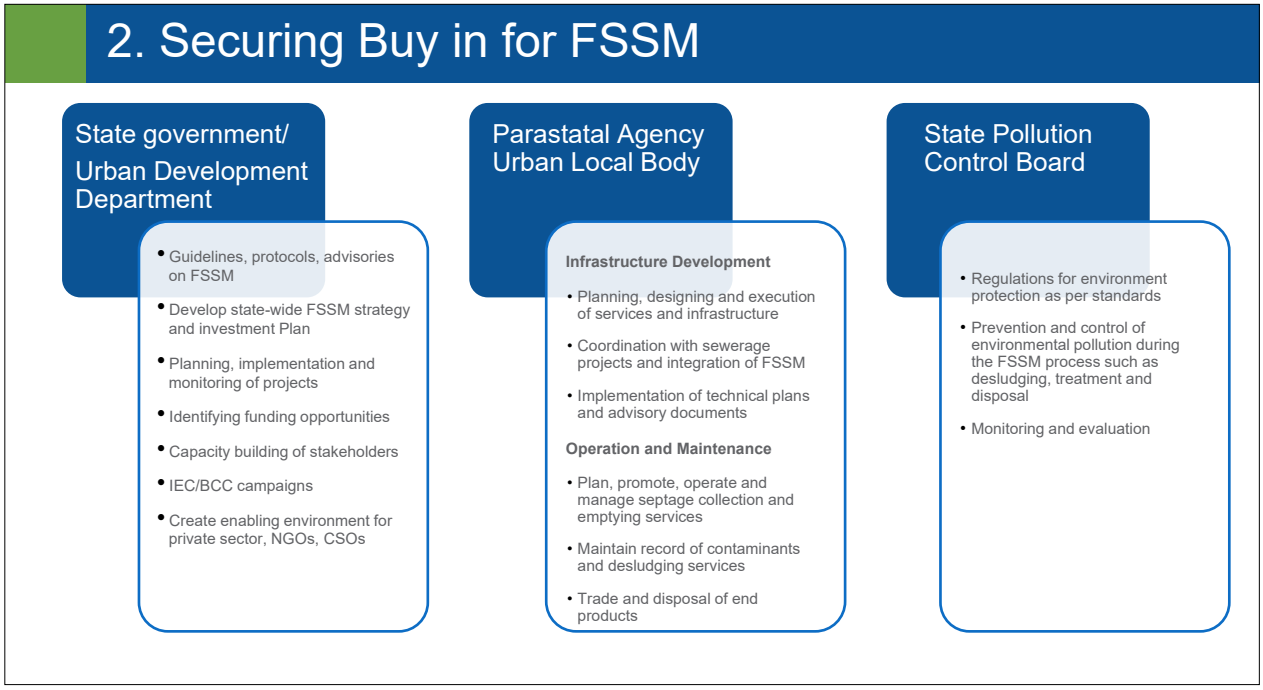


A framework for FSSM Capacity Building at state level was also identified as a priority, as a guide for any organisation that is engaged in supporting rural or urban FSSM work in future. The Framework aims to enable a paradigm shift in favour of FSSM and non-networked sanitation systems to achieve universal treatment of faecal waste and improvement in health and living conditions.



FSSM is a service centric approach where households and the desludging operators play a key role. The slide shows six different aspects to be considered for creating an enabling environment. Government support in terms of advocacy, capacity building and budget is necessary and mandatory. Legal and regulatory frameworks shall be created to ensure strict monitoring of the

operations happen. The framework should become a driver of FSSM. Institutional arrangements should be clarity and the responsibilities of design, execution, operation, monitoring of the project should be present. Skill and capacity building is required at every stage of the project. This is also important for empowering certain stakeholders such as informal desludging operators. Identifying funding opportunities and finalizing the financial model helps to regulate the transactions and maintain the integrity. Socio cultural acceptance is a sensitive subject and is important for eliminating the taboo around the sanitation businesses and workers and improve their dignity.



Undertake a study for a few towns 3 to 5 sample towns of different size and geography), to understand current status and challenges in urban sanitation at the town level. The study will look into the existing status of and proposed plans and investment for sewerage and STPs and likely coverage of town population, ULB structure and staffing for sanitation, status of ULB Finances and implications of user charges for sewerage infrastructure investments, water quality testing of water bodies and ground water, schedule and operations of desludging of septic tanks, etc.

The Study will also look into the recommendations for FSSM with Phase wise approach for different size and category of towns in a state. This study may provide a Needs Assessment perspective for capacity building – addressing critical aspects of 1. What needs to be done at the state level to promote a Policy and Institutional environment, 2. What needs to be done at the Municipality level to provide an enabling framework and some incremental start steps to address the unsafe disposal of septage waste and finally 3. Training modules and priorities for city officials.

Institutional Framework for Sanitation

	Funding	Design and Planning	Implementation	Operations and Maintenance	Monitoring
National Government	UD Department	CPHEOO, Project Guidelines			Pollution Control Board,
State Governments	Relevant State Departments	State Departments, Parastatals/ Boards	State Departments, Parastatals/ Boards	State Departments, Parastatals/ Boards	State PCBs
ULBs, Parastatals/ Boards	Only O & M costs	Parastatals/ Boards, sometimes ULBs	ULBs, Parastatals/ Boards	Mostly ULB, sometimes, Parastatals/ Boards	

Source: Presentation by IIHS in Round Table Consultation on Municipal Strengthening

Water and Sanitation is a state subject, that has devolved to ULB after 74th Amendment. Union Government plays a central role by -By providing substantial portion of capital investments through various programmes, setting technical guidelines and standards (via CPHEEO): that determine criteria for funding. State level Arrangements differ - Fragmented and/ or overlapping responsibilities & Poor linkages between sanitation and planning/ housing.

Case Study – Uttarakhand

State level advisory body constituted:

- To guide and promote FSSM for the state
- To organize regular review meetings in order to track the progress
- Plan to channelize funds for state-wide scale up of septage management
- Issuing advisories and norms for FSSM and waste water management

State Septage Management Committee

Secretary, Urban Development (Chair)

Secretary, Uttarakhand Peyjal (Co-Chair)

Managing Director, Uttarakhand Peyjal Nigam

Chief General manager, Uttarakhand Jal Sansthan

Director, Urban Development Directorate

Representative from NIUA

The objective of constituting SSMC is to discuss, promote and streamline the FSSM in the state. The committee is chaired by Secretary, Urban Development and Co-chaired by Secretary, Uttarakhand Peyjal. The committee also consist of Director, Urban Development Direcrorate (who is also the nodal official for MoU under NIUA-UDD). Representatives from UDD, Peyjal Nigam, Uttarakhand Jal Sansthan and NIUA are also members of SSMC. Key responsibility are mentioned in bullet points in the above slide.

Case Study – Uttarakhand

- To monitor the activities pertaining to septage management at district level
- Committee constitutes of:
  - Commissioner or Executive officer
  - Pey Jal Nigam
  - Jal Sansthan
  - State Pollution Control Board
  - Health Department
  - Town & Country Planning Department

Septage Management Cell Responsibilities

Onsite Sanitation Systems	Collection & Conveyance	Treatment
• Maintaining records of septic tanks • Ensure new septic tanks are based on IS 2470	• Fixing desludging frequency • Registering operations • Renewing license every three years • Desludging and tipping fee	• Identifying disposal point in absence of treatment facility • Supporting parastatal bodies for setting up facilities

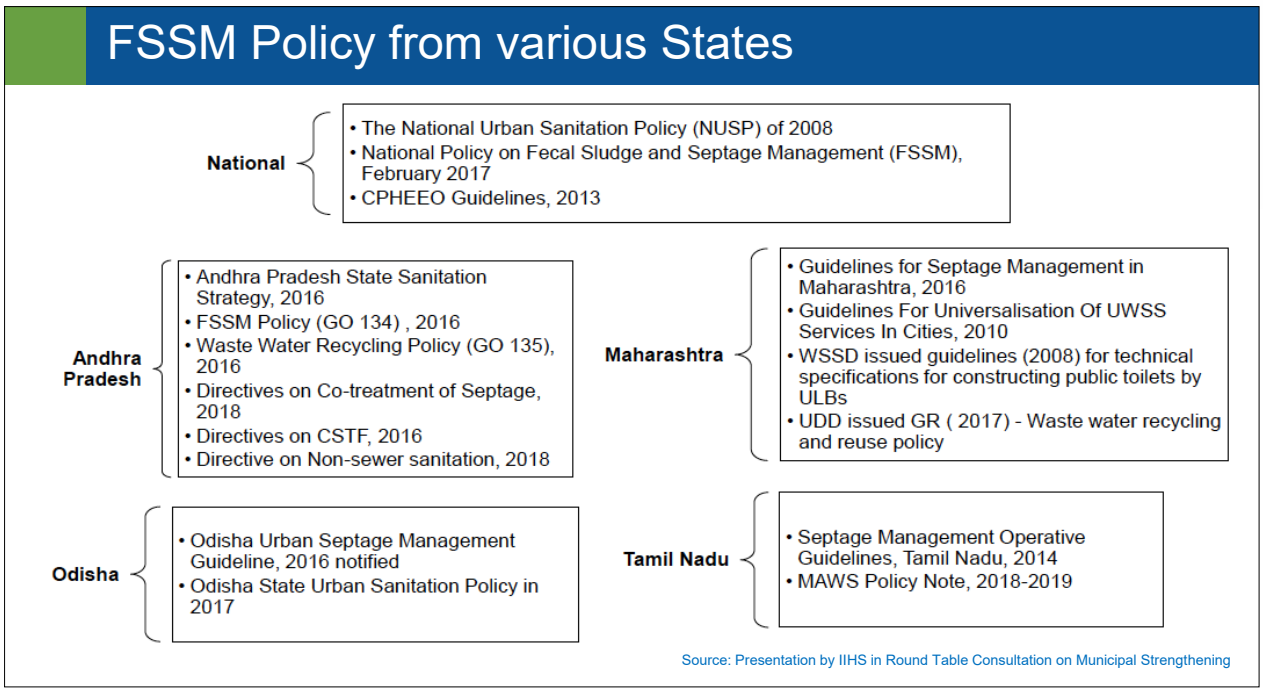
The objective of Septage Management Cell was to operationalize FSSM and monitoring the activities at the district level. The cell is headed by commissioner of the nagar nigam or executive officer of the nagar palika parishad or nagar parishad. The cell consists of representatives from parastatal bodies involved in liquid waste management, pollution control board who is the regulatory body for solid-liquid waste management, Health department of the ULB and town and country planning department. The responsibilities of the cell are across each stage of FSSM as shown in the above slide.

3. Developing State FSSM Policy – Policy and Regulations

- **State Level Policy – *Guidance/ Vision Document***
  - To provide a regulatory framework for sanitation service chain
  - Monitoring framework for FSSM activities
- **Advisory for operationalizing the policy – *Strategy/ Scale up Plan***
  - To support ULBs for rolling out the protocol
  - Responsibilities of different authorities
- **Guidelines and technical advisories - *Implementation***
  - To provide support for streamlining the collection and emptying services, strategies treatment and disposal, operations and maintenance

Different types of Policy and Regulations are recommended at the state level for promoting FSSM. A protocol or a byelaw which put forwards a regulatory framework and defines the roles and responsibilities of the different stakeholders in FSSM. An advisory document preferably in a local language for the ULBs describing steps for operationalizing FSSM at the city level. This should

provide details of hoe to contract, license the private desludging operators. A separate set of guidelines and technical advisories shall also be provided on types of technologies appropriate for region and details of capital and operational expenditure. Case studies from different parts of India with photographs also helps to give better idea to the decision makers as to how the treatment/disposal facility would look.



The National Policy on Faecal Sludge and Septage Management unveiled in February 2017 aims to create an enabling ecosystem for sustainable and safe FSSM. A state-level policy must be formulated with detailed strategic and operational guidelines that would serve as a reference guide for all actionable points. This has to be in concurrence with the national policy, which stipulates that each state should develop and propagate FSSM planning guidelines and implementation strategy. The state policy should provide a framework that outlines the objectives, timelines and clearly communicates the implementation approach to the parastatal bodies and the ULBs. It is imperative to create this policy, as this will enlist the requisite and necessary action points for pursuing it on-ground, it will also provide clarity and help maintain consistency across all FSSM activities.

Case Study - Uttarakhand

Policy and Regulations for FSSM

- Septage Management Protocol
  - Issued by Urban Development Department on May 22nd, 2017
  - Based on PEMSR Act, 2013 and National FSSM Policy
  - Septage management cell constituted at ULB level
- Advisory note for operationalizing State Septage Management Protocol
  - Issued by Uttarakhand Urban Development Directorate on Dec 16th, 2020
  - FSSM regulations prepared by ULBs
- Guidelines/ Advisories – DRE, Co-Treatment

Uttarakhand State soon after the launch of national FSSM Policy, released a Septage Management Protocol on May 22nd, 2017. The protocol was based on the Prohibition of Employment of Manual Scavengers and their Rehabilitation Act (2013). It focused on simplifying operationalizing FSSM in its 92 ULBs by instituting a Septage Management Cell headed by the head of the ULB and representatives from the relevant departments at the district level. Later an advisory note was introduced by the state for operationalizing the protocol. This protocol mandated all the ULBs to prepare FSSM regulations at the local level.

4 & 5. Capacity Building Plan and Content

<table>
<tr><th></th><th>Target Audience
Training Modules</th><th>Executive Officers/ Commissioners of Small Towns</th><th>Mid-Level and Senior Engineers</th><th>Elected Representatives/ Chairpersons/ Mayors and Ward Counsellors</th><th>Junior Technical and Administrative Staff/ Sanitary Inspectors</th><th>Commissioners/ Senior Officials/ Senior Engineers</th><th>Faculties from Nodal Training Institutes</th><th>Consultants working with government as part of TSU/ PMU/ PDMC</th><th>Pollution Control Board</th><th>Town Planners</th></tr>
<tr><td>1A</td><td rowspan="2">Orientation Training</td><td colspan="3">One day orientation for mixed group of audience</td><td rowspan="2">Sensitisation/ consultation: Need to develop videos, posters, handouts on case studies</td><td rowspan="2">Half day consultation/ workshop on policy, regulations and financing; Advocacy material such as policy briefs, handouts, factsheets on existing/ upcoming FSTPs; Cotreatment videos on FSSM and FSTPs</td><td rowspan="2"></td><td rowspan="2"></td><td rowspan="2">Half day consultation/ workshop on regulatory and statutory aspects of FSSM and FSTP management</td><td rowspan="2">One day orientation on linkages between urbanisation and sanitation; Linkages between planning tools/ documents; Rules and regulations of the two interconnected sector-land use planning and sanitation</td></tr>
<tr><td>1B</td><td colspan="2">One day orientation</td><td>Half day training on Role of Elected Representatives and 74th Amendment</td></tr>
<tr><td>2</td><td>Specialised Training and Exposure Visit</td><td colspan="2">Three day training and exposure visits on Technology and Financing Options for FSSM
Three day training and exposure visits on IWWSM</td><td>Two day training and exposure visit along with EO (one day classroom and one day site visit); Policy and regulations, basic technology financing for FSSM</td><td>One day exposure visit to state-level good practice on solid and liquid waste management</td><td>Two day peer learning/ twining program exposure visit to FSTP and interaction with senior state/ ULB officials</td><td colspan="2">Three day ToT on Technology and Financing Options for FSSM
Three day ToT on IWWSM</td><td>Two day training and exposure visit on regulatory and statutory aspects of FSSM and FSTP management</td><td>Three day training and exposure visit on IWWSM</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">Advanced Training</td><td rowspan="2"></td><td>Four day advanced training on Designing of FS Treatment Systems</td><td rowspan="2"></td><td rowspan="2"></td><td rowspan="2">International exposure visit</td><td colspan="2">Three day ToT on Planning for FSSM
Four day ToT on Designing of FS Treatment Systems</td><td rowspan="2">International exposure visit for senior officials</td><td rowspan="2"></td></tr>
<tr><td>Two day advanced training on Planning and Designing of Co-treatment Solutions</td><td colspan="2">Two day ToT on Planning and Designing of Cotreatment Solutions
Two day ToT on Financing and Contracting Options for FSSM</td></tr>
</table>

Source: Normative Framework for Capacity Building, NIUA

The Normative Framework for Capacity Building specifies 3 levels of Capacity Building for 8 group of Govt Stakeholders. Based on these states need to prepare their CB and IEC plan for all stake holders involved in the FSSM Service chain, including Govt, Private and Community. FSSM is a social infrastructure where community has a very crucial role to play as the proper design of containments and their timely emptying is the responsibility of House Holds. Thus, and IEC and CB need to be rolled out parallelly for each component of FSSM Service Chain – Emptying, Transportation, Treatment, Reuse/ Disposal.

Identifying National Nodal Training Agencies empowered and funded to deliver trainings identified, their Train the trainers (ToT) done and appropriate state contextual learning and training content developed. State level studies contribute content for training modules. A set of training programmes can be decided with an attempt to merge them in the existing training calendar of the nodal training institutes. Some specific FSSM training and exposure visits can be supported over and above these.

Identifying State and National level Academic and Research Institutes who can partner and support the development of training content and also research on decentralised non-networked sanitation systems. Formal and Informal Partnerships developed for delivering a set of trainings: Orientation, Advanced Training, Train the trainers etc.

4 & 5. Capacity Building and Advocacy Plan Template

Stages of the Service Chain	Stakeholders Involved	Engagement Tool & Information to be communicated	Training Required and areas for training
Emptying	• Household - Regular Emptying • Desludgers – Safe Desludging, Disposal at treatment site/ designated site • Sanitation Workers – Ensuring Health and Safety • Sanitary Inspector - Monitoring • ULB – Regulations, Payment Mechanism, Licensing, Monitoring • State – Policy, Operational Guideline	Eg IEC and BCC for regular desludging Focused Group Discussion with Elected Reps for advocacy on their role Consultation with desludgers for business models, licensing, health and safety	Orientation of Sanitary workers and Inspectors on Health and Safety Orientation for ULB officials on FSSM Specialised training with exposure visit on Financing and technology Options for FSSM
Conveyance			
Treatment			
Disposal/ Reuse			

The Normative Framework for Capacity Building specifies 3 levels of Capacity Building for 8 group of Govt Stakeholders. Based on these states need to prepare their CB and IEC plan for all stake holders involved in the FSSM Service chain, including Govt, Private and Community. FSSM is a social infrastructure where community has a very crucial role to play as the proper design of containments and their timely emptying is the responsibility of House Holds. Thus, and IEC and CB need to be rolled out parallelly for each component of FSSM Service Chain – Emptying, Transportation, Treatment, Reuse/ Disposal

Priority should be to develop capacity of the para state technical agency to change its approach from centralised STPs to non-networked sanitation systems solutions and more decentralised STPs and FSTPs. Capacity building and advocacy together play a great role in this. Along with communication and awareness raising about the urgency, need and a critical mindset to look for solutions that are most relevant for India. Non sewered sanitation systems are not a temporary solution to the water stressed and fast urbanising India, these are perhaps the need of the hour as the most appropriate solutions to achieve multiple SDG goals and national development indices and gaols.

6. New Research, Documentation & Dissemination

Why Research - Address Ground Level Challenges, Implementation issues, Impact of Policies and Regulation, Monitoring and Evaluation

- Uttarakhand – IIT Roorkee with support from NIUA conducted a feasibility study for Co-treatment at STPs
- Odisha – Assessment of river health improvement due to FSSM solutions
- Assessment of containment typologies and payment capacity in slum areas for Bhubaneswar for subsiding desludging tariffs

Why Documentation and Dissemination – Peer Learning, Support for states/ cities with similar context and challenges. Not only good practices but the process, challenges and learnings

- Odisha – Has set up Water Academy to strengthen Capacity Building efforts for FSSM

The purpose of research and studies should be to engage the para-state agencies and the administrative wing, in appreciating the necessity of enabling norms and regulations, improving the efficiency of existing STPs and for facilitating co-treatment of septage with STPs and general awareness and interest in addressing the urban sanitation challenges.

Learning events and workshops promoting more peer-to-peer learning opportunities within a state and across other countries of such research work will be an effective capacity building exercise much better than formal classroom training for staff with long years of experience of practical challenges.

7. Operational Strategy

Framework for State Scaleup Plan

- Introduction: State profile and why FSSM is relevant for the state
- Legislative and regulatory context at all three levels of government
- State scale-up strategy for FSSM: Approach for phase-wise implementation
  - Implementation approach
  - Stakeholder responsibilities
  - Capacity building
  - IEC and BCC campaign strategy
  - Financial/Revenue models in FSSM
  - Monitoring and evaluation
- Investment plan and financial requirements at state-level
- Case studies of city-level successful interventions in the state/other states

The State Investment Plan will contain the following sections (but will not be limited to):

(a) Introduction: State profile with respect to access to sanitation and infrastructure present.
(b) Legislative and regulatory aspects at the national, state and local level.
(c) Operationalizing FSSM in the state and scale up strategy.
(d) Phase wise investment plan and its expected output and outcome and last but not the least
(e) case studies to showcase best practices and experiences so as to avoid making mistakes.

Different states may need different approaches for capacity building. What works in one state may not work in another, given the varying geographical, socio-economic, administrative and sanitation status. This step can begin with the state support agency initiating a few steps on its own and then eventually succeeding in making the State Urban Development Department initiate to hire a team of staff on its payroll or constitute a cell or a Progamme Management Unit to support and implement a strategy for FSSM for the entire state.

3.2 State Scale Up Plan

Introduction and Objectives

- Sanitation status in the state, districts, major ULBs,
  - Access to toilet
  - Households having septic tank
  - Households having sewer connection
- Definition
  - Faecal sludge, septage
  - FSSM
- Quantification and Qualitative characteristics of septage
  - SFDs for districts or major ULBs
- Alignment of FSSM in sanitation vision of the state
- Scope and objective of state FSSM policy
- Key outcomes envisaged in state

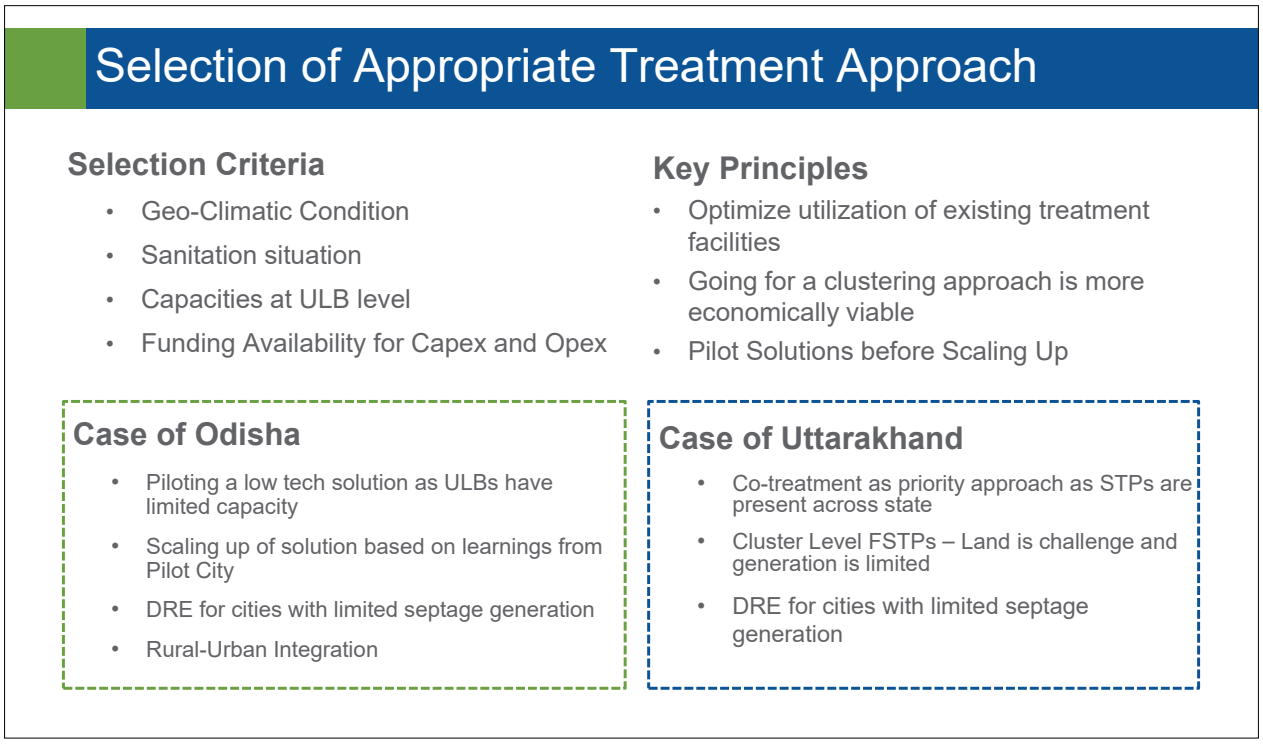
The introduction section of the investment plan shall consist of the profile of the state. The profile of the state should clearly present the current status of sanitation in the districts and major ULBs in the state. Latest census data can be used for preparing this section. It should also include the definition and characterization and quantification of the faecal sludge and septage. Use of tools such as SFD is recommended to strongly represent the rationale for FSSM. The vision and objective should be clearly communicated in the plan.

Legislative and Regulatory Context

- **State Level Policy – *Guidance/ Vision Document***
  - To provide a regulatory framework for sanitation service chain
  - Monitoring framework for FSSM activities
- **Advisory for operationalizing the policy – *Strategy/ Scale up Plan***
  - To support ULBs for rolling out the protocol
  - Responsibilities of different authorities
- **Guidelines and technical advisories - *Implementation***
  - To provide support for streamlining the collection and emptying services, strategies treatment and disposal, operations and maintenance

The legislative and regulatory context includes laws, acts from the national level and all the guidelines and advisories. The nuances of the national acts shall be highlighted as they are legally binding on all the citizens of India. If the state has published its own guidelines, regulations or any municipal byelaws, then the same should be referred to in the scale-up plan.

A protocol or a byelaw which put forwards a regulatory framework and defines the roles and responsibilities of the different stakeholders in FSSM. An advisory document preferably in a local language for the ULBs describing steps for operationalizing FSSM at the city level. This should provide details of hoe to contract, license the private desludging operators. A separate set of guidelines and technical advisories shall also be provided on types of technologies appropriate for region and details of capital and operational expenditure. Case studies from different parts of India with photographs also helps to give better idea to the decision makers as to how the treatment/disposal facility would look.



Selecting the appropriate treatment approaches based on state context – geo climatic conditions, capacities at ULB level and funding for both capex and opex is crucial for ensuring state wide scale up. Optimize utilization of existing treatment facilities and going for a clustering approach is more economically viable

State scale-up strategy

- Implementation approach
  - Operational plan
  - Regulating agency
- Stakeholder responsibilities
  - Identification
  - Engagement plan
- Capacity building:
  - Need gap assessment
  - Capacity building plan and tools
- IEC and BCC
  - Effective strategy & content
  - Delivery mechanisms
- Financial models for FSSM
  - Service fee, Tipping fee
  - Disposal fee
- Monitoring and evaluation
  - Robust framework
  - Learnings to optimize the system

While developing the state scale up strategy, the following aspects need to be catered:

- **Implementation approach** – Prepare an operational plan, keeping in mind the major ULBs, sanitation statuses and the vision, mission of the state. The regulating agency should be looped into the approach as it plays a crucial role in the monitoring of the services and infrastructure.
- **Stakeholders responsibilities** – Identification and characterization of the stakeholders along with an engagement plan with each of the stakeholder.
- **Capacity Building** – Identify the need of capacity building of the stakeholders and plan to develop the content, tools for dissemination.
- **IEC & BCC** – Develop a plan for IEC and BCC campaign along with the strategy and content to roll out at the state level. The delivery mechanism of the campaigns is important as it has to make an impact on the masses for successful implementation of the project.
- **Financial models** – Identify the upper cap or a range for desludging fee, tipping fee and/or disposal fee. Regulating the costs is important for holistic acceptance of the project.
- **Monitoring and evaluation** – M&E of the project is important. A robust framework should be developed and the learnings from the ground should be translated into actions to improve and optimize the systems from time to time.

Investment plans and funding requirements

- Prioritization of towns
  - Households having septic tank
  - Depending upon the quantity of the sludge collected daily
  - Proximity to the surface water bodies
- Phasing of investment
  - Co treatment at STP, SWM facility
  - FSTPs
  - Cesspool vehicles
- Source of capital investment
  - Program funds
  - State funds
  - Philanthropy organization
  - International agencies
- O&M cost recovery plan
  - Financial model
  - O&M agency
  - PPP models

Key is Convergence

While preparing an investment plan following aspect should be covered:

- **Prioritization of towns** – The towns with high dependency on septic tanks with no infrastructure for collection and conveyance of septic effluent and grey water should be on top priority. Proximity to the surface water body and quantity of sludge collected daily through demand desludging should also be considered. There can be several other criteria which are region specific such as groundwater table, increase in water related diseases, rapid urbanization etc.
- **Phasing of investment** – It is important while preparing the plan, to phase out the investment. The investment should logically happen for co-treatment first i.e. towns where STP and SWM plants with composting facilities are present, followed by small towns for scientific land application and towns where FSTP needs to be set up. The procurement of cesspool vehicles should also be phased out depending on the increase in the demand for desludging of septic tanks.
- **Source of capital investment** – A city can access funds from multiple national and state level programs to cater to various stages in FSSM. Alternatively, the city can approach philanthropic organizations to support the infrastructure and operations. International agencies such as GIZ, BMZ, World Bank, Asian Development Bank etc. are also plausible sources.
- **O&M cost recovery** – Plan for O&M cost recovery should also be prepared. The financial model, agency which will be responsible for O&M should be identified. Systematic project implementation through various PPP models should also be explored.

Summary

- Each state needs to identify its strengths, weakness, opportunities and threats while preparing a state investment plan for scaling of FSSM.
- The plan shall focus on utilizing the existing infrastructure as much as possible before deploying new infrastructure.
- Regional climatic conditions and understanding of demand and supply of the sanitation services should determine the capacity and technology in FSSM.
- Priority should be to develop capacity of the para state technical agency to change its approach from centralised STPs to non sewered sanitation systems solutions and FSSM. Capacity building and advocacy together play a great role in this.
- Along with communication and awareness raising about the urgency, need and a critical mindset to look for solutions that are most relevant for India.

Session

04

City level Approaches for FSSM planning

4. City level Approaches for FSSM planning

Learning objectives

- Understand the importance of an integrated approach for faecal sludge and septage management
- Learn stages of planning for FSSM on a city level, including a logical planning framework of necessary activities
- Understand how to select context specific options through case studies and know how different aspects are connected and influence each other

Contents

4.1 City level Approaches for FSSM planning

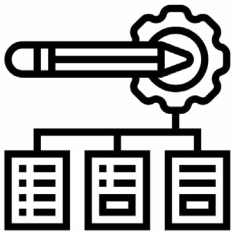
Planning Framework

- Planning and operationalizing a city-wide FSSM system = complex situation (often!)
- Main reasons = diverse levels of service and piecemeal approach in terms of uncoordinated activities by stakeholders
- FSSM plans to convert to a organized and coordinated processes with citywide sanitation strategy
  - Understanding and matching stakeholders' interests
  - Appropriate and accepted management scheme and financial mechanisms
  - Involves empowerment of key stakeholders

Each ULB in a state needs to follow the state policy, protocol on FSSM. However, without any guidance, planning and operationalizing city wide FSSM systems even for co-treatment can be quite a challenge in itself. FSSM is a service centric sanitation approach and heavily relies on its key stakeholders, households, desludging truck operators and treatment facility managers. The challenge arises when the activities for operationalizing FSSM are not carried out across the service chain involving all the stakeholders simultaneously. FSSM planning framework should take into consideration the stakeholders' interest, promote an appropriate management scheme with clarity on financial mechanism which is accepted by the stakeholders and also include activities which empower the key stakeholders of FSSM – desludging operators.

Planning Stages

- 5 Stages of FSSM Project
  - Exploratory study
  - Preliminary (pre-feasibility) study
  - Feasibility study
  - Detailed project development
  - Implementation



- A detailed and thorough understanding of essential tasks and activities lead to the development of a robust planning framework

The planning project for FSSM consists of five stages. Each stage is important and should be completed before initiating the next stage. Time and money invested in the planning stage of the project helps to identify the risks, mitigate them and make the project more sustainable and impactful. Hence, it is strongly recommended that all the five stages should be completed.

Exploratory study

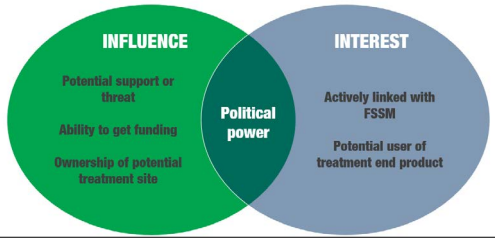
- Process ignition step
- Preliminary assessment of the initial situation and first inventory of stakeholders is prepared
- Mapping out current condition and their interconnections
- Helps in identification of facilitators
- Constitute FSSM Taskforce
- Inception report – Expected output and outcome of project

The first stage of the project is to conduct an exploratory study. This is an ignition step where stakeholder identification is done. The information regarding the present situation about the service delivery is to be collected from the stakeholders. After understanding the requirements of the key stakeholders, a FSSM taskforce is to be constituted. The task force should consist of representatives of the key stakeholders. The taskforce should be involved in each and every stage of the project and be kept well informed. The taskforce should also decide and mutually agree on the expected output and outcome of the project.

Pre-feasibility Study

- Launching of the planning process
- Key activities
  - Identification and characterization of stakeholders
  - Kickstarting planning process by engaging stakeholders
  - Analyzing sanitation practices
  - Identification of site for treatment facility
- Pre feasibility report – document the stakeholders engagement strategy, analysis of the current situation and site identification

"People who matter".



The second stage of the project is pre-feasibility study. The activities in this stage are in continuation to the exploratory stage. Stakeholder characterization is performed based on the influence and interest. How much influence does the stakeholder have on the sanitation service chain of FSSM or how much interest will the stakeholder take into FSSM. Depending upon the influence and interest, the engagement tools and techniques are to be identified with each stakeholder. It is recommended that various planning and technical documents such as City Sanitation Plan, City Development Plan, Detailed Project Reports etc. should be read through as part of desk research.

The sanitation practices need to be analyzed and gaps need to be identified. One of the most important parts of any project is securing a site for a treatment facility. Potential sites need to be identified and the same needs to be discussed with the FSSM taskforce before zeroing on the site. The prefeasibility report shall document the outcomes of the analysis, criteria for identifying and selecting the sites.

Feasibility Study

- Identification of economically viable sanitation service model
- Key activities
  - Quantification and characterization of sludge
  - Site investigation and Treatment system
  - Financial model through consultative process
  - Project implementation model – EPC, BOT, BOOT, HAM etc.
- Feasibility report – inferences from each activity forming inputs to the DPR

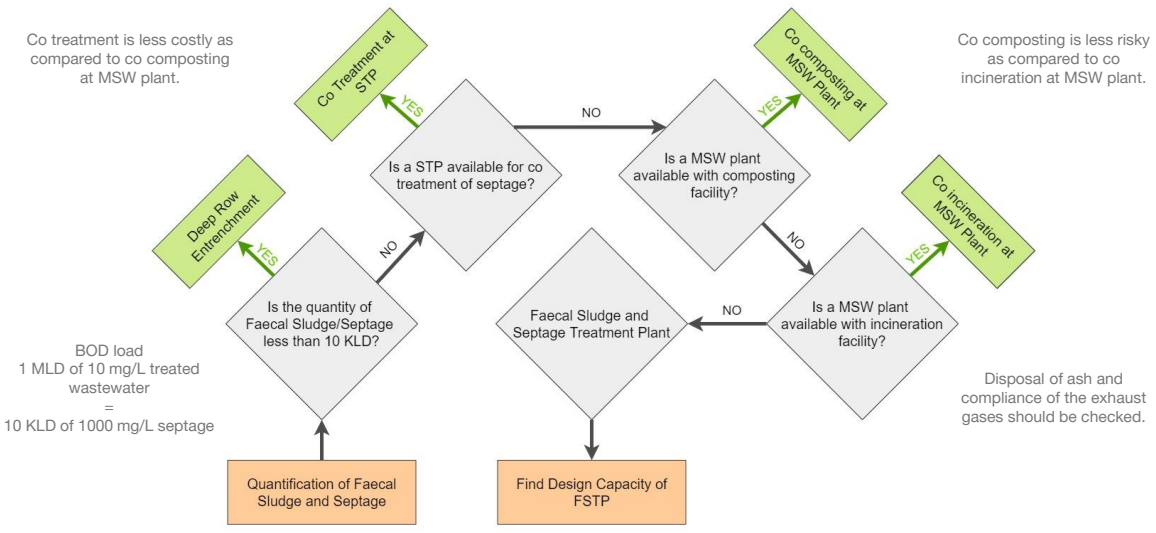
Site Investigation – Core Sample

Source: Construction Testing UK

The next stage in the project is feasibility study. In this stage, an economically viable sanitation service model needs to be identified. The key activities in this stage are: (1) to perform quantification and characterization of faecal sludge and septage. For this demand and scheduled desludging practices need to studied; (2) investigation of the treatment plant site - Soil bearing capacity, ground water table, contour mapping, soil testing etc. needs to be carried our; (3) Identification of financial model through consultation with FSSM Task Force and (4) identification of project implementation model such as Engineering Procurement Commissioning or PPP models such as BOT, BOOT, HAM etc. The aim of feasibility study is to do ground work and provide inferences that feed into the DPR stage of the project.

As part of the process, focus group discussions and key informant interviews can be carried out with the officials from different line departments such as urban planning department, parastatal bodies such as sewerage boards, ULB or special purpose vehicles in cases where applicable. The aim of feasibility study is to do ground work and provide inferences that feeds into the DPR stage of the project.

FSSM Approaches



The FSSM Approach mainly depends on the quantum of faecal sludge, type of desludging practiced and the existing infrastructure available at the ULB. If the ULB continues practicing demand desludging and the quantity of the sludge collected is less than 10 KLD, then Scientific Safe Disposal Mechanism such as land application or deep row entrenchment is suggested. The same solution can be adopted even if the collection of sludge is less than 10 KLD through scheduled desludging.

In case of availability of STP within the city of within 10-20 km of driving distance, co-treatment with sewage is a viable option. If a MSW plant is available with a composting facility, co composting of dewatered sludge is possible and with an incineration facility, co-incineration of dewatered and dried sludge can be done. If none of these options are available, a faecal sludge and septage treatment facility can be planned.

Detailed Project Report

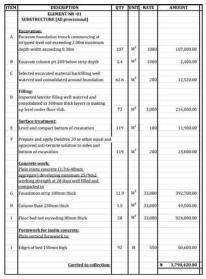
- Focused on the collection – conveyance and treatment part of the service chain
- Key activities
  - Phase wise no. of vehicles required
  - Hydraulic and constructional drawing of treatment plant
  - O&M plan
  - Detailed cost estimates
  - Tender document
  - M&E framework for implementation stage
- DPR – Document containing all information required for successful implementation of the project

Vacuum Trailer Tractor

Vacuum Truck

Hydraulic and Construction Drawings

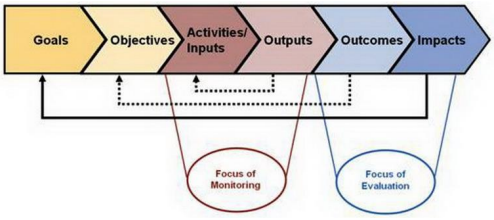
Bill of Quantities



In this stage the solution for collection-conveyance and treatment part of the service chain needs to be elaborated. In case of collection and conveyance, the number and type of trucks required for 5, 10, 15 years need to be planned. If there are private desludging operators, then it is recommended to empower them and register/license them to provide quality service to the household. For the treatment facility, hydraulic design and construction drawings of each unit at the treatment plant are made. The O&M plan of the treatment units shall also be included. A detailed cost estimate with a bill of quantities needs to be made. A tender document as per the selected project implementation model shall be created. A monitoring and evaluation framework can also be added for the implementation stage.

Implementation Phase

- Implementation of DPR and M&E of the project
- Key activities
  - Recruitment of contractor
  - Consent to establish
  - M&E of the project
  - IEC and BCC
  - Commissioning of the plant and
  - Consent to operate
- M&E of the service delivery initiates



Source: Imperial Research Organization

Source: BBC Media

This is the last stage of the project consisting of implementation of DPR monitoring and evaluation of the project. In this stage, a contractor is selected through a tendering process. The consent to establish is procured from the state pollution control board for setting up the treatment facility. The construction work commences and the monitoring of the work is done. This is a crucial time for the entire project and should be utilized for IEC campaign and BCC, so that when the plant commences, the infrastructure is better utilized. The commissioning plan of the plant is to be made before starting the commissioning of the plant. After documenting the results of the commissioning process, a consent to operate is sought from the state pollution control board. The monitoring and evaluation of the service delivery initiates after this point.

4.1.1 Tools for Assessment

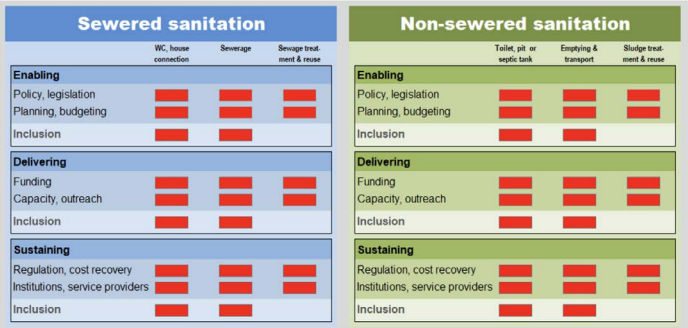
City Service Delivery Assessment (CSDA)

Tool for

- Systematic process for working with stakeholders
- To assess the enabling environment for CWIS
- Complements the SFD assessment.

The tool has three main components:

- Optional initial assessment, which provides a rapid high-level overview
- Full assessment, which analyses the enabling environment
- Action checklist, which lists a number of interventions



Source: Blackett, I., Hawkins, P. (2019). City Service Delivery Assessment for Citywide Inclusive Sanitation – Tool and User Guide.

The City Service Delivery Assessment (CSDA) for FSM is a tool for diagnosing the main impediments to service delivery based on objective criteria and to visualise them in a colour-coded scorecard. The process and CSDA output answer overarching questions about the quality of the current enabling environment, the extent of FSM service development and the commitment to FSM service sustainability.

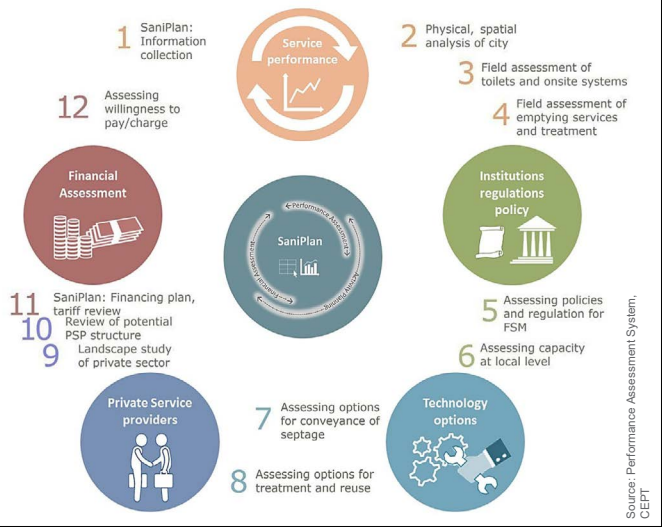
The CSDA provides a structured assessment, based on responding to the same questions on FSM service performance through all stages of the service chain, across the five cities to be objective and allow comparison. The resulting CSDA scorecard shows areas of strength and weakness for FSM in a city. It helps identify priority areas for action, e.g. establishing plans and associated budgets to improve FSM services, or focusing on developing poor-inclusive technical interventions.

Saniplan

- Provides a structured approach t planning for urban sanitation.
- Focuses on integrated service performance with a detailed assessment of finances

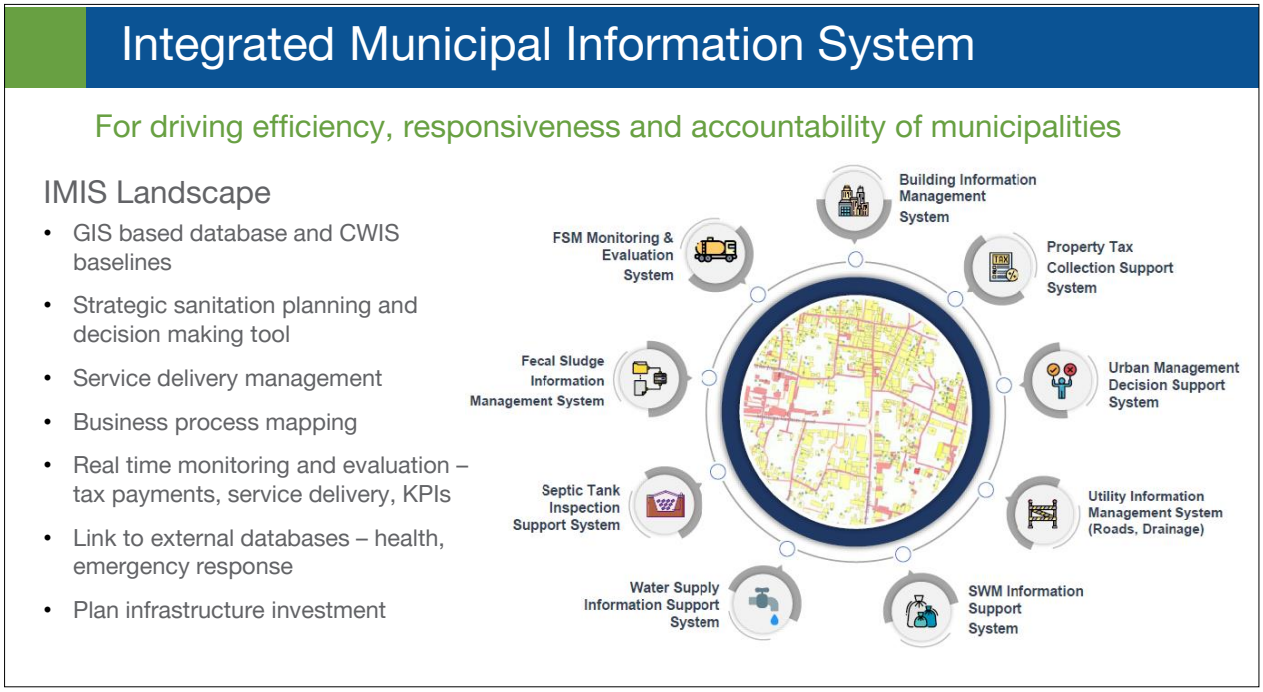
SANIPLAN has three components:

- Performance assessment,
- Planning, and
- Financial planning.



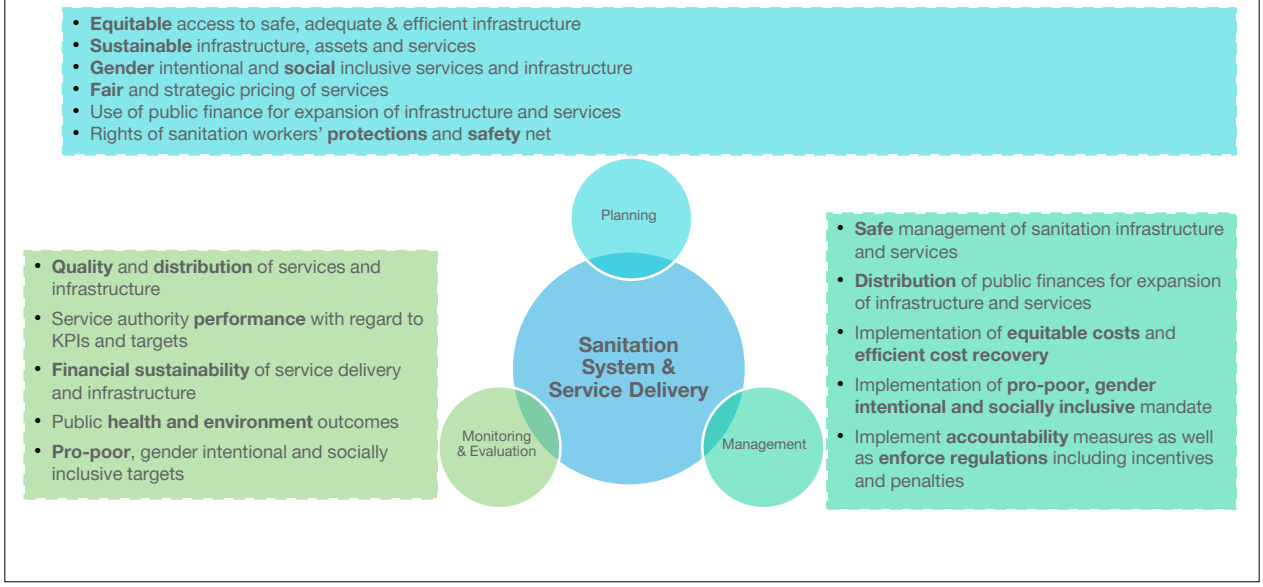
SaniPlan is a decision support tool that provides a structured approach to planning for urban sanitation. It focuses on integrated service performance with a detailed assessment of finances. It is a planning tool which can support more informed stakeholder participation. Based on local priorities, users can identify key actions for service improvement. Its dashboards also support more informed interaction with decision makers. SaniPlan has three modules: a) performance assessment, b) planning, and c) financial planning. It provides a multi-year planning framework for improving performance on five service themes: access, equity, service levels and quality, efficiency and financial sustainability. A key feature of SaniPlan is to develop a feasible financing plan for both capital and operating expenditures in the context of local finances. SANIPLAN can be used for various sectors - water, sanitation, solid waste; and can also be customized for a specific context.

4.2 IMIS and CWIS



Integrated Municipal Information System (IMIS) is used for improving the efficiency, responsiveness and accountability of the ULB. Since, FSSM is a service centric approach in sanitation, care needs to be taken to provide good quality service with easy and simple monitoring mechanisms. The IMIS system caters to all the environmental services simultaneously. It helps to have all the database geotagged for a city. Using this tool, strategic sanitation planning can be done. Service delivery management such as scheduling the services, emergency services etc. can be managed from one point. The business process mapping is also possible using the system. The system can also be linked to other departments such as tax payments and used for improving the KPIs. In emergency times (such as pandemic) the system can also be linked to external databases for health monitoring and emergency response etc. Lastly, the system can also inform the decision maker, when the infrastructure needs to be augmented.

IMIS catalyzes CWIS



IMIS improves the sanitation system and the service delivery through improving the planning, management and monitoring – evaluation. IMIS also helps to catalyse CWIS by making the service accessible, equitable and affordable to masses.

Summary

- Five stages of FSSM Planning Framework
- Activities and importance of each phase of planning
- FSSM approach leveraging existing infrastructure
- Integrated Municipal Information System - integrates all the sanitation services together and eases monitoring
- IMIS promotes City Wide Inclusive Sanitation
- Wai, Maharashtra Journey to become ODF++
- Nagda, Madhya Pradesh Evidence based planning approach using GIS

There are five stages in the FSSM planning framework consisting of distinct objectives and activities in each stage. Each phase is important in itself and helps to streamline the focus with respect to CWIS. IMIS is important as it links all the environmental services in the city and helps to optimize the management of the services. It also catalyzes CWIS. Case study of Wai depicted the journey of the city to become ODF++ through a systematic planning process from 2013. In the second case study, evidence based planning was showcased. With the help of GIS, visualization of data and interdependencies of environmental services can be highlighted.

Session

05

Faecal sludge and septage management - An overview of key concepts

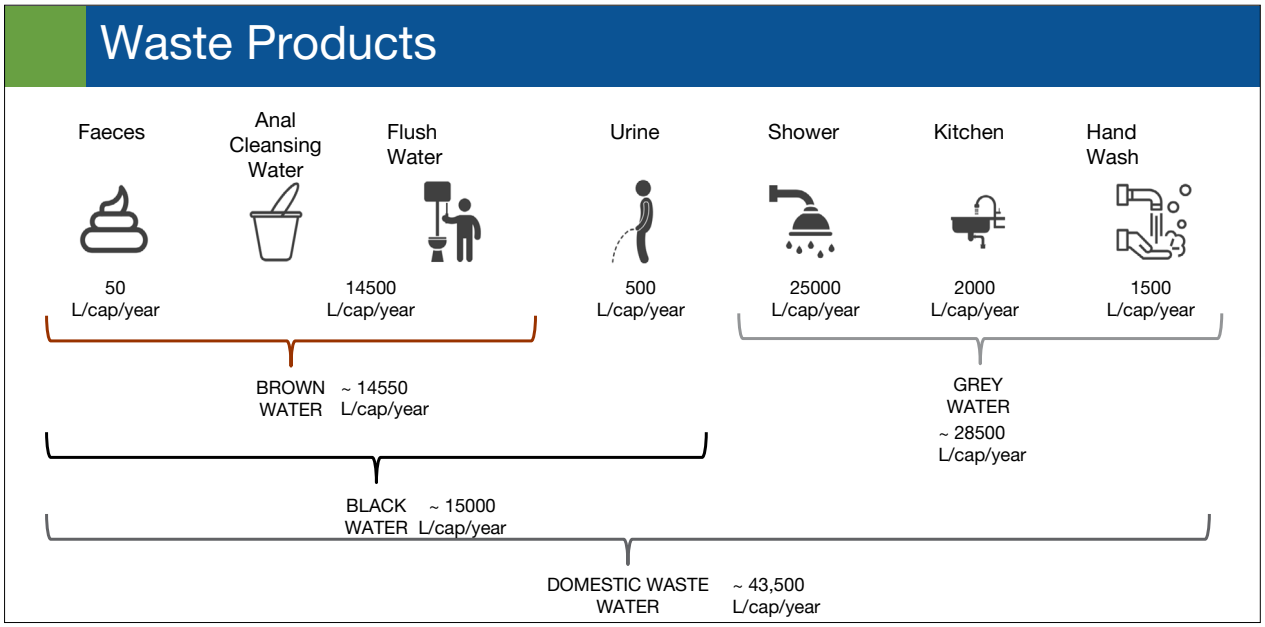
Learning objectives

- Know the difference between wastewater, faecal sludge, and septage
- Understand types of sanitation system, components of a sanitation system, and faecal sludge and septage management (FSSM) value chain
- Learn the different methods of quantifying faecal sludge and septage (FSS) and types of desludging at a city level
- Gain knowledge about technical specifications to be followed in FSSM along the service chain

Contents

- Difference between waste products
- Sanitation systems
- FSSM value chain
- Quantification of FSS
- Demand and scheduled desludging
- Technical specifications for quality assurance in FSSM

5.1 Waste products and their characteristics



The slide provides details of the waste produced by each person in a year. To flush 50 L of faeces, approximately 14,500 L of water is used for flushing per person per year. This type of wastewater is known as brown water because of its colour and content. Brown water is the most hazardous type of domestic waste, since it contains pathogens. Adding to this 500 L of urine, the total tally of black water generated from the user interface such as a toilet is approximately 15,000 L. The addition of urine adds the nutrients required for initiating the digestion process, which turns the water black.

At household level, approximately 28,500 L of grey water is produced from bathrooms, kitchens and hand wash basins. Grey water ideally does not contain pathogens and is significantly less polluted as compared to brown or black water. When the black and grey water is mixed, the mixture is commonly known as domestic wastewater or sewage. Thus, approximately 43,500 L of wastewater is produced per person per year.

Difference - Sewage and Septage

- Main waste products - sewage, faecal sludge and septage
- Parameters - solids concentration, organic matter, nutrients, pathogens and metals
- Comparison between septage and sewage

Parameter	Septage	Sewage	Ratio of septage to sewage
TS	40,000	720	55:1
TVS	25,000	365	68:1
TSS	15,000	220	68:1
VSS	10,000	165	61:1
BOD_5	7,000	220	32:1
COD	15,000	500	30:1
TKN	700	40	17:1
NH_3-N	150	25	6:1
Total P	250	8	31:1
Grease	8,000	100	80:1

Source: United States Environmental Protection Agency (USEPA) Handbook on Septage Treatment and Disposal

The main waste products in the wet sanitation systems are blackwater, sewage, faecal sludge from pits and holding tanks, and septage from septic tanks. While the sources of these products are the same, the parameters indicating the pollutants caused by the waste material are not the same.

The important parameters which identify the strength of the wastewater are solids concentration (TS, VS, TSS, VSS), organic matter (indicated by COD and BOD), nutrients (in terms of N and P), pathogens, and metals. The concentration of these parameters varies amongst the waste products due to several factors. However, it is necessary to know the values of these parameters and their corresponding values for other waste products.

The table shows the comparison between septage and sewage. It is clearly evident that septage has higher concentrations of all pollutant parameters as compared to sewage. A high TS concentration for septage in comparison to sewage is a result of accumulation for a significant time period in a containment unit. Another indicator of slow digestion of septage during accumulation in a containment unit is the high volatile solids. The resulting solids from this slow digestion process is inorganic in nature indicated by the high COD value of septage in comparison to sewage.

Waste products in sanitation

- Characterisation ratios - indicates degree of treatment required
- Significance of comparing waste products based on characteristics

Ratio (gm/gm)	Public toilets	Septic tanks	Medium strength 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

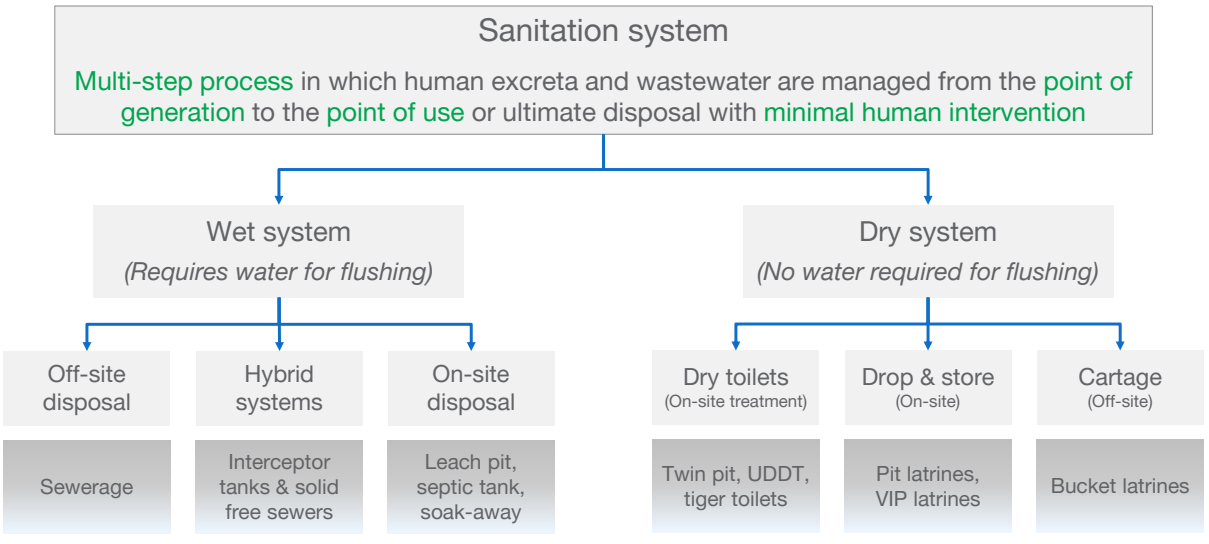
Source: Linda S. et Al. (2014) Faecal Sludge Management

By characterising waste products, one can get the characterisation ratios of parameters that indicate the degree of treatment required. For example, higher VSS concentration means the need to provide stabilisation as one of the treatment processes. Another example is the COD:BOD ratio that indicates the biodegradable fraction of organic matter.

Comparing the characteristics of different waste products is thus important to understand how to deal with them. This indicates two important aspects critical to FSSM: a) handling of septage should be carried out safely and monitored carefully, and b) treatment systems designed for sewage cannot be simply shifted to treat septage even though the treatment mechanisms are the same.

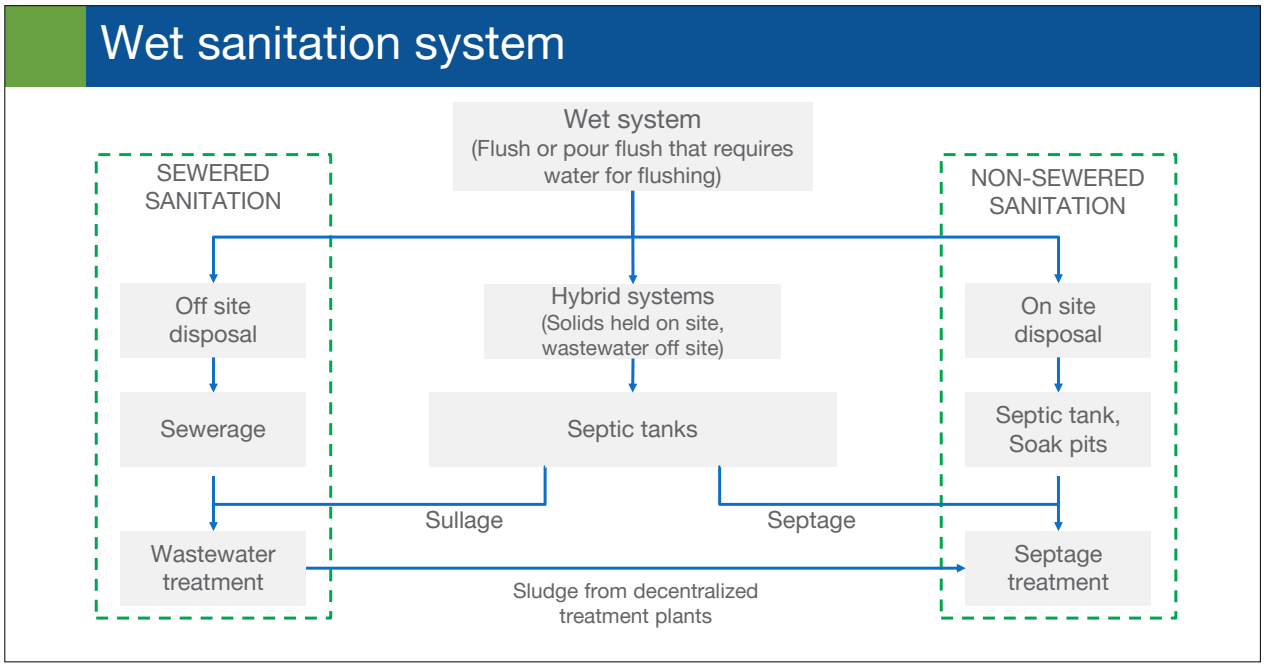
5.2 Sanitation System Approach and FSSM value chain

Sanitation system



Sanitation system is a key component of infrastructural services provided to citizens to maintain a safe, healthy, and hygienic living conditions. It can be defined as a multi-step process in which human excreta and wastewater are managed from the point of generation to the point of use or ultimate disposal with minimal human intervention.

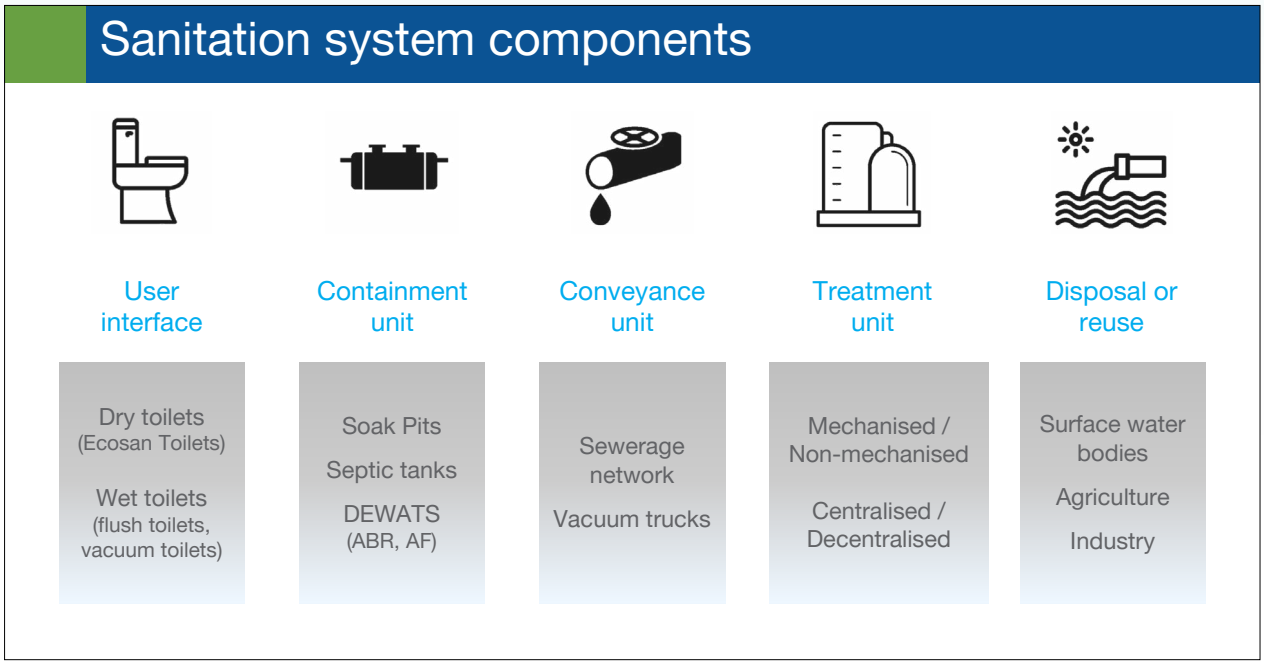
Broadly, a sanitation system can be classified into two categories: wet and dry systems. This categorisation is defined on the basis of water availability for sanitation. And in this session, the focus of discussion will be on the wet system.



Wet system is the most sought-after type of sanitation system because of its easy usage, operation, and dealing with the waste. However, it is a myth that a wet system is easy to operate and maintain.

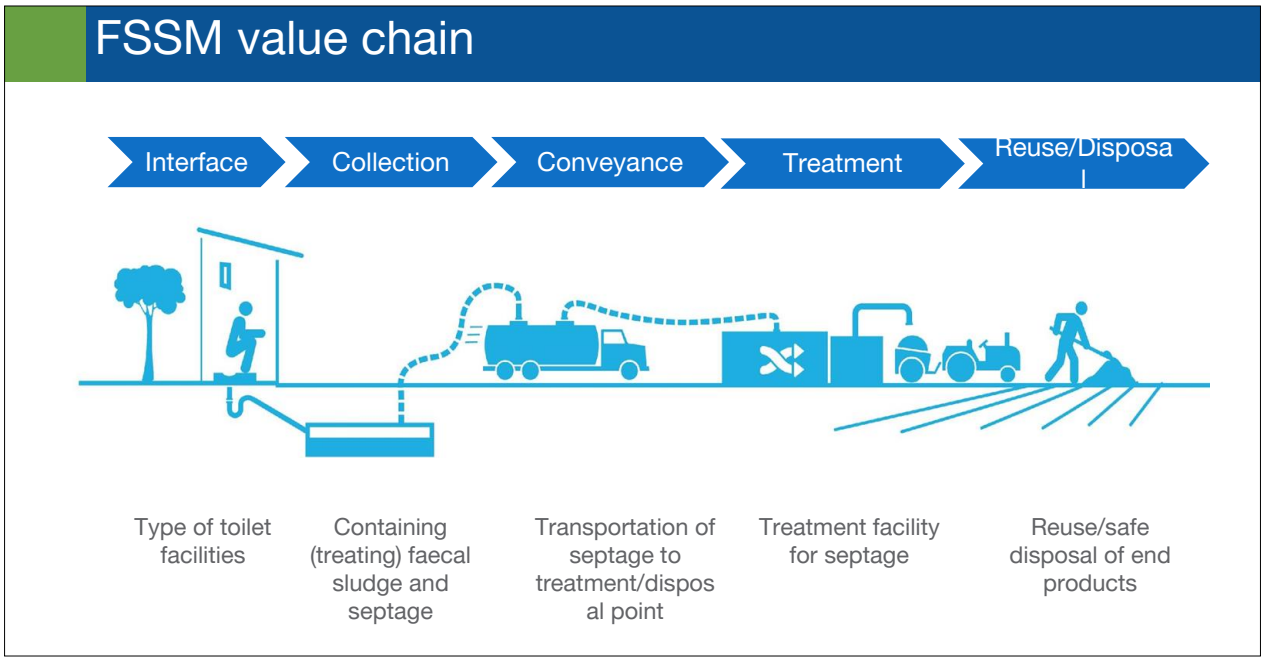
Under a wet system, if the waste is collected through a network of pipes that convey the waste from source to the point of treatment or safe disposal, it is termed as 'sewered sanitation' and it entails offsite disposal of toilet waste. The network of pipes responsible for the offsite disposal of waste products is called a sewerage network. And with the growing concerns regarding environmental pollution and damage to our natural ecosystem, it is absolutely necessary for providing a certain degree of treatment to the collected sewage before disposal.

On the other hand, non-sewered sanitation systems are those systems that collect and store waste at the source for a specific time period before being collected for further treatment. In such sanitation systems, the waste is collected on-site in containment units like septic tanks, soak pits, etc. And the accumulated sludge is collected after a specific time period and in regular intervals for treatment.



Considering sewered type of sanitation, it is clear that the waste from the source has to be disposed off-site where it needs to undergo treatment before disposal. However, one needs to understand the different components that make up such a sanitation system.

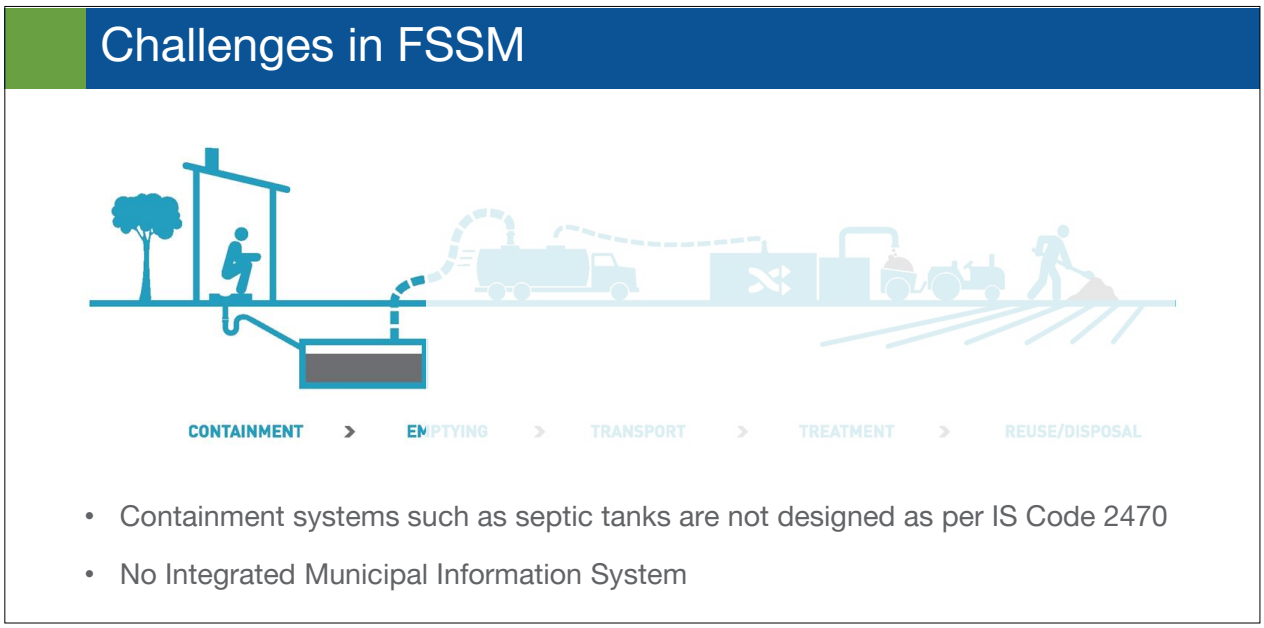
If one imagines each step of the sanitation system, the five important steps are as shown in this slide. The first point where the waste product is generated includes a user interface that is designed to safely collect human urine and excreta. Next, the waste can be collected in a containment unit or a conveyance unit depending upon the availability of sewerage connections. Following this is the treatment step where all the toilet waste is brought together to create a homogeneous mixture for proper handling of waste matter. Ultimately, the treated waste products are either disposed of or reused depending on the extent of treatment provided.



Faecal sludge management refers to the processes for building a sustainable and environmentally safe infrastructure from containment to end use or disposal of faecal sludge from on-site sanitation systems (OSS). It is imperative to look at these processes as a value chain where value can be added at each stage. The sanitation value chain also provides a useful method to divide different FSSM processes into different activities and identify the type of improvement that may be required.

In order to ensure efficient and end-to-end FSSM, planners need to assess services across all links in the FSSM value chain. The first link – access – refers to the type of toilet facilities available to the end user. Open defecation, if any, is also covered under this. Collection refers to the ways of containing, and sometimes treating, faecal waste. These are usually septic tanks, twin pits, single pits. Conveyance refers to the ways in which FSS is removed from containment systems and transported to treatment and/or disposal sites. FS should then be treated and rendered fit for appropriate disposal or reuse as per prevailing quality standards.

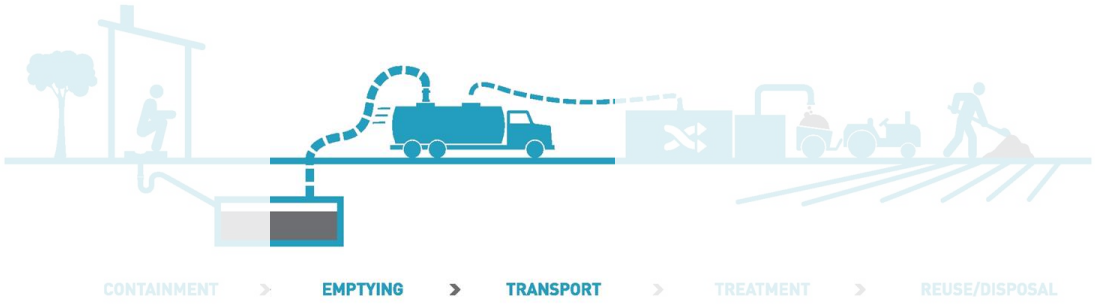
5.3 Challenges in FSSM



At the containment level, the major challenges faced are:

- Lack of standard practices in terms of construction and operation of septic tanks, pit systems, etc. This affects the successive steps in the FSSM service chain as well as can be a reason for degradation of human and environmental health.
- While data for access to toilets is readily available and improving steadily, the same cannot be said for containment units. It is necessary to build a database of containment units for every city relying on non-sewered sanitation systems. This is essential for ULB officials in providing information under various national missions and programs along with project proposals. Also, the database is useful while implementing or modifying the FSSM plan based on the requirements of the people.

Challenges in FSSM

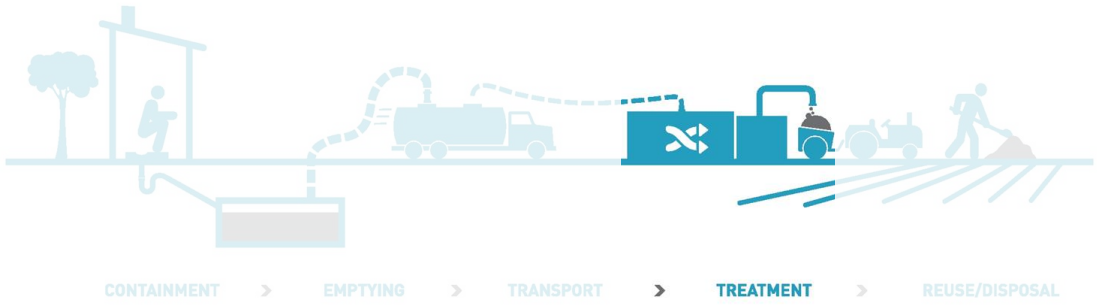


- Demand based desludging leading to over design of plants
- Lack of regulations leading to irregular and unplanned practices
- Lack of enforcement of laws leading to manual scavenging

For emptying and transport of sludge from containment units, the major issues faced are:

- Desludging is practiced only when it is deemed necessary, i.e., when it's backflows through the toilet or top cover of the containment unit starts leaking. This is a consequence of lack of standard practice applied during construction of containment units. Moreover, it is now mandatory for ULB officials to create a database of containment units and ensure that they are upgraded as per the latest guidelines issued by the respective government body.
- Practice of desludging is largely informal leading to a stigmatised approach to this step in the service chain. It is often observed that the people employed to clean containment units belong to marginalised communities. Lack of a formal approach makes it harder for these service providers to ensure proper mechanisms to perform their duties without causing any personal damage or loss. Furthermore, the informal nature of service provision has led to private players indulging in illegal and unplanned practices while charging a steep price for service provision.

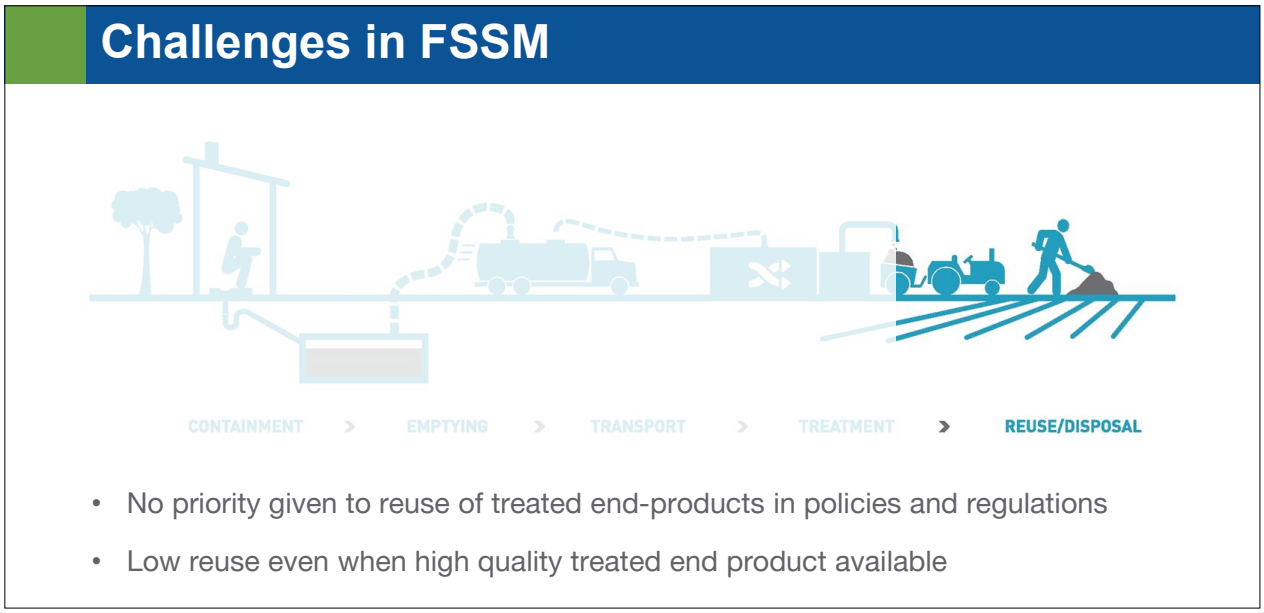
Challenges in FSSM



- Very few treatment plants available for safe handling of faecal sludge and septage which leads to indiscriminate disposal
- High cost of treatment due to strict standards of treated wastewater disposal

Two main challenges faced in terms of treating faecal sludge and septage are:

- In general, the number of treatment plants dedicated for dealing with faecal sludge and septage are low in number. On the other hand, the number of containment units and the amount of sludge collected from these units is rising. As a result, cases of illegal, indiscriminate, and direct disposal of collected sludge into the environment are observed.
- Moreover, applying strict and stringent standards applicable to wastewater treatment for faecal sludge and septage treatment makes the cost of treatment high. This creates an issue for designing and implementing FSTPs leading to discharging sludge directly to land or in wastewater treatment plants without proper precautions.



Final step of the FSSM service chain has challenges as a consequence of the challenges in the earlier steps:

- Absence of policies and regulations for treatment of sludge does not yield a reliable quality of treated end products. This is a major drawback for recovering resources as well as creating a steady stream of revenue for treatment.

5.4 Quantification of faecal sludge and septage

Why quantification is necessary?

- Type of desludging envisaged
  - Demand desludging
  - Scheduled desludging
- Scale of collection and transport network
- Identifying discharge sites (co treatment)
- Proper sizing of infrastructure
  - Faecal sludge and septage treatment plant
  - End-use and disposal mechanism

Quantification of the faecal sludge and septage and the data needed to arrive at the number largely depends on the type of desludging envisaged in the city. Quantification is a real challenge in case of demand desludging where in-depth understanding is required about the behaviour of households towards emptying of their septic tanks. In case of scheduled desludging, the data can be collected from the ULBs and coupled with sample surveys. However, to operationalize scheduled desludging, appropriate regulations need to be passed at the ULB level.

Quantification is necessary for gauging the scale of collection and transport network, identifying the number and types of discharge sites. It is also needed to arrive at the required design capacity of the FSTP and adopt an appropriate financial model for sustaining the FSSM services.

Methods of quantification

Sludge production method

- Estimates total sludge production
- Starts with primary data collection – household survey
- Carried out in case of scheduled desludging

Sludge collection method

- Estimates sludge loading rate at the treatment plant
- Start with collection and transport companies (legal & illegal)
- Carried out in case of demand desludging

Many assumptions need to be made in both the methods due to lack of available information!

There are two methods of quantification - production method and collection method. The sludge production method is based on the standard septage generation rate. This method needs to be followed where scheduled desludging is practiced. The sludge collection method is based on the quantity of the septage collected from households by existing vacuum trucks and its operators. This method needs to be followed where demand desludging is followed.

However, one needs to understand that both methods individually are not completely reliable and require assumption. Hence the methods need to be tweaked depending on the data already available with the ULB and ground conditions.

Sludge production method

- Number of users
- Location
- Types and number of various onsite systems
- Population of different socio-economic levels

IS: 2470 Code for practice for Installation of Septic Tanks (Part 1: Design Criteria and construction)- 1985

Volume of digested sludge
0.00021 m^3/cap/d ~ 76.65 L/cap/annum

US EPA: Technology Transfer Handbook on Septage Treatment and Disposal

Average per capita septage generation
230 L/cap/d

The sludge production method is based on the empirical number called volume of digested sludge in a septic tank. As per IS 2470 which gives the practice of installation of septic tanks, the volume of digested sludge can be calculated as 0.00021 cum per person per day. In the USA, the septage generation rate varies from 190 L/cap/d to 265 L/cap/d; whereas the same in Germany is between 110 to 4380 L/cap/d. In the US EPA manual, the average septage generation is recommended as 230 L per capita per day. However, this number needs to be used carefully as it differs depending on criteria linked to dietary habits of the person and usage of the toilet.

Challenges faced

- Quality of septage varies significantly;
  - Faeces production varies significantly with dietary habits
  - Quantity as well as quality varies
  - Volume of urine excreted also changes depending on liquid consumption, physical activity, and climatic conditions
- Non standard dimensions and type of containment units
- Not all waste that is generated gets collected

The sludge production rate may vary depending on dietary habits. It's not just the quantity but also the quality which may change due to this. The scarcity of data pertaining to onsite sanitation systems (containment units) built is quite prevalent in ULBs. Since desludging frequency is not set, not all faecal sludge which is generated every year is collected annually.

Sludge collection method

Factors affecting the collection

- Acceptance and promotion of FSM
- Demand for emptying and collection services
- Availability of legal discharge or treatment sites

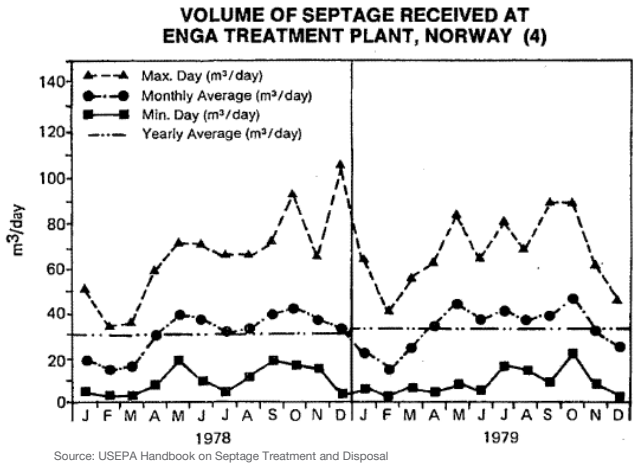
Volume estimates

- Interviews, site visits, and a review of internal records of FS C&T companies
- Number of collections/day, volume of FS /collection,
- Average emptying frequency at the HH level,
- Estimated proportion of the population that employ the services of C&T companies

The sludge collection method relies on the inferences drawn from structured interviews conducted with various stakeholders in FSSM. There are various factors affecting the collection and all are taken into consideration during the data collection.

A structured interview consists of direct and indirect questions leading to data needed for assessing the quantity of faecal sludge and septage collected on a daily basis. Inferences need to be drawn from the responses received during the interviews.

Seasonal variation



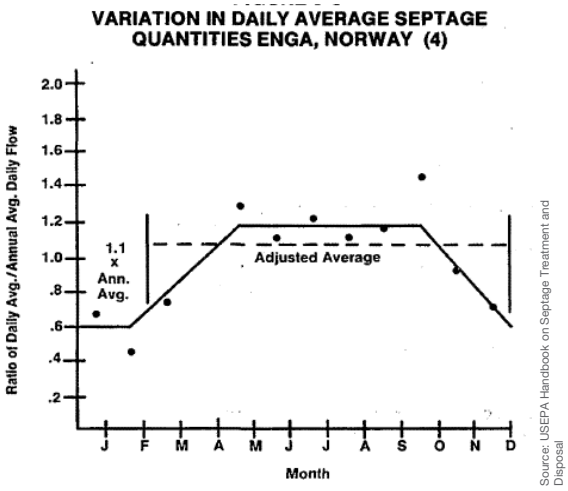
Source: USEPA Handbook on Septage Treatment and Disposal

- In demand desludging,
  - Demand increases during monsoon
  - High frequency in places with high ground water table
- Consistent demand through out the year;
  - Hotels, schools, restaurants
  - Community and public sanitation blocks

Seasonal variation needs to be taken into consideration during structured interviews. The graph on the slide shows that the average monthly collection differs for the same plant. In case of demand desludging, the demand for septic tank emptying might increase or decrease depending upon certain factors such as high intensity rainfall leading to overflow of septic tank, and decrease in ambient temperature leading to reduction in digestion rate. However, there are still some properties such as restaurants and commercial offices, and public sanitation facilities which regularly desludge the septic tanks throughout the year.

Peaking factor

- The ratio of the maximum to the average quantity
- Ranges from 1.5 to 4.0
- Will vary from city to city
- Extensive data collection to avoid risk in estimating design capacity
- Treatment facility to accommodate the change in loading



Source: USEPA Handbook on Septage Treatment and Disposal

Peaking factor needs to be understood while estimating the quantity of septage. The peaking factor caters to the variations in the monthly collection of septage. It can range from 1.5 times to 4 times the monthly average. This needs to be fixed based on the inferences drawn from the structured interviews.

Challenges faced

- Number of discharge location or demand for the septage
- Affordability of tipping fee
- A large informal sector is working in the business of "septic tank cleaning"
- Not all what is collected reaches the treatment plant!
- Identification of new legal discharge point might increase the frequency of the desludging

The quantity of septage collected also depends on availability of discharge locations or demand of septage among farmers. If there are multiple discharge points available, then operators will not have to turn down the request of the septic tank desludging. The collection might also change depending upon the desludging fees. A large informal sector exists in emptying of septic tanks which goes unmonitored. Not all the collected septage reaches the designated discharge point for treatment. In absence of proper monitoring, the FSTP might still receive less septage because of indiscriminate disposal.

5.5 Demand and scheduled desludging

Demand desludging

- Customers request for service
- Service may be performed by public or private operator

Advantages

- Provides the households more control as they determine when to request for service
- No requirement of database of septic tanks for MIS and collection of sanitation tax

Disadvantages

- Containment may be full before the request for service
- Lump sum payment at the time of service
- Expensive as the process is time consuming
- No opportunities for optimisation of the service
- No guarantee of income/month for the

Desludging of containment units such as septic tanks is critical and should be practiced at a regular frequency. However, currently in India, ULBs are practicing demand desludging. The provision of desludging services upon request by the household is called demand or "on-demand" desludging. The household can opt for calling a private operator or the ULB for availing this service. Demand desludging has more disadvantages as compared to advantages.

Disadvantages:

- Usually, the households call for the service only when there is an emergency such as back flow from the septic tank or bad odour from the toilets. This essentially means that the containment system is full (more than a year ago or so) well before the service has been called for. Thus, increasing the pollution load on the water bodies where the sullage is disposed.
- The charges for the desludging service are fixed by the private operator based on the ground conditions. These charges can be usually high depending on how worse the situation is. In case of ULBs, the charges are usually fixed and quite affordable but the service is not prompt and hence households do not opt for this option.
- The process of desludging is time consuming as the scum on the top has hardened and needs to be loosened and broken-down using a jetting machine. Once the scum is broken down, the contents of the septic tank are mixed well using a jetting machine or rods and vacuumed out of the septic tank into the truck. However, the solid content of such cases is quite high and hence the vacuum pump cannot work in the optimal range of vacuum and is inefficient.
- Since the call for service can come from any part of the town and households located at varying distances from the treatment/disposal point, there is no scope for optimisation of service making it more expensive.
- Since there is guarantee of income per month for the operators, this discourages the private enterprises from entering into this business. Moreover, the existing operators might tend to charge more in absence of proper regulations.

Scheduled desludging

- Regular and periodic emptying service provided to the household
- Zone by zone desludging
- Financial management with ULB

Advantages

- Ensure the performance efficiency of septic tank
- Helps to preserve environmental health
- Avoids emergency situation- preventive measure
- Cost effective through program efficiency
- More affordable to the property owners

Disadvantages

- Requires a strong IEC and BCC
- Difficult to be practiced in ULBs with low tax collection efficiency
- Different sludge accumulation rates and FS storage capacities makes estimation of “optimal frequency” difficult

Scheduled desludging is a concept where the containment units are emptied at a fixed frequency decided by the ULB. The households are informed in advance regarding the service time. Financial management is to be done by ULB. The advantage of practicing scheduled desludging is that it helps the septic tank to perform consistently. Since the scum is still soft, the desludging process is quite easy and requires less time. The cost of desludging can be brought down by optimising the route. Since the cost of desludging reduces, it becomes more affordable to households.

Although there are advantages, scheduled desludging does face some challenges. Operationalising scheduled desludging requires a strong IEC campaign. If the desludging charges are to be recovered in the form of tax, then the ULB should focus on increasing and maintaining the tax

collection efficiency. In this case, ICT can be used for improving the performance. Since the sizes of the tank and sludge accumulation rates can differ, the optimal frequency of the desludging cannot be gauged easily.

5.6 Quality Assurance in FSSM

Quality assurance in FSSM

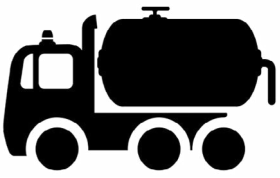
- Quality assurance to be ensured at each stage of FSSM
- Performance efficacy and efficiency - manual to mechanical intervention
- Draft, use and enforce Standard Operating Procedures
- Electro-mechanical equipment – Preventive maintenance
- Monitoring protocol to be followed for sampling and testing

Promote reuse of end products – Indirectly regulates the complete service chain in FSSM

At every step in the FSSM service chain, the efficacy and efficiency of the performance requires a combination of manual and mechanical intervention. Certain best practices and standards should be strictly adhered to in order to ensure the good health and working conditions for both man and machine. With regards to standards and operating procedures for electro-mechanical equipment used in the service chain, they are to be made available by the respective manufacturer as part of the O&M plan. It is necessary to provide training by the manufacturer to the service providers in ensuring the best practices are followed. Quality assurance at each step of the FSSM service chain involves a certain set of best practices to be followed. Also, end products quality should be as per certain standards prescribed under Indian standards, PCB, and the CPHEEO.

Collection and Transportation Stage

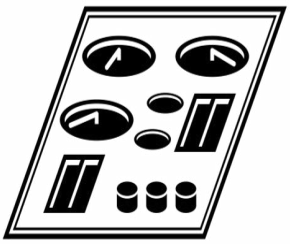
- Follow practice given in **IS 11972 (1987)**
- Use protective and safety equipment
- Vacuum truck to conform to **IS 13496 (1992)**
- Ensure accountability through 3 copy service slip



Whether the mode of sludge collection from onsite containment units such as septic tank, pit latrine, etc. is manual-mechanical or purely mechanical, it is critical for all personnel involved to wear personal protective equipment (PPE). A PPE kit mainly comprises wearables that protect the head, eyes, lungs, and limbs of the person. It is also important that the personnel wearing PPE kits should be checked for appropriate measure and fit. Transportation of collected sludge can be done using a tanker mounted on a truck or a tractor. Pumping mechanisms used in such types of desludging can either be vacuum pumps or positive displacement pumps. However, main technical specifications to be followed to comply with standards should look into the registration of vehicle for desludging purposes with specified load carrying capacity on slopes, test certificates for pumping equipment, colour and volume of tank container, suction hose system for cleaning and instrumentation as per requirement under FSSM byelaws.

Treatment Stage

- Similar to wastewater treatment
- Currently no definite standards for biosolids
- Three sets of guidelines mostly followed in the treatment of faecal sludge and septage:
  - for biosolids - WHO and USEPA guidelines
  - for liquid waste - PCB guidelines
  - for air emissions under incineration process - PCB guidelines under SWM rules



Treatment of faecal sludge and septage (FSS) is considered to be similar to wastewater treatment. However, the standards and technical specifications applicable to FSS treatment are not yet defined by the pollution control authorities; also, all wastewater treatment standards cannot be applied directly. Currently, the norm followed for FSS treatment in India includes following WHO and USEPA guidelines for dealing with biosolids, PCB guidelines for treating liquid waste material, and PCB guidelines for incineration of hazardous materials under SWM rules (2016) for monitoring emissions.

Summary

- Faecal sludge, septage and sewage are similar but not same!
- Understanding ground challenges is key to planning FSSM
- Methods and challenges of quantification of faecal sludge and septage
- Pros and cons of demand and scheduled desludging
- Maintain quality assurance to improve the sanitation service delivery

Session

06

Stakeholder Engagement Tools and Programs

Learning objectives

- To understand the process of identification and characterisation of stakeholders
- To learn about stakeholder engagement and different tools involved in it
- To understand the IEC and BCC activities focussing FSSM planning

Contents

- Stakeholders Analysis
- Engagement with Stakeholders
- IEC and BCC activities for FSSM

6.1 Stakeholder Analysis

Stakeholders

Any group, organization or individual that can influence or be influenced by the development of FSSM project, are considered as stakeholder.

Key stakeholders

- Urban Local Bodies
- Households

"People who matter".

Marginal stakeholders

- Sanitation sector experts
- Universities

Managing faecal sludge at the city-level efficiently and sustainably requires the involvement and support of all concerned stakeholders. Neglecting the needs, priorities and interests of people as well as their culture, and economic reality is one of the significant causes of failure for water and sanitation programs in low and middle-income countries.

For planning and implementing FSSM project, you should consider those who:

- Are responsible for the project and its different components (including funders, WASH officials from different sector offices, managers, employees, etc.)
- Are intended users or beneficiaries
- Are negatively affected by the project but may not be in a position to say so
- Might threaten the success of the project through their opposition or lack of cooperation
- Could represent the interests of people unable to participate
- Have unique knowledge related to an aspect of the project.

Importance of Stakeholder Analysis

- Identify and characterize stakeholders
- Level of a project:
  - Planning
  - Execution
  - Monitoring and evaluation
- Understand social and institutional context
- Planning of stakeholders' participation
- Engage and build trust amongst stakeholders

Why is stakeholder identification and analysis important?

- To identify who to involve and at which level of participation, at the different stages of the planning and implementation process
- To understand the social and institutional context
- To identify conflicts and interests between the stakeholders.
- To clear the roles and responsibilities of each stakeholder in every stage of the project.

Why is stakeholder analysis important?

- Lack of influence and recognition
- Constraints in collection and transport business
- Lack of resource and capacities, lack of awareness
- Tensions between stakeholders, power games

Lack of agency to participate: a) Lack of Influence and Recognition b) Lack of understanding the official language c) Lack of Money.

Constraints in the sludge emptying business: a) Costs of sludge transport b) Lack of available land for FSM activities.

Lack of resources and capacities: a) Lack of management capacities b) Lack of human resources c) Laws are incomplete or not enforced d) Poor tax recovery.

Awareness and Behaviour: a) Lack of awareness.

Tension between stakeholders: a) Power games/competition b) Lack of communication and coordination within and between agencies c) Tensions in between formal and informal sectors.

Stakeholder Analysis

Identification of Stakeholders

- Who are interested in the intended initiative?
- What is their role?
- Who are the potential beneficiaries?
- Who might be adversely impacted?
- Who has constraints about the initiative?
- Who may impact the initiative? Who has the power to influence?

Stakeholders in FSSM

Municipal authorities

Regional authorities

Utility service provider

Traditional authorities & influential leaders

Desludging operators

NGOs, CBOs active in WASH

Primary and End users

Stakeholders identification is one of the first tasks when starting a new project. Collaboration with local facilitators is essential to get the situation under control quickly. Identifying stakeholders is an iterative process, during which additional stakeholders are added as the analysis develops. Identification of the stakeholders can be done by answering simple questions shown on the slide. The slide also gives common stakeholders in FSSM for reference; however, it should be noted that this list is not exhaustive.

Characterisation of stakeholders

Stakeholder	Interest	Opportunities /Threats	Involvements Needs
Urban Local Bodies	Public health Sanitation work Sanitation fees	Power of enforcement through regulatory framework Management of treatment units	Sensitisation, need for capacity building, collaboration Institutional and regulatory framework, enforcement Involvement of financing schemes
Stakeholder B			
Stakeholder C			
...			

Main interest: Consultation with stakeholders should be carried out in order to determine how each interest can be taken into account in the future FS systems.

Strength: Establish what the process leader can count on.

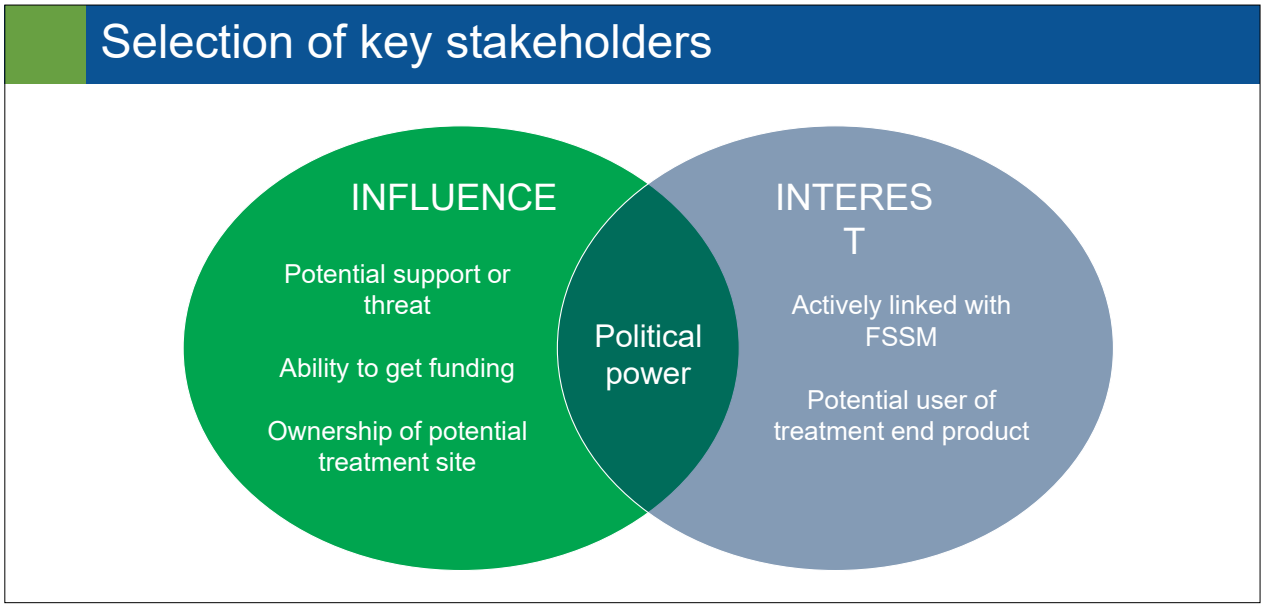
Weakness: Establish where information, empowerment and capacity building is needed.

Opportunities/threats: Characterise the potential positive (negative) perspective of the project.

Relationship between stakeholders: Hierarchy, friendship, competition or professional link. Good, bad can decide which working groups can be built.

Impact: Type of impact of the project on the stakeholder determines the measure needed to maximise positive impact and mitigate negative impact.

Involvement needs: The action required, results mainly from identified interest, weakness and potential.



Key stakeholders in an IWSM project are those whose interest and influence are most at stake.

There are six criteria or attributes which are important for the selection of key stakeholders:
1. Activity linked with IWSM management
2. Political power
3. Potential support or threat
4. Ability to get funding
5. Ownership of a potential treatment site
6. Potential user of a treatment end product.

Missing key stakeholders in sanitation planning

Sanitation planning is done with a fixed mindset: providing access to toilets, conveying wastewater through sewer network, and treatment prior to disposal

Lack of Consultation with Key Stakeholders

WOMEN

CHILDREN

URBAN POOR

PEOPLE WITH SPECIAL NEEDS

City Wide Inclusive Sanitation consciously ensures involvement of all the key stakeholders in an equitable manner.

Traditionally, sanitation planning is done using a fixed mindset of providing access to toilets, collection and conveyance of wastewater through sewerage networks and setting up a treatment facility before disposal. However, the affordability, sustainability of this approach was not validated and stakeholders' demands were not completely catered to through this approach. The slide showcases the importance of CWIS approach to create stakeholder engagement. Out of the 7 principles, equity, inclusivity, gender is highlighted in 4 principals.

Influence and Interest matrix

	Low influence	High influence
Low interest	Not closely involved in the project and only require information sharing aimed at general public. INFORMATION	May oppose the intervention. Should be kept informed and acknowledged to avoid disruption or conflict. CONSULTATION – INFORMATION
High interest	Require special efforts to ensure that their needs are met and their participation is meaningful. CONSULTATION - EMPOWERMENT	Should be closely involved to ensure their support for the project. CONSULTATION – COLLABORATION – EMPOWERMENT / DELEGATION

It is important to differentiate between two different types of opportunities and threats; the influence over the project and the interest in the project. The two concepts can be defined as:

- Influence: Is the power that stakeholders have on the project, i.e., to control which decisions are made, facilitate their implementation, or affect the project negatively.
- Interest: Characterizes stakeholders whose needs, constraints and problems are a priority in the strategy. Eg., sludge service providers, end users, households and sanitation authorities.

6.2 Stakeholder Engagement

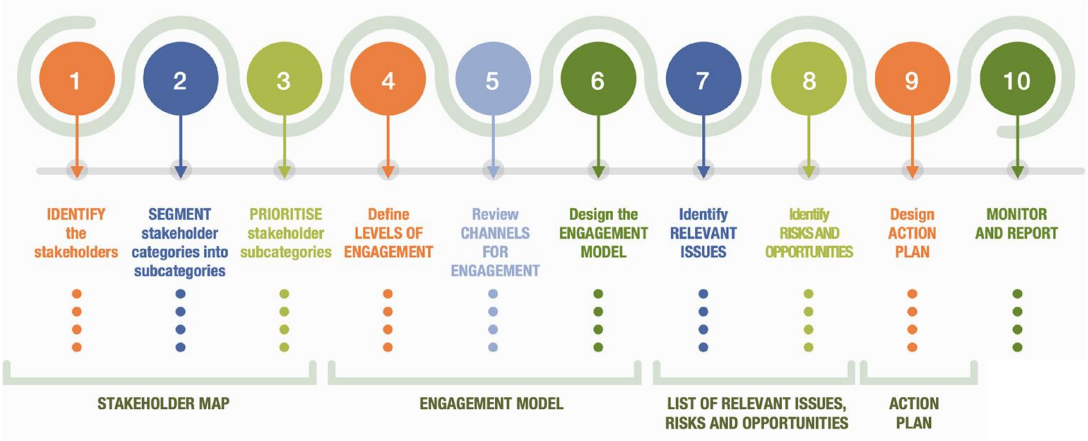
Importance of Stakeholder Engagement

- To take into account stakeholder needs and priorities
- To avoid conflicting interest and goals
- To develop an appropriate project design
- To take ownership of the project
- To build consensus on the project framework
- To develop skills, confidence and trust with stakeholders
- To increase sustainability of the project

Thus, resulting in securing the investment in the terms of time and money

Stakeholder Engagement

Including stakeholders in the planning process in order to consider their needs, priorities and interests, to achieve consensus and to remove opposition.



Stakeholder engagement or stakeholder involvement is key for the successful implementation of faecal sludge management (FSM) projects. It is the art of including stakeholders in the planning process in order to take into account their needs, priorities and interests, to achieve consensus and to remove opposition. Stakeholder engagement is largely about defining the participation level of people in the process and how to best answer their needs (e.g., through awareness raising or training and capacity building).

Stakeholder Participation Matrix

		Participation Level			
		Information	Consultation	Collaboration	Empowerment/ Delegation
Planning	Launch of planning process	All stakeholders		Municipality, utilities	
	Detailed assessment of current situation		Key Stakeholders	Municipality, utilities	
	Identification of service options		Key Stakeholders	Municipality, utilities	
	Development of an Action plan	All Stakeholders	End users	Municipality, utilities, FS operators, NGOs	Empower weak and non-organised groups
Implementation		Households, traditional authorities and opinion leaders	End users	Municipality, utilities, FS operators, NGOs	Empower and delegate to municipality, utilities, FS operators, NGOs
Monitoring and Evaluation		Key Stakeholders	Households, FS operators, end users	Municipality, utilities, selected NGOs	

Source: Strande L. et al., (2014) Faecal Sludge Management

Information: Objective is to enable the stakeholders to understand the situation, the different options and their implications. This is a one-way flow of communication.

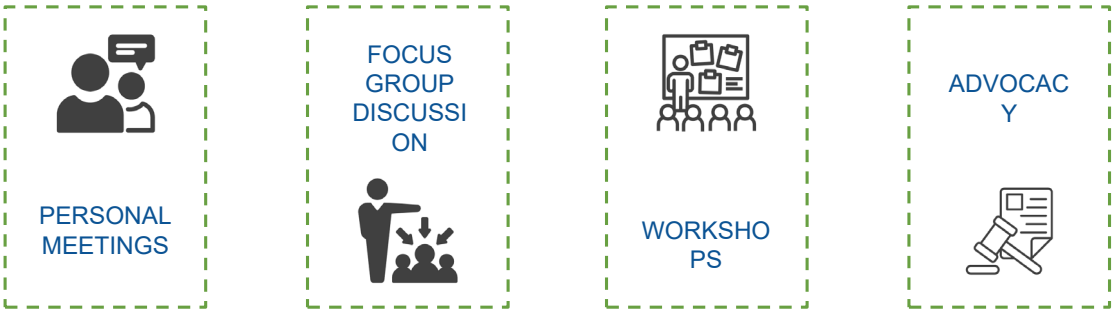
Consultation: Objective is to have stakeholders' feedback on the situation, options, scenarios and / or decisions.

Collaboration: Objective is to work as a partner with the stakeholder on various aspects such as creating scenarios and identification of preferred solutions.

Empowerment / Delegation: Objective is to build capacities of the stakeholders so that they can make informed decisions, take responsibility for final decision making, and assume their roles and responsibilities in the FSM system.

Involvement Tools

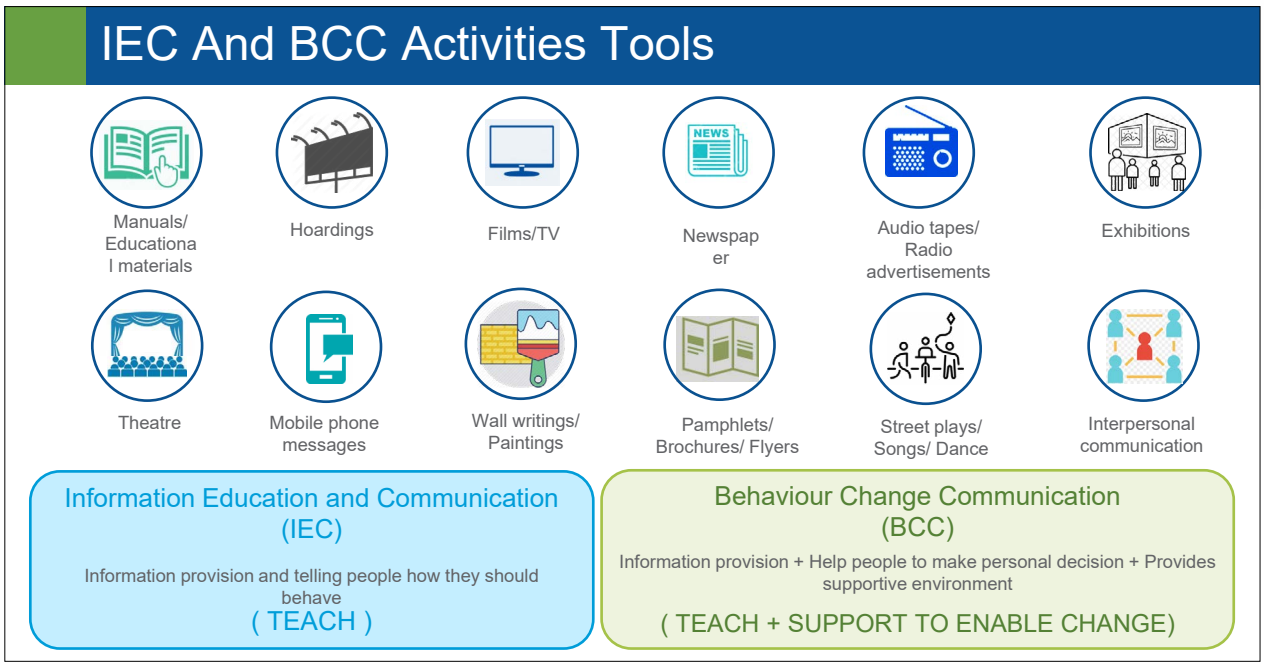
Consultation – Collaboration – Empowerment – Delegation



The engagement with the stakeholders is to be done in the form of Consultation, Collaboration, Empowerment and Delegation. In order to perform this, different tools are utilized. Some of the common involvement tools are listed on the slide. Consultation can happen through personal

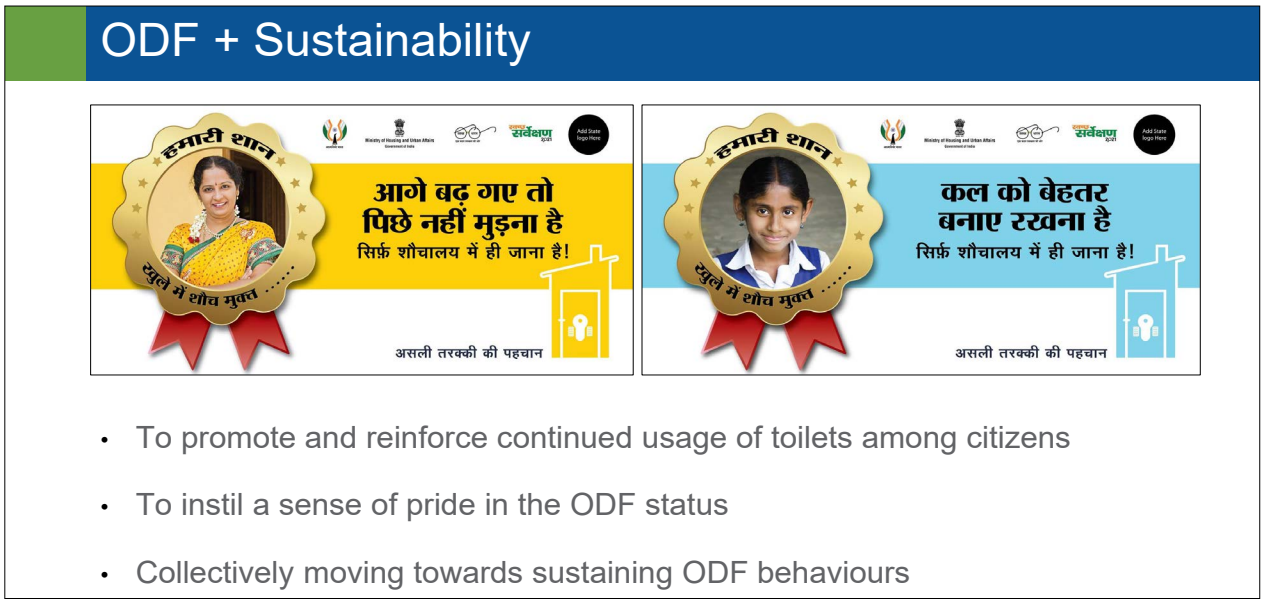
meetings, focus group discussions and workshops. Collaboration can happen with all the four tools. Empowerment can happen mainly through focus group discussion and workshops. Delegation can happen mainly through advocacy and workshops.

6.3 IEC and BCC Tools



IEC refers to Information, Education and Communication. BCC refers to Behaviour Change Communication. BCC is one step ahead of IEC and enables the people to make decisions and provides a supportive environment.

The information can be disseminated through various mediums. The information should relate to water borne diseases, benefits of safe & potable water, hygiene practices, services provided by the department etc. The slide shows different mediums that can be used during the campaign.



For ODF+ sustainability, MoHUA released several artworks through digital handles. The aim of this was to promote and reinforce the use of toilets and sustain the ODF status. Many ULBS, used the artworks and localized it and used it for the campaigns. Notice that in this campaign, the pictures of vulnerable groups were used to bring to focus that these groups suffer because of lack of access to toilets.

Malasur Campaign

Source: BBC media

Introducing MALASUR – The Demon of Defecation

- Social and Behaviour Change Communication (SBCC) campaign
- Aims to heighten the risk perception of faecal sludge by linking it to water

Who is Malasur?

- A mnemonic; a creative property
- A visual representation of faecal sludge which is at the heart of the communication intervention.

The Malasur Campaign was launched by the Ministry of Housing and Urban Affairs. It is a campaign model for social and behaviour change communication. It is aimed at increasing awareness about the risk of the mismanagement of faecal sludge leading to pollution of water. To effectively communicate the message, the campaign introduced Malasur – the demon of defecation. Various artworks centered towards Malasur were released in this model campaign, which were used by the ULBs for conducting the campaigns at their respective local levels.

Malasur Campaign

Pattamundai Municipality, Odisha

Chunar Nagar Palika Parishad, UP

Kichcha Nagar Palika Parishad, Uttarakhand

Vadgaon Municipal Council, Maharashtra

The slide shows pictures of the campaigns in different cities in India. Notice that the campaigns were conducted in local language to effectively communicate the message to the masses.

Septic Tank Desludging

Source: Municipal Corporation Ambikapur, Chhattisgarh

Source: BBC media

For regulating the septic tank desludging frequency, certain messages were provided to the ULBs. The ULBs used this information on their digital platforms and also used the sides of the vacuum trucks to advertise the message.

Summary

- Stakeholder analysis is a vital tool for understanding social and institutional context of a project
- Identification and characterisation of stakeholders essential information about who will be affected by and will influence the project
- Stakeholder engagement ensures mitigation of future risks
- Stakeholder engagement plays a vital role in sustainability of the project

Session

07

Situation assessment - Introduction to feasibility assessment

Learning objectives

- Understand the importance of conducting an assessment of initial situation for planning of an FSSM project
- To know the different tools and methods for collecting relevant data and learn how to perform an initial situation assessment

Contents

- Assessment of initial situation
  - Data to be collated
- Tools and methods for data collection

7.1 Assessment of initial situation

Assessment of initial situation

- Acquiring the baseline information to define the rationale for the project
- Objectives:
  - Setting the rationale
  - Understanding the stakeholders
  - Collate information feeding into DPR
- Collecting good quality and useful data
- Provides a snapshot of the sanitation situation
- Data collection is a challenging but the most important process

The main goals of the assessment of the initial situation are to set the scene, understand the context, get to know the stakeholders and provide enough information to start elaborating the faecal sludge management scenarios.

This includes, among others, the definition of context-specific design parameters that allow logical plans to be made to move forward. This phase of the planning process is, therefore, characterized by data collection via different means such as maps or Google Earth.

The idea is to get a holistic snapshot of the situation.

By looking at the data collected, different situations and contexts can be identified such as existing infrastructure services, sewer networks, type of toilets, service providers and how they are organized, and whether the sludge is safely or unsafely managed.

The assessment of the initial situation is considered to be successful when: a) the process/methods used are as per the local context, and b) data gathered by these methods provide a good idea regarding the existing situation. Simply said, the need for the FSSM project will be justified based on the demand that is reflected from data on the existing sanitation situation.

However, it needs to be accepted that data collection is not an easy process. It is both time consuming and requires both human and financial resources to perform the activity in a complete and correct manner. In fact, it is often observed that places where existing data is available but cannot be relied upon due to lack of updating with time, improper collection methods, etc. Ideally, the best way forward to use existing data is to gather it from as many sources as possible. This way there is a possibility to cross-check their quality and rationale behind the data collection.

Data Requirement

DATA	DESCRIPTION
General (local) context	Population and demography, physical characteristics, climatic data, stormwater management, spatial data and city structure, and local economy
Sanitation situation	Water availability, toilet facilities (household and public), onsite and offsite sanitation system including collection, conveyance, disposal/treatment, tariffs for households, investment in infrastructure, enduses and resource recovery initiatives, key stakeholders in sanitation service chain
Practices at household level	Type toilet units, containment systems, methods and frequency of emptying, seasonal variation, and tariffs paid for emptying of containment system

The slide shows the data to be collected for the feasibility assessment. Base data from the census can be used and sample surveys can be done to extrapolate the results.

Demographics, climatic data, spatial data and local economy etc. is collected under general context. The next set of data is that of sanitation – access to water, access to toilet, onsite offsite sanitation etc. Practices at the household level should also be checked. For this sample survey proves to be useful.

Data Requirement

DATA	DESCRIPTION
Profile of sanitation service providers	Socio-economic profile, frequency of activity, remuneration patterns, access to cleaning equipment, methods and staff employed, problems encountered such as health and social pressure
Legal and regulatory framework	Laws and regulations, legal mechanism for application, enforcement, grievance redressal mechanism
Design data for treatment facilities	Sludge quantification and characterization, criteria for selection of appropriate treatment options
End product reuse/disposal practices	Treatment and disposal of sludge, treatment methods, disposal practices, reuse of treated sludge by stakeholders, and interest and willingness to pay

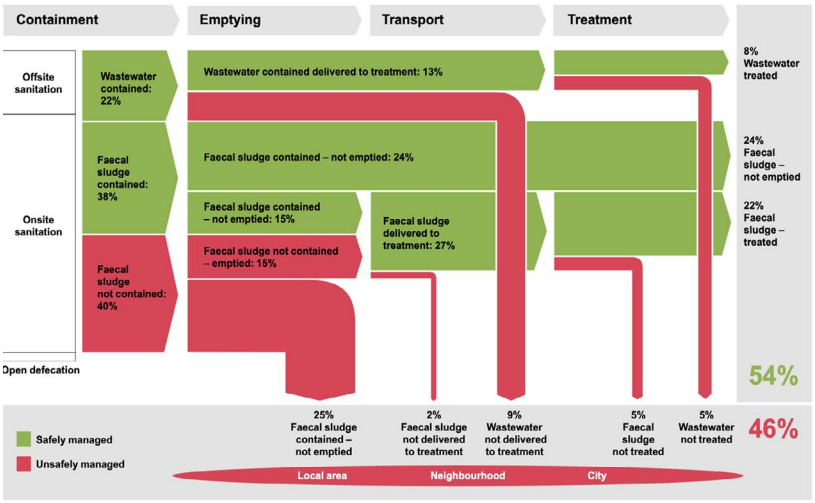
Profiles of sanitation service providers need to be gauged. For this focus group discussions with the operators is recommended. For legal and regulatory framework, one needs to check with the prevalent laws and acts at ULB and state level, as these laws and regulations might be stricter when compared to national level regulations. For characterization of the sludge, sampling needs to be done. Criteria needs to be developed for selection of appropriate treatment units. The demand for end products that is the treated water and biosolids need to be checked at the local level. If reuse is not possible, then disposal practices need to be ascertained.

7.1.1 Mapping of Excreta Management

Introduction to Shit Flow Diagram (SFD)

Shit Flow Diagrams (SFD)

- A diagnostic tool
- Understand and communicate flow of waste product
- Represents quantum of waste product handled safely.
- Represents impact of ill management of waste at different levels



Source: Blackett, I., Hawkins, P. (2019). City Service Delivery Assessment for Citywide Inclusive Sanitation

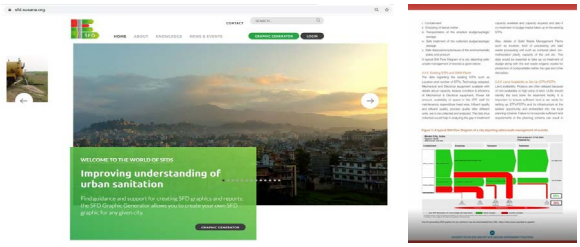
SFD is a tool to readily understand and communicate how excreta physically flows through a city or town. It shows how excreta is or is not contained as it moves from defecation to disposal or end-use, and the fate of all excreta generated. An accompanying report describes the service delivery context of the city or town.

The SFD conveys percentages of excreta transported through sewers or emptied from containment, but it's not a detailed planning tool. It also shows how much is delivered to treatment, but it's not a quantification tool with accurate volumes. Lastly, it shows percentages of excreta treated or not treated, but doesn't assess treatment performance. It is a relevant tool for advocacy and has the potential to trigger further and sustainable action when produced within the context of a project or a program and linked to planned investments.

The SFD tool uses data, specific definitions and terminology to create a graphic of excreta flows in urban areas, along with a systematic description of the enabling environment, and an overview of all data sources. The SFD helps to engage political leaders, decision makers and civil society in discussions about excreta and related investment and management priorities in their city.

SFD: Advocacy at Various level

- An effective communications and advocacy tool
- For coordinated dialogue about waste management.
- Engages political leaders, sanitation experts and civil society organizations
- A tool for engineers, planners and decision-makers to inform urban sanitation programming



To create a buying at different levels ranging from national to state to city, SFD is an effective advocacy tool to engage political leaders, sanitation experts and practitioners. In 2020 it was recognized in the advisory by CPHEEO on 'Onsite and offsite sewage management practices. To gain knowledge about the tool visit sfd.susana.org which provides a repository of more than 100 SFD of cities/states across the world. It also comprises a graphic generator which helps in creating an SFD of the city based on the sanitation data added.

7.2 Tools and Methods for Data Collection

Data Collection and Representation

Literature review	Semi-structured interviews	Household-level surveys
Qualitative field observations	Mapping	Laboratory analysis
	SWOT analysis	

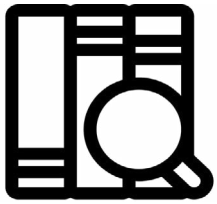
Data collection can be done in a combination of ways. Having access to literature of the city, i.e., DPRs from earlier or ongoing projects help to get introduced to the city at the start of the project. Mapping is another tool using which we can gather macro-level data to have better visualization of the city. Lot of times there is obvious information which is missing in the statistical numbers

or the previous project documents. Household and institutional surveys give better insight into perceptions, practices etc. of sanitation. Perception and practices might vary significantly. Semi structured interviews or key informant interviews is another way of collecting good quality reliable data. Qualitative field observations can be made by conducting transect walks in certain areas. Laboratory analysis is needed during the characterization of faecal sludge and septage.

Data representation can be done in a qualitative way using SWOT analysis. SWOT stands for Strength, Weakness, Opportunities and Threat. In the analysis, these four aspects for the projects are identified and systematically addressed so as to avoid any risk in the future.

Literature review

- Literature review = data gathering from secondary sources
- Reliability and authenticity of secondary data
- Primary sources = governmental agencies, NGOs,
  and international organisations
- Secondary sources = assessments studies by consultants and other actors



The literature review consists of searching data that already exists (grey literature, i.e., reports, maps, or white literature, i.e., publications). Data quality (especially with statistics) is always questionable, and, in very dynamic contexts, may become quickly outdated. The main sources of the information are always the different governmental agencies as well as non-governmental organizations (NGOs) and institutional organizations. In addition to the main source, the secondary sources include assessment studies by consultants and actors that are often not published officially.

Semi-structured interviews

- Primary source of information
- Semi-structured interviews - individuals or focus groups
- Interviews of stakeholders in presence of facilitators
- Time consuming
- Provides strong & reliable information

Semi-structured interviews

Semi-structured interviews are one way to structure discussions aimed at collecting information. The interviewers are the process leaders, usually with facilitators, and the interviewees are FSM stakeholders. Semi structured interviews can be held with individuals or in focus groups. They require time and experienced interviewers, but they help to build a solid basis for further work. Semi structured interviews are conducted with a fairly open framework which allows for focused two-way communication. They can be used to give and collect information.

Household-level surveys

- Information from primary source
- Data collected on practices as well as their perception and sanitation status
- Vital to characterisation and quantification of faecal sludge
- Important and pertinent questions without overburdening the interviewees
- Context-sensitiveness, understanding social norms, gender equity
- Tools - Kobo Toolbox, Sani Tab, M Water

Surveys or questionnaires are a way of collecting information systematically, so that data collected from different sources can be easily compared and analysed quantitatively, eg., using statistics. In FSSM, they are used to collect data at the household level in order to assess the practices, perceptions and sanitation status.

The following aspects need to be part of the household-level survey in an FSM planning process:

- **Characterization of the interviewee:** Status, family, cultural background, household size
- **Water supply:** Water sources, water quality, service quality, water consumption, costs
- **Hygiene and sanitation:**
  - Type of on-site sanitation technology (or open defecation), numbers of users
  - Type of emptying services (what happens when the pit is full) – if no sewers: mechanical/manual, public/private, frequency (winter/summer or dry/rainy season), cost, perception of cost and service, willingness to pay for improved services
- **If sewer network:** Type of sewers, problems encountered, discharge point
- **Greywater management**
- **Solid waste management:** Disposal/end-use practices

- **Stormwater management**
- **In rural areas:** Animal manure management – disposal/end-use practices
- **Institutional/organizational aspects:** Who is responsible for each service, positive/negative aspects
- **Environmental awareness:** Perception of cleanliness and health impacts, willingness to improve
- **Communications channels:** Main information sources, information on consumption habits.

Qualitative field observations

- Validate information received from surveys,
- Understand ground conditions better
- Visual ques on water, sanitation and other related challenges
- Transect walks, interviews and focus group discussions with stakeholders

Qualitative field observations

Field visits are a powerful tool for the process leaders to understand the reality better, to cross-check the available information by observing and discussing with people, and to build trust onsite with the main stakeholders. They provide an introduction to existing sanitation services and an initial understanding of conditions from the perspective of local residents. Quantitative household-level surveys are essential for good quantitative data, but freer observation is also important.

Mapping

- Visual aid focusing on interdependencies various aspects of WASH
- Understanding of city development in terms of socio-economic conditions, reach of infrastructure facilities
- Encourages participation by stakeholders
- Locations of facilities like access roads, obstacles for desludging trucks, disposal sites or treatment locations
- Development of technologies and tools have made the process more interactive in recent years

Mapping

Mapping is essential for a clear and extensive analysis of the existing situation, especially when it comes to understanding the city structure and identifying the treatment sites. Mapping is much easier in recent years with the democratization of satellite images (eg. through google earth) and geographical information systems (GIS). Participatory mapping is also recommended, as it is a good way to involve selected stakeholders. Particularly important is the identification of key elements, such as existing disposal sites or obstacles for emptying trucks (eg. road segments prone to traffic jams and poor quality of roads).

Laboratory analysis

- Building a comprehensive database of waste characteristics
- Characteristics vary significantly between and within the cities
- Sampling schedule and well equipped laboratory
- Parameters to be measured and their significance

Source: SANDEC

For characterization of faecal sludge and septage, laboratory analysis needs to be done. However, a sampling plan needs to be created and SOP needs to be made for collection, transportation of samples. The laboratory analysis should follow standard procedures as laid down in IS codes. It should be noted that the characteristics of septage can vary significantly within the city.

SWOT matrix

- Strengths, Weaknesses, Opportunities and Threats (SWOT)
- Focus on key stakeholders, organisationa and institutional framework
- Identify the positive and negative factors
  - to maximise the potential of strengths and opportunities
  - minimise the impact of the weaknesses and threats
- Enabling environment for stakeholder engagement

Source: Schall, 2004

When carrying out the initial assessment, it is important to clearly determine what are the strengths, weaknesses, opportunities and threats (SWOT) of the environment in which the FSM system has to be developed, especially the organizational and institutional framework, as well as the key stakeholders. The SWOT matrix shows the positive and negative factors that have to be dealt with, setting them out clearly in this way makes it possible to take action in order to maximize the potential of the strengths and opportunities while minimizing the impact of the weakness and threats.

Summary

- Feasibility assessment - initial situation presents, defines the purpose of the project
- Primary data collection – household surveys, semi structured interviews, focus group discussions
- Secondary data collection – literature review, assessment reports, DPRs
- Data collection is an exhaustive process but helpful for mitigating risk of potential hurdles or failures in futures
- SWOT matrix provides inference from the analysis of the data collected

Session

08

Treatment approaches in FSSM

8. Treatment approaches in FSSM

Learning objectives

- To know the factors that govern the design and selection of treatment technologies
- To understand the treatment objectives and their relation to the faecal sludge and septage (FSS) treatment chain
- To learn the different approaches available in FSS treatment

Contents

- Selection criteria for FSS treatment technologies
- FSS treatment objectives and treatment chain
- Approaches to FSS treatment

8.1 Selection Criteria Treatment Technologies

Selection Criteria

Treatment performance	Local context	O&M requirements	Costs
• Effluent and solids quality according to the discharge / reuse standards	• Characteristics of sludge (dewaterability, solids concentration, stabilisation, spread ability) • Quality of the frequency of the sludge to be received at treatment facility • Climatic conditions • Land availability and its cost • Interest in the end use	• Availability of skilled persons for O&M and monitoring • Availability of spares locally in case of mechanical equipment	• Investment costs covered (land acquisition, infrastructure, human resources, capacity building and training) • O&M costs • Affordability for households and ULB

The decision for selecting FSS treatment technologies is dependent on certain important factors as shown here:

- **Treatment performance:** An important factor to be kept in mind because the compliance to norms and regulations will determine the degree of treatment necessary and taking the right approach to FSS treatment. Moreover, this factor also gives an insight into potential reuse of treated end products thereby creating a potential revenue stream.
- **Local context:** After getting an idea regarding the treatment approach, the local context in terms of sludge characteristics and quantity plays a crucial role in order to design the treatment system. Other parameters under the local context that should be kept in mind are the climatic conditions and land availability in order to make sure that the designed treatment system is able to meet discharge standards.
- **O&M requirements:** The availability of skilled human resources or need to build capacity in FSS treatment is crucial for long-term operations of the treatment system. Additionally, having an inventory of spares and tools for conducting regular maintenance is essential to prevent continuous and uninterrupted treatment operations.
- **Costs:** Lastly, it is essential to match the design of the FSS treatment system that meets all the requirements to also justify financial investments based on the capacity of the ULB. It is often necessary to create a balance between these two aspects such that the ULB is able to ensure safe sanitation services without creating a financial burden. However, it should be kept in mind that under no circumstances can compliance to standards be compromised as it has a direct impact on health and hygiene of service providers as well as citizens.

8.2 Treatment Objectives & Treatment Chain

Treatment objectives

DEWATERING

- Reduction of design capacities
- Simplifies treatment scheme
- Gravity settling or filter drying beds
- Mechanized dewatering
- Dewaterability of faecal sludge and septage

- Adding dry material to increase solid content
  - Pyrolysis
  - Co composting
- Liquid fraction – high in ammonia, salts and pathogens

One of the very important treatment objectives of faecal sludge and septage is dewatering. Dewatering helps to reduce the volume of sludge to be handled and treated using other treatment mechanisms, hence it reduces the CapEx significantly. Separating the solids and liquid stream simplifies the treatment of the faecal sludge and septage and helps to optimise the process. Eg., in case of heat drying, dewatering will save a significant amount of energy.

Dewatering can be achieved by gravity settling or filtration. However, it needs to be noted that dewaterability of faecal sludge is less as compared to septage. Hence, in such cases, stabilisation is recommended before dewatering.

Dewatering can also be achieved by increasing the solid content in the faecal sludge or septage. In case of pyrolysis or incineration, addition of dehydrating agent such sawdust or wood chips is done to increase the solid content as well as the calorific value of the solids.

It needs to be kept in mind that after dewatering, the liquid fraction might contain high amounts of ammonia, salts or pathogens.

Treatment objectives

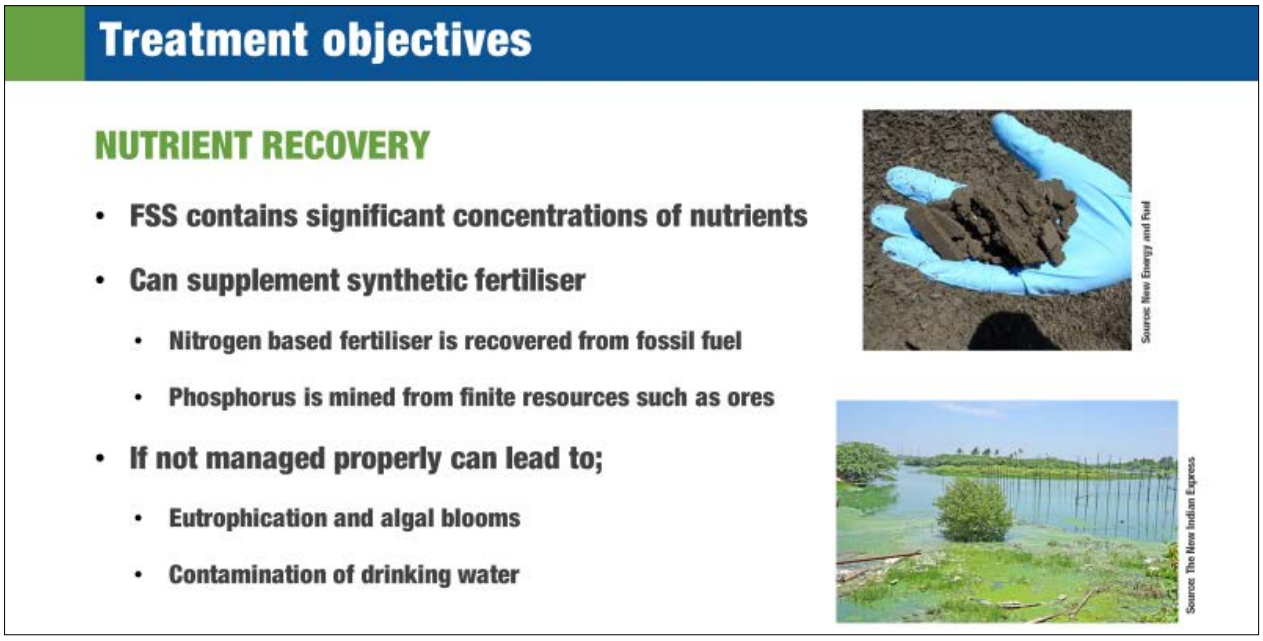
PATHOGEN REMOVAL

- FSS contains large amount of pathogenic micro organisms
- Significant health risk due to direct/in direct exposure
- Treatment up to adequate hygienic level

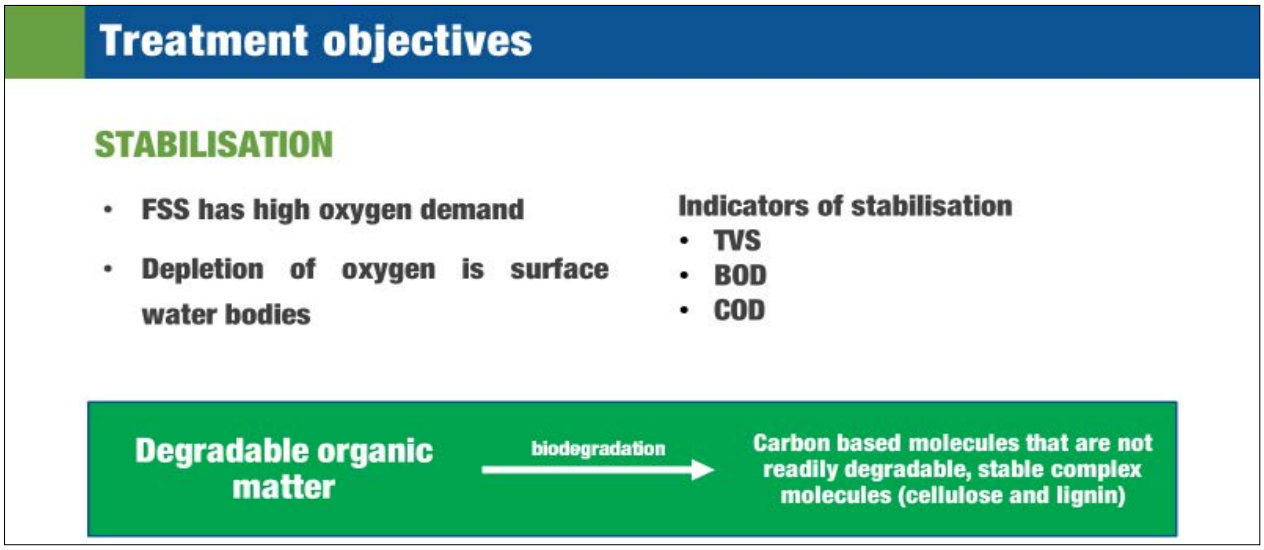
- Reduction/inactivation
  - Starvation
  - Predation
  - Exclusion
  - Desiccation
  - Temperature

The second most important objective is pathogen removal. Pathogen removal is important from the discharge and reuse point of view of the end products. Faecal sludge and septage is known to contain high numbers of pathogens and hence indiscriminate disposal of it may result in cross contamination of the water resources. Reduction of pathogens is achieved by various ways as listed in the slide.

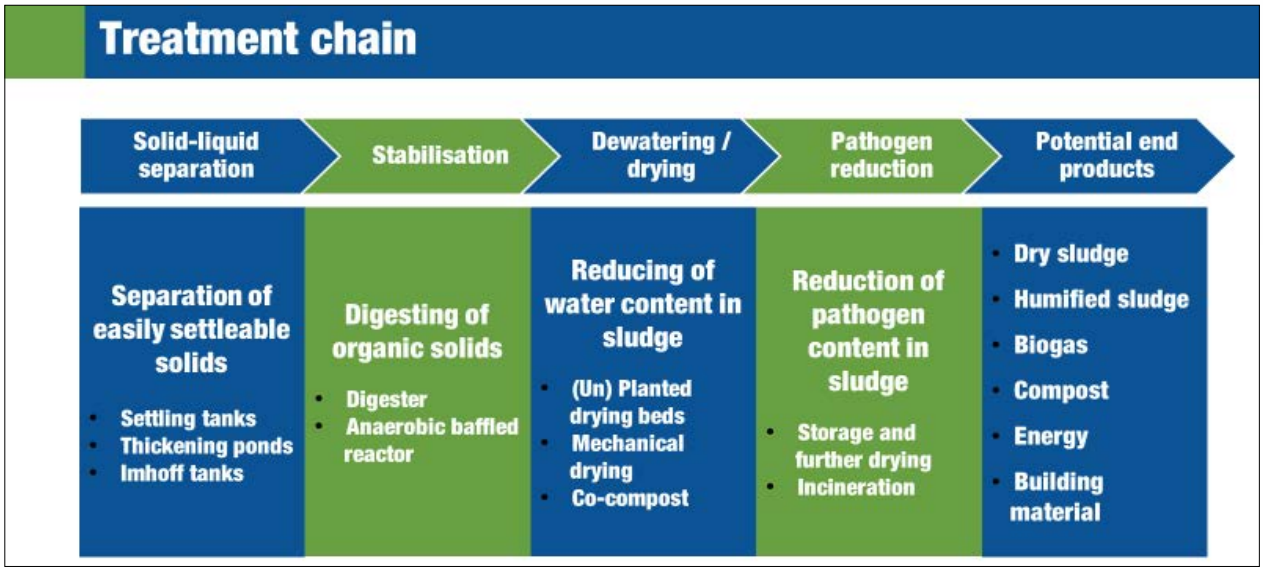
Starvation refers to starving the pathogen to death. Predation refers to introducing or allowing specific types of bacteria to eat (predate) the pathogens. Exclusion refers to physical exclusion of pathogens depending on their size using filters. Desiccation refers to reducing the moisture content to the level where the cell wall ruptures due to dryness. Pathogens are believed to be reduced significantly at temperatures above 60^0C.



Nutrient recovery is a specific treatment objective which is very important when we are intending to use the end products as soil supplements for improving its characteristics. Faecal sludge and septage contain a good amount of nutrients. If managed properly these nutrients can be used as supplements to synthetic fertilisers in agriculture. However, if not managed properly, it leads to eutrophication of water bodies and further it may lead to contamination of drinking water resources.



Stabilisation of faecal sludge is also one treatment objective. Faecal sludge contains more organic solids which needs stabilisation before it can be discharged into the environment. Stabilisation reduces the oxygen demand of the liquid fraction of the faecal sludge. The need of stabilisation can be assessed using parameters such as volatile solids, BOD and COD.



Treatment facilities are a combination of different treatment mechanisms. Each treatment mechanism has a specific treatment objective. Faecal sludge and septage treatment plants can be divided into four stages. At least three stages are put together to achieve complete treatment of faecal sludge and septage. Pre-treatment of septage such as screening is always recommended before starting with actual treatment processes.

Solid liquid separation (physical treatment): This stage refers to separation of easily settleable solids. Septage is known to have higher content of non biodegradable particulate COD. This COD can be reduced significantly by separating the solids from the liquid fraction. Solid liquid separation is based on physical treatment and can be achieved by settling thickening tanks or geo tubes.

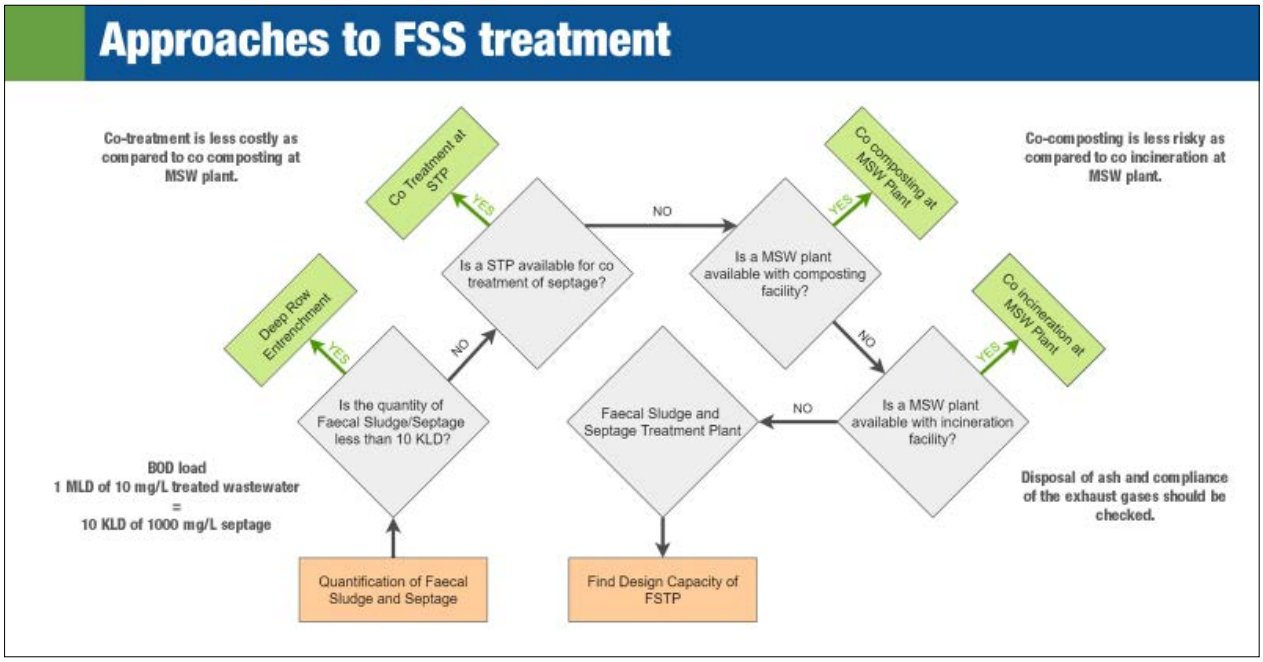
Stabilisation (biological treatment): This stage refers to the stabilisation of organic solids in the sludge. Faecal sludge is known to have higher content of slowly biodegradable COD. Reduction of COD in such cases can be achieved using biological treatment in the form of anaerobic treatment. Anaerobic digestion provides stabilisation of the difficult to digest solids. The process reduces the odour and increases the dewaterability of the sludge.

Dewatering/ Drying (physical treatment): This stage refers to reduction of water content in the sludge. This can be achieved by treatment mechanisms such as evaporation, evapotranspiration, heat application. Treatment units such as planted, unplanted drying beds or mechanical dewatering equipment are suitable to achieve adequate reduction in the water content.

Pathogen reduction (physical treatment): This stage refers to reduction in the pathogens in the sludge. The same can be achieved by various ways, however, the most common way is to store the solids for longer duration (starvation) or to expose the solids to temperature up to 70^0C or application of heat to drive away the moisture (desiccation).

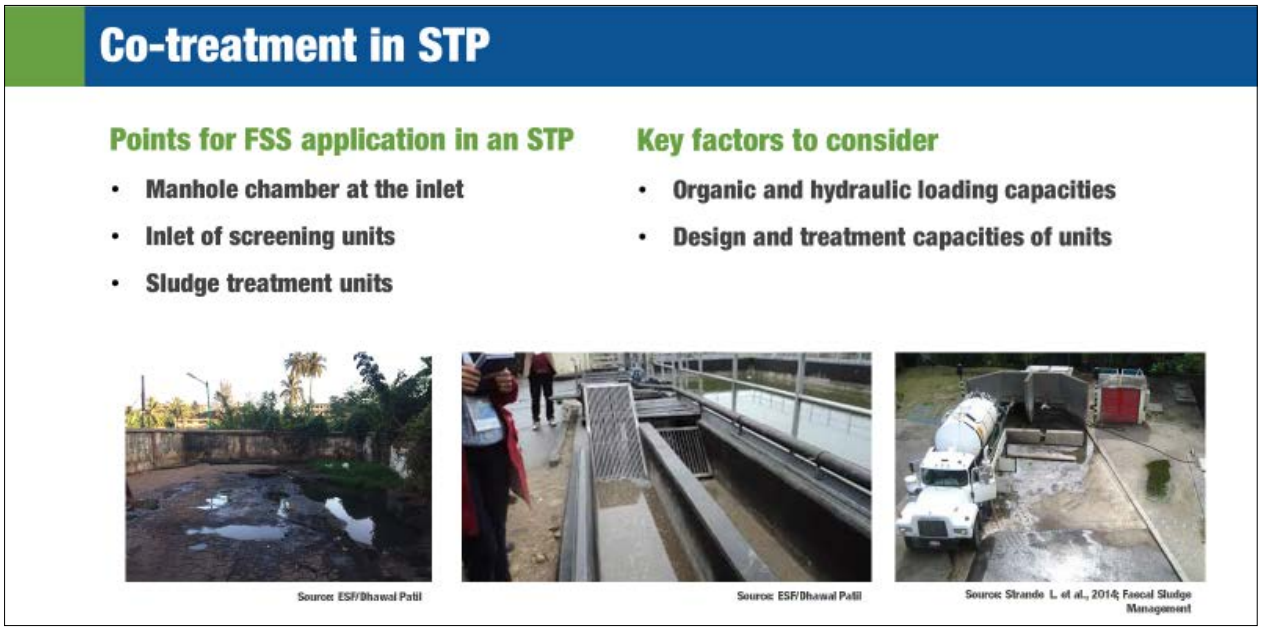
Depending upon the treatment units selected for forming the treatment chain, end products such as dry sludge, humified sludge, biogas, energy etc are produced.

8.3 Approaches to FSS treatment



In this slide, we can understand the different treatment approaches in faecal sludge and septage management. The selection of treatment approach is dependent on a few specific factors like quantification and characteristics of the FSS, type of sludge, seasonal variations and local conditions. There are different treatment approaches as:

I. Deep row entrenchment
II. Co-treatment at STP
III. Co-treatment in MSW plant
IV. Faecal Sludge Treatment Plant (FSTP).



Co-treatment of FSS in STP is one of the treatment approaches. It is mainly dependent on the effect of organic and hydraulic loading on various treatment units at STP. In this approach, FSS

can be applied at different stages as: i) At the manhole chamber before the inlet of STP ii) At the inlet of screens of the STP iii) At the sludge management process of the STP.

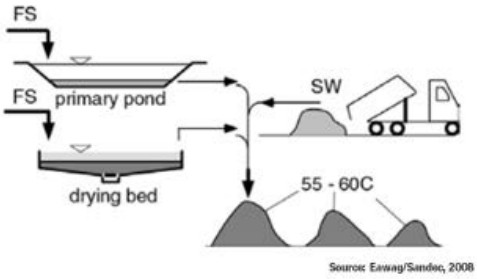
Co-treatment in MSW plant

Co-composting

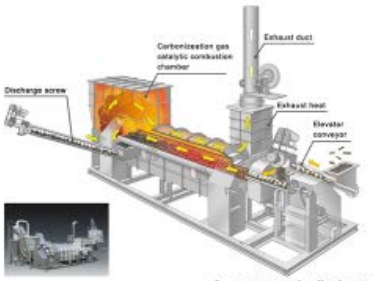
- Dewatering of sludge
- Dry solid content of 40-45%
- Good source of nitrogen in compost

Sludge incineration

- Dewatering and drying of sludge
- Dry solid content of 80%
- Acts as a good source of heat



Source: Eawag/Sandec, 2008


Source: www.waterallleeds.com

Dry Solid Content Requirements

- **Combustion -** Dry solids content should be at least 80 per cent and preferably higher. The precise requirements will depend on the process used to burn the sludge.
- **Composting.** For optimum results, the dry solids content should be in the range 40–45 per cent. This corresponds to a water content which, in the case of compost, is normally referred to as its moisture content, of 55–60 per cent. It is possible to achieve solids contents in the required range by increasing the retention time on sludge drying beds; however, the more usual approach is to co-compost dewatered sludge with materials that have both a higher carbon to nitrogen ratio and lower moisture content.

Deep row entrenchment

- Method of safe disposal
- Needs strict enforcement of guidelines and monitoring protocol
- FSS applied to deep trenches and topped with soil
- Low cost, easily implemented with low O&M as well as nuisance


Source: S. Vishwanath, Biome Environmental Trust

Deep row entrenchment (DRE) refers to the method where septage is fed to an excavated pit. Once the pit is fed with septage, the liquid seeps into the surrounding soil and the solids are arrested in the pit. Once the pit is full it is topped off with the excavated earth so that the solids can be stabilized. Once stabilized the content of the pit is converted into terra preta, which can be safely used in agriculture to improve the characteristics of the soil.

DRE is very simple and low on operational expenditure. It does not create any visible or olfactory nuisance. ULBs usually have heavy machinery for earth excavation readily available with them and hence, no specialised equipment is required to start practicing DRE. DRE cannot be practiced in low lying areas and regions where the groundwater table is high.

Summary

- **Deciding the treatment technology for safe management of FSS requires a consideration of critical factors**
- **FSS treatment chain can be finalized based on the treatment objectives**
- **Design of treatment system should be based upon the treatment objectives and the necessary compliance**
- **Selection of right approach is critical for affordability and sustainability of FSSM**

Case Studies - Videos

- **Spillover Effects of Faecal Sludge Management: Dumaguete City**
- **Co-composting of FSS with MSW – Shakhipur Municipality**

Session

09

Financing Aspects of FSSM

9. Financing Aspects of FSSM

Learning objectives

- To evaluate the financing requirement for FSSM across the service chain.
- Understand how to prepare FSSM budget requirement for a city.
- To understand various the business models of FSSM and understand what works for a city.

Contents

- Financing FSSM
  - Capital expenditure
  - Operational expenditure
  - Income and revenue
  - Annualized cost
- Financial flow models

9.1 Financing FSSM: - Capital expenditure, Operational expenditure, Income and Revenue and Annualised cost

Capital expenditure

Service Chain	Capital Expenditure	Stakeholder Responsible
Toilet Access & Containment	• New toilets • New Containment Systems • Refurbishment of toilets & containment system	Household
Emptying and Conveyance	• Procuring Desludging vehicles	ULB/Private player
Treatment	• Cost of land preparation • Civil structure (life span of 30 years) • Plumbing and electrical component (life span of 15 years) • Electromechanical components (life span of 10 years) • Cost for site investigation & sampling • Transport and Overheads	ULB/Parastatal agencies

Capital expenditure refers to all the one-time expenditure done to set up the treatment facility such as a FSTP. It generally includes all the costs listed on the slide. The percentage contribution of each component here changes depending upon the selection of treatment modules. For example, in the case of treatment using settling thickening tanks, sludge drying beds and DEWATS, the civil cost will contribute largely to the total cost of the project. However, in case of mechanised dewatering and drying, the cost of electromechanical components will be on the higher side. The planning and supervision cost also increases in the same proportion when the civil components increase. Since civil construction takes considerable time, planning and supervision costs also go high in that case.

Operational expenditure

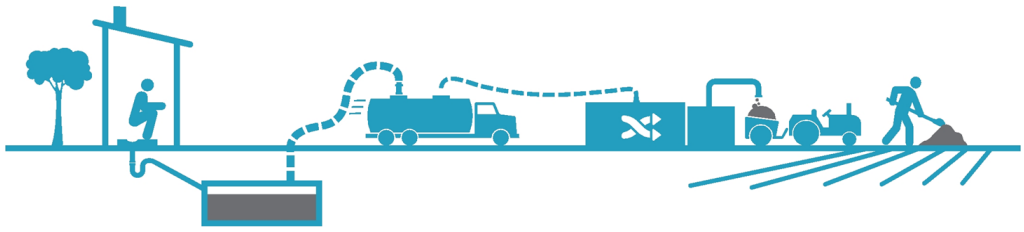
Service Chain	Operational Expenditure	Stakeholder Responsible
Toilet access & Containment	Repair of toilets & containment systems	Household
Emptying and Conveyance	Fuel cost Repair & Replacements Salaries of employees Establishment Cost	ULB/Private player
Treatment	Fixed Costs: • Expenditure to be borne in treating the FS and Septage received at the treatment plant • Cost of material for operation • Cost of power for operation • Cost of chemicals (if required any) • Human Resource cost • Preventive maintenance cost Variable Costs: • Expenditure to be borne even if FS and Septage received at the treatment plant	ULB/Parastatal agencies

Operational expenditure refers to the cost required to operate the treatment plant to treat and manage the sludge at the FSTP. This cost can be divided into two heads, direct and indirect cost.

The direct cost refers to the cost which needs to be borne for actual operation and will vary depending upon the quantity of the sludge received at the FSTP. Indirect cost refers to the cost to be borne irrespective of the quantity of the sludge received at the plant. Example is human resource cost and lease (in case the land is procured on lease for constructing FSTP).

Financial support under various national missions

Sanitation Value Chain



CONTAINMENT > EMPTYING > TRANSPORT > TREATMENT > REUSE/DISPOSAL

Swachh Bharat Mission(SBM), SBM 2.0

AMRUT 2.0, SBM 2.0, 15th Finance Commission, Namami Gange

The 15th Finance Commission has recommended tied grants for ULBs for improving water and sanitation situation which includes management of faecal sludge and septage.

The funds required for building the containment units and buying of vacuum trucks can be availed from Swachh Bharat Mission Urban. However, it is highly recommended that the ULB encourages the private desludging operator to register themselves and license the service. The funds required for the treatment facility and the reuse/ disposal mechanisms can be availed through AMRUT, SBM, 15th FC and NMCG. Funding can be availed from more than one source for completing the sanitation value chain of FSSM at city level.

Revenue for Desludging Services

Budgetary support

- ULB procures desludging vehicles on its own or encourages private players to invest in desludging vehicle and run the operation.

User fee

- Fee collected from the Household/establishment for collecting and transporting the faecal sludge and septage to treatment/disposal unit.

There are various streams of income and revenue for a desludging service. Standard streams are listed on the slide. Budgetary support in case of desludging services is provision of micro finance loan not low interest loans to the entrepreneurs for buying trucks and starting the business. User fees refers to fees collected from the household after providing the desludging services.

Revenue for Treatment Unit

Budgetary support

- Financial support provided by the government authority (ULB) to the company to set up a treatment plant and operating and maintaining it.

Discharge fee or Tipping fee

- Fee collected from the collection and transport company to discharge faecal sludge and septage at the treatment plant.

Sale of end products

- Revenue generated from the sale of end products such as soil conditioner, solid / liquid fuel, building material, treated water etc.

There are various streams of income and revenue for a FSTP. Standard streams are listed on the slide. Discharge fees refers to the tipping fee to be given by the desludging operator to the FSTP operator for taking the responsibility of the sludge for treatment and further disposal. Purchase price refers to the revenue generated by sale of the treated products. However, it needs to be understood that from these two streams, it is impossible to meet all the operational expenditure of the FSTP and hence budget support is needed. Budget support refers to the financial support provided by the government authority to the company which is operating and maintaining the plant.

Annualized cost

$$Annual\ CapEx = CapEx \times \frac{(1+r)^N \times r}{(1+r)^N - 1}$$

Where;

CapEx: Capital expenditure

r: Rate of interest (bank rate – inflation rate)

N: life span of the component

$$Annualized\ Cost = Annual\ CapEx + OpEx - R$$

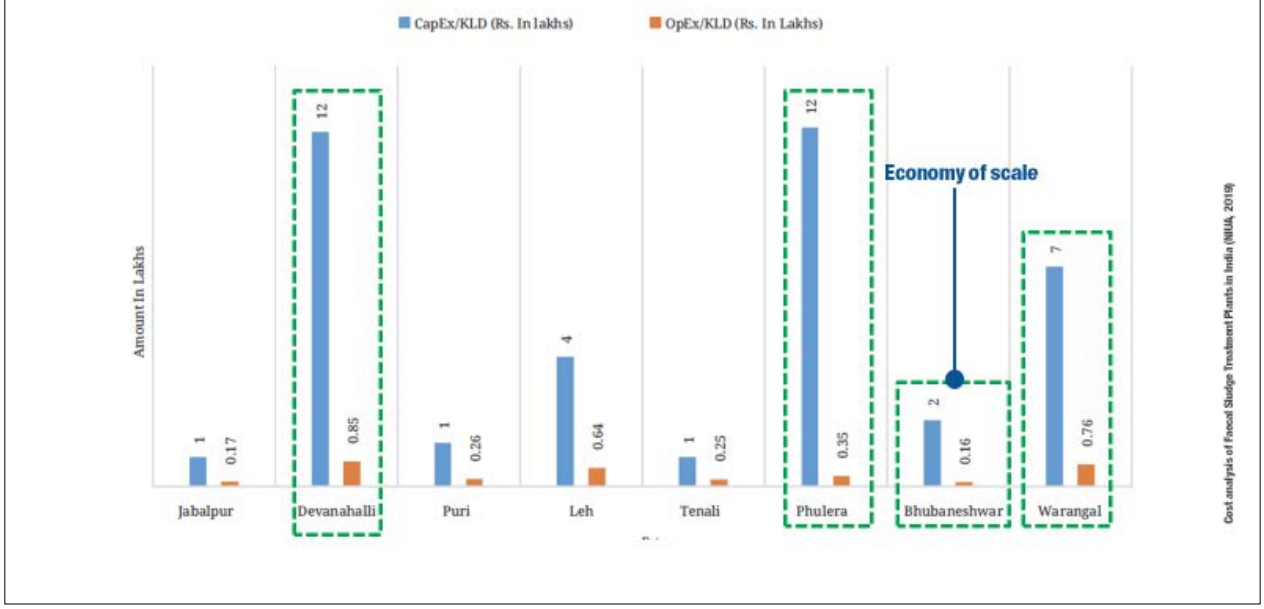
Where;

OpEx: Operational expenditure

R: Revenue

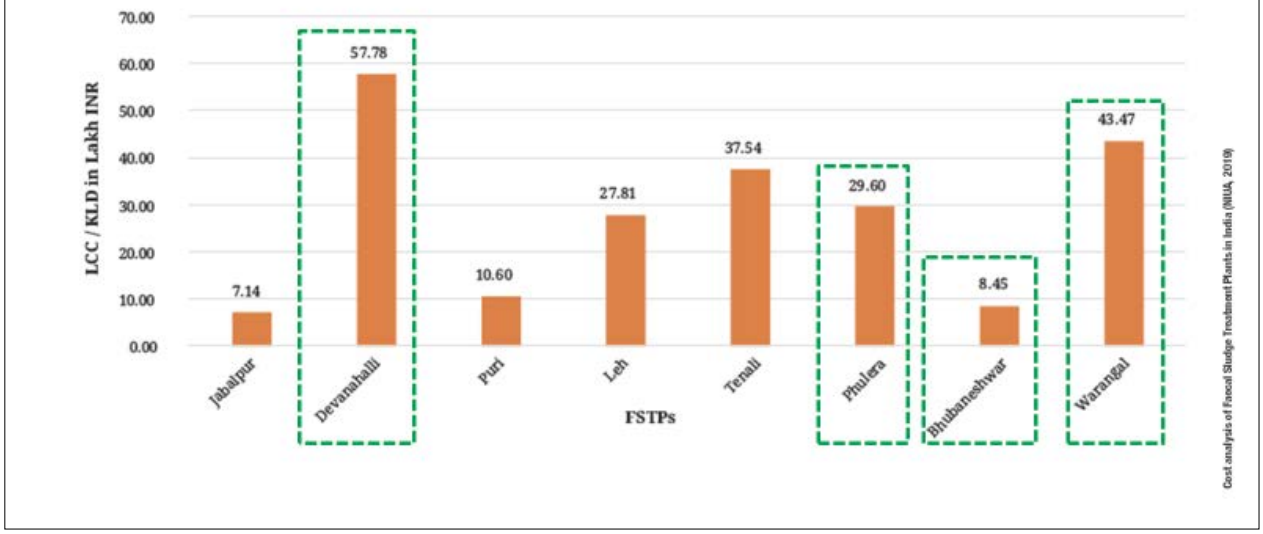
Annualised cost method is one method of life cycle analysis of infrastructure projects such as treatment plants. This method aggregates operation-maintenance cost, income and revenue and capital expenditure of the project into one single cost. It factors in the life of the civil, electromechanical and plumbing and electrical components based on their life spans. The O&M cost is factored in using rate of interest. Hence the method annualizes all the costs at a given cost which can be compared for all the technologies to choose suitable technology.

Cost analysis FSTPs in India



The slide gives cost analysis of the FSTPs in India. The plants marked in green are the plants which cater to both liquid and solid treatment completely. The blue bar shows the capital cost of the technology whereas the orange bar gives the O&M cost of the technology. Devanahalli and Phulera plant is based on DEWATS module, with feeding tank, stabilization unit, unplanted drying beds and co composting for solids treatment whereas for liquid treatment AS, ABR, AF and PGF have been installed. Bhubaneshwar is also based on DEWATS model, however, here settling thickening tank is used for separation of solids and liquid. At Warangal, the treatment units are screw presses followed by thermal drying and pyrolysis of the sludge. Liquid after dewatering is also treated separately.

LCA of FSTPs in India



The life cycle cost of these plants is shown in the slide above. It can be observed that the cost of the Bhubaneswar plant is far less as compared to the other three plants. Hence it can be seen that appropriate selection of the treatment units is necessary for optimising the cost of treatment. In LCA, the design capacity of the treatment plant can have an impact on the life cycle cost. The design capacity of each plant are as follows: (1) Devanahalli- 6 KLD, (2) Warangal- 15 KLD, (3) Phulera- 20 KLD, (4) Bhubaneshwar- 75 KLD. Thus, it is also important to explore other options to manage septage for smaller capacities instead of having a full scale FSTP.

Operationalizing Cost FSSM

Faecal Sludge Treatment Plant[1]

FSTP	Technology	Capacity (KLD)	Capex (Rs lakh/ KLD)	Opex (INR lakh/KLD/annum)
Bhubaneswar	DEWATS	75	2	0.17
Leh	Planted Drying Bed	12	4	0.64
Warangal	Pyrolysis	15	7	0.76
Jabalpur	MBBR	50	1	0.17
Phulera	DEWATS	6	12	0.35

Costs vary widely between different technology options, however, based on generalized averages of existing FSTPs in India (2019) –

- **Rs. 6 lakh / KLD to construct**
- **6% of construction of FSTP for annual operations**

Desludging operations[2]

- **Cost of vacuum truck**
  - **5000-6000 litres – INR 30-35 lakhs**
  - **3000 litres – 15-25 lakhs**
- **Fuel costs, operator salaries, establishment costs, trip economy**
- **Desludging charges – Rs 1000-3000 per operation.**

City	Population (thousand)	Charge per operation (INR)
Kundapura, Karnataka	31	1700
Mihijam, Jharkhand	40	2500-3000
Vijayapur, Karnataka	40	1000
Belgavi, Karnataka	110	1500-2500
Hazaribagh, Jharkhand	150	1000-1200
Adityapur, Jharkhand	170	2500-3000
Cuttak, Odisha	610	1000-1300
Jabalpur, Madhya Pradesh	1260	1505

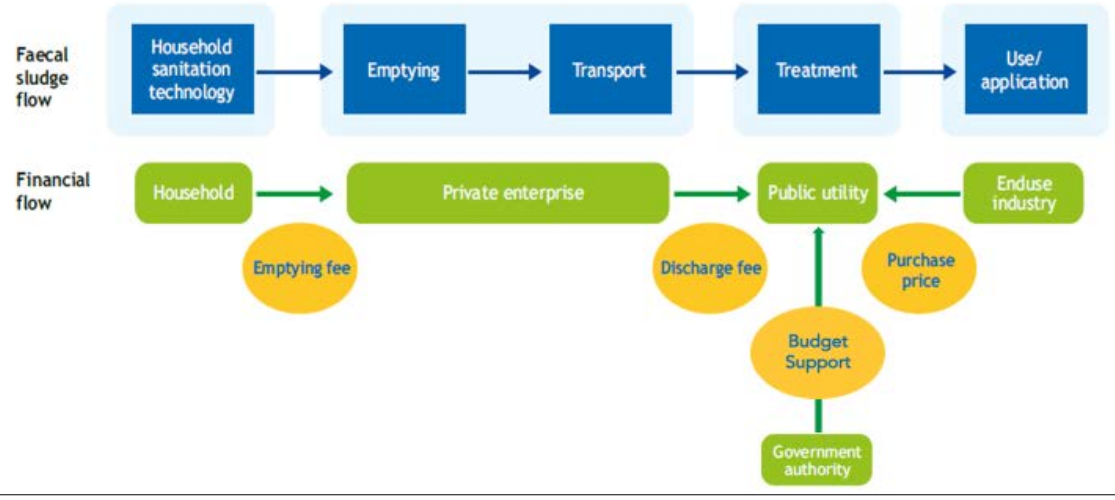
1. Based on Details of FSTP's in India compiled by KPMG for the NFSSM alliance, as on 1st March, 2019 and NIUA (2019) "Cost Analysis of Faecal Sludge Treatment Plants in India"
2. NIUA (2018) – Various reports on field based research on septage and wastewater management commissioned for the states of Odisha, Madhya Pradesh, Karnataka and Telangana

The slide summarizes the capital cost and O&M cost of various FSTPs in India. The cost has been normalized with respect to the design capacity. The second table on the slide shows the desludging fees charged by operators to the households in different towns across India.

9.2 Financial flow models

Discrete Collection and Treatment Model

Model 1: Discrete collection and treatment model



In Model 1, each of the stakeholders is responsible for a single technology in the FSSM chain, and consequently, money is exchanged each time responsibility is handed over (emptying and transport are identified here as a single technology). The household-level toilet user pays a private enterprise (PE) an emptying fee to remove the sludge and the PE is responsible for the emptying and transportation of the sludge. The PE is then charged a discharge fee by the public utility for accepting and treating the sludge. The utility is also paid a purchase price by an end-use industry in exchange for treated FS or sludge-grown products (eg., fodder). In this model, the utility operates independently from the government authority and must cover all costs by collecting sufficient discharge and purchase fees.

Discrete Collection and Treatment Model

Case Study: Dehradun, Uttarakhand

- **Kargi STP – 68 MLD utilized for co treatment by Jal Sansthan, GoU**
- **Approx. 30 Private desludging operators | Desludging fee INR 1000 – 4000 per trip | Tipping fee INR 300 per trip**
- **Septage Management Cell at the ULB regulates FSSM**
- **GoU provides budgetary support for O&M of STP**

In Dehradun, the discrete collection and treatment model is being used. There are approximately 30 private desludging operators in Dehradun who provide the service to the households. The desludging fees vary from INR 1000 – 4000 per trip depending upon accessibility and the time required to clean the septic tank. Kargi STP is designated STP for co-treatment of septage in the city; hence, the operators have to dispose of the septage at the treatment facility. A septage receiving station has been installed at the STP for receiving septage. A tipping fee of INR 300 per trip is paid by the operators to the treatment facility. After treatment, many a times the dewatered biosolids are provided to the farmers for reuse in farms.

Discrete Collection and Treatment Model

Model 1: Discrete collection and treatment model

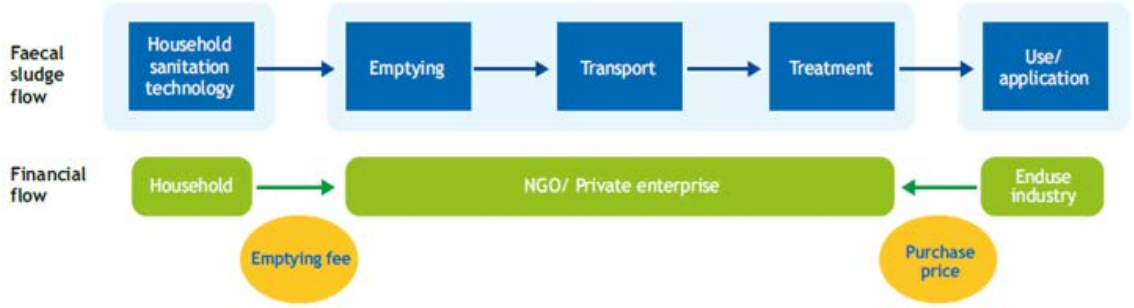
PROS	CONS
• Households are free to choose the most competitive price on offer for emptying; • Timing of emptying is flexible and can be done when financially feasible • The household is not committed to a fixed sanitation tax	• The utility's operating expenses must be covered by the discharge fee • High variability in the demand of desludging leads to issues at treatment facility

In this model the household has the freedom to choose the service provider. There can be various criteria for choosing a service provider out of which the main is desludging fees. The service can be availed by the household on demand basis; thus, the service is only available when the septic tank is full or experiencing any issues such as odour etc. The household is not committed to pay fixed sanitation tax.

The disadvantages are tipping fees that need to be included in the desludging fees. This does not leave a room for the desludging operator to make profits and might refuse to provide service to certain households. The high variability in the demand of desludging can prove to be a challenge to collection and transport businesses as well as the treatment facility.

Integrated Collection, Transport and Treatment Model

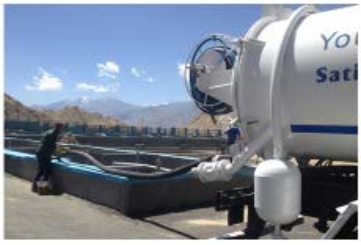
Model 2: Integrated collection, transport and treatment model



In model 2, the operator responsible for treatment is not subject to the sludge or payment irregularities of the PE responsible for emptying. Model 2 appears similar to model 1, but the financial implications are significantly different. In model 2, a single private enterprise or non-governmental organisation (NGO) is responsible for the emptying, transport and treatment, thus eliminating the need for a discharge fee between the stakeholder responsible for C&T and the stakeholder responsible for treatment.

Integrated Collection, Transport and Treatment Model

Case Study: Leh



- Leh Municipal Council and Blue Water Company (BWC) has commissioned FSSM
- BWC is responsible for the collection and transportation of FS as well as the O&M of the FSTP
- BWC collects the desludging fees.

  Outcomes as of 2020
  - More than 2.6 Million liters FS collected and treated,
  - Trips increased from 6-8 trips/ month to 80-100 trips/ month.

Image Source: SORDA (https://www.sorda-sa.org/)
Source: Blue Water Company, Feeler on Leh (Ladakh)- India's first PPP in FSM.

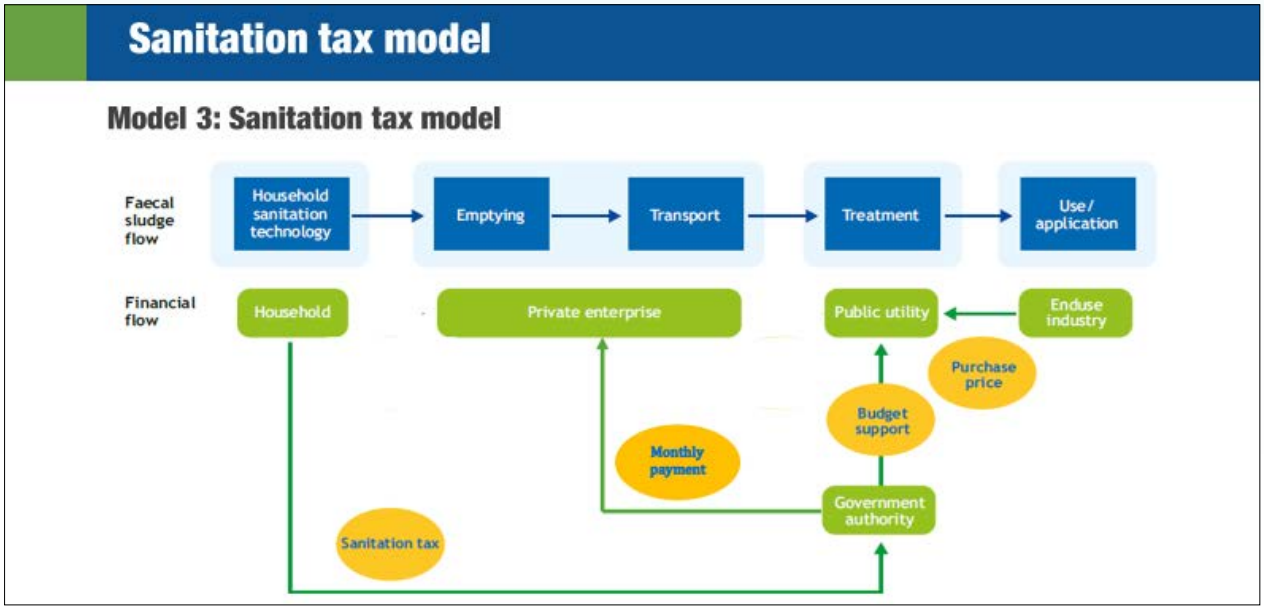
In Leh Municipal Council, FSSM is operationalized by Blue Water Company (BWC). BWC not only is responsible for providing desludging services to the properties in the administrative boundaries, but also responsible for operating the treatment facility. The FSTP here is based on Planted Drying Beds followed by Planted Gravel Filter for treating the liquid fraction. BWC also collects the desludging fees from the households to keep FSSM operational in the city.

Integrated Collection, Transport and Treatment Model

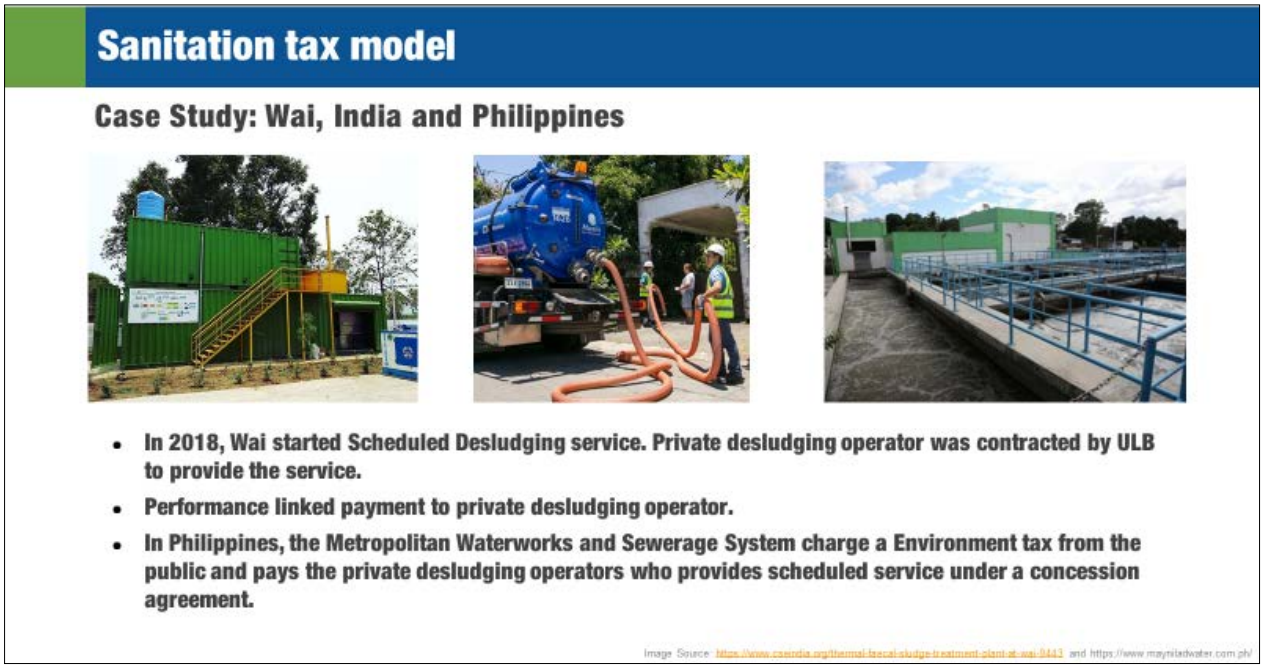
Model 2: Integrated collection, transport and treatment model

PROS	CONS
• A single operator is able to optimise the business model and improve efficiency; • Less potential for illegal discharge as the single entity will discharge at the self-run treatment works	• High fees may be passed onto the household • Existing small private players are at risk of elimination

Since a single operator is responsible for the maximum part of the service chain, optimization of the business model is possible. It is also possible to improve efficiency of the services and treatment facility. There is little to no possibility that the septage is disposed indiscriminately. The disadvantages are that the private company who runs the FSSM service chain can soon have a monopoly and charge high prices to the households for the service. This will discourage the households from emptying the septic tanks frequently. The existing small private desludging operators' business is at stake as they are at risk of being completely eliminated from the ecosystem.



In the sanitation tax model, the households pay for the service through sanitation tax to the ULB or government authority. The desludging operators provide the services to the households and get paid by the ULB for the number of households serviced. The desludging operator then tips the septage at the treatment facility free of cost. The treatment facility operator is paid separately from the ULB in the form of budgetary support. The treatment plant operator still has one more revenue stream, i.e., purchase price. This can be obtained by selling the treated end products.



In Wai Municipal Council, the sanitation tax model is implemented along with scheduled desludging. This means that every three years the septic tank of the household gets serviced by the desludging operator. The desludging operators have to get themselves registered and obtain a license to provide the service to the households on behalf of the municipal council. The desludging operator and the treatment facility are paid based on the number of households serviced each month. A similar model is implemented in the Philippines.

Sanitation tax model

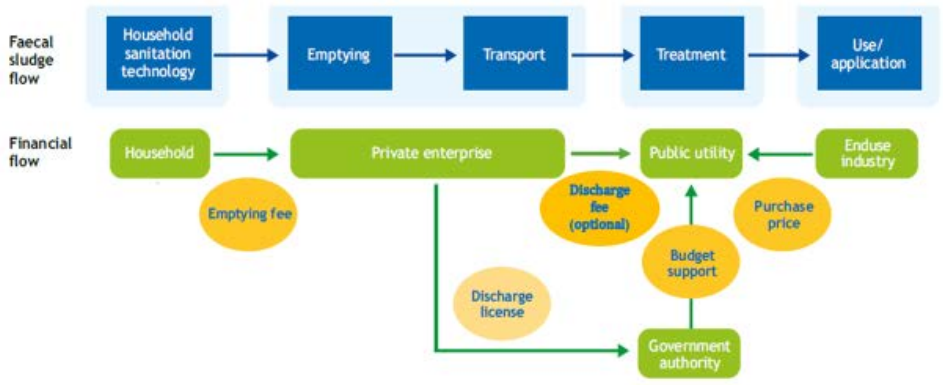
Model 3: Sanitation tax model

PROS	CONS
• Low-income households' that are not connected to the sewer may have lower C&T costs from cross subsidies; • C&T operators benefit from cost and route optimization in case scheduled emptying is opted. • Potential increase service coverage and emptying frequency.	• Households may not be willing to pay regular sanitation tax since on-ground emptying frequency is less. • Database of septic tanks and their accessibility needs to be maintained. • C&T operator may face technical challenges in emptying septic tank with difficult access.

The advantages of this model are that the low-income households which are not connected to sewerage will have to pay less tax. The desludging operator can optimize the route and thereby increase his profits. If the services are managed well, then the service coverage area emptying frequency both can be improved significantly. The disadvantage is the ULB needs to accept the increase in the sanitation tax from the households at the early stage of the project. The tax needs to be affordable to the households. A database of the septic tanks and their accessibility etc. needs to be maintained by the ULB. This allows for proper scheduling of the households. The desludging operator might face a lot of difficulties to cover the designated number of households in a day creating a backlog of services which will accumulate over a period of time.

Licensing Model

Model 4: Licensing model



In the dual licensing and sanitation tax model, the private entrepreneur who is responsible for C&T is not penalised with a discharge fee for each discharge at the FSTP, but instead is granted unlimited (or semi-limited) access to dump through a discharge license, thus reducing illegal discharge by those C&T operators who may not be able to afford the discharge fee. Having to pay a discharge license, no matter how nominal, ensures that the government has more administrative control over the industry. Data on the number of operators, the revenue that is generated, the distances travelled etc. can be collected and used to advise policy.

Licensing Model

Case study: Many cities across Tamil Nadu such as Karunguzhi,Trichy, Coimbatore, etc

- Tamil Nadu State Investment Plan in 2018 - Scale treatment across the state based on clustering of ULBs around STPs.
- Standard Licensing Agreement for private desludging operators.
- Host ULBs to license all the desludging operators serving within the cluster.
- ULBs to charge a License Fee of INR 1,000 per year and a tipping fee of INR 100 per load

Image Source: TNUSSP [illegible]
Source: NITI Aayog, 'Faecal Sludge & Septage Management in Urban Areas- Service and Business Models'2021

The licensing model has been implemented in cities of Tamil Nadu. A standard licensing agreement was used across the state. Here the private desludging operators pay a license fee to the government authority and agree to collect a fixed desludging fee from the households for the service and to pay fixed tipping fee to the treatment facility operator. The government authority through its regular tax provides budgetary support to the treatment facility operator. The model has proven to be highly successful in the state.

Licensing Model

Model 4: Licensing model

PROS	CONS
• Industry regulation and legitimisation through licensing • Improvement in health and safety conditions; • Unlimited discharges minimise risk of illegal dumping	• Not applicable in cities without existing private operators. • Requires stringent monitoring from the Authority to be effective.

The advantage of this model is that the informal desludging operators can be regulated and legitimized through licensing. The model overall improves the health and safety conditions of the service providers. The unlimited discharge at the treatment facility minimizes the risk of illegal dumping. The disadvantage of the model is that it can be quickly operationalized only when the private desludging operators are present in the city. A strict monitoring protocol needs to be in place for improving the services and avoiding any indiscriminate disposal of septage.

Summary

- **Various types of capital and operational expenditures are involved in operationalising FSSM in a city.**
- **Expenditure can be met through potential funding opportunities at the national and state level.**
- **Various revenue stream at collection – transport and treatment stage of service chain.**
- **Types of financial models and case studies; need to identify what fits well in the city**

Session

10

O&M Aspects of FSSM

10. Operation & Maintenance Aspects of FSSM

Learning objectives

- Learn the meaning of operation and maintenance (O&M) in FSSM
- Know the critical factors that govern the operation and maintenance aspects of an FSSM project
- Learn how to develop an effective O&M and monitoring plan to ensure treatment performance of an FSTP

Contents

- O&M planning
- Monitoring
- Recordkeeping
- Occupational Health and Safety
- Case studies

Operation and maintenance in FSSM

- Importance of O&M in FSSM
- An in-depth look into the activities that make up the entire service chain
- Inclusion of O&M in the initial stage of an FSSM project is important

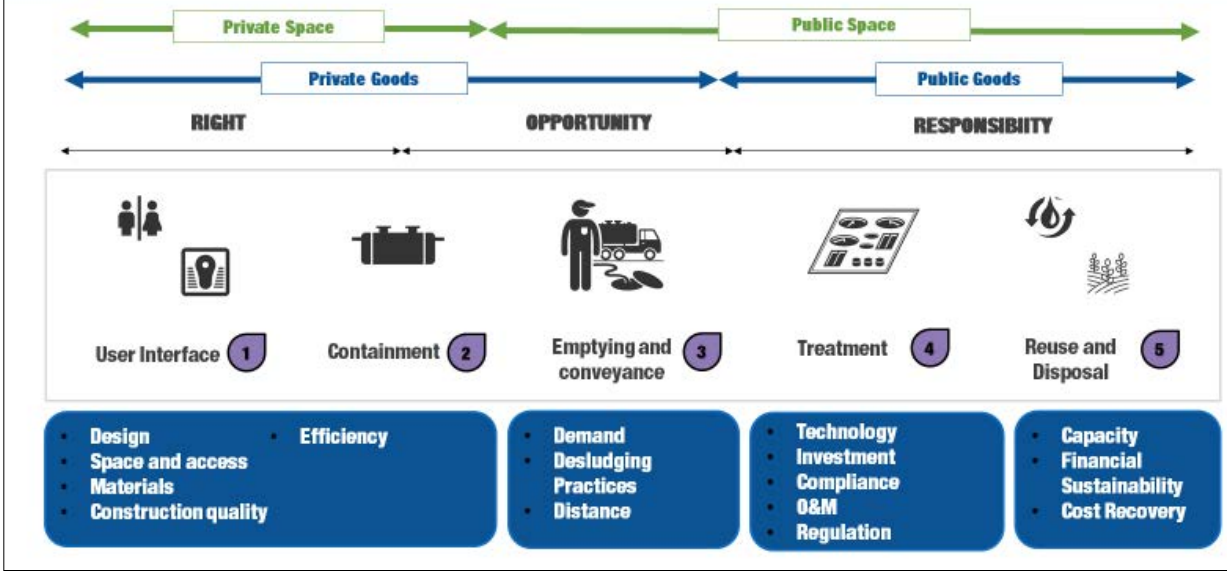
Source: Samverse Environmental Solutions

Importance of O&M in FSSM: Entire FSSM service chain requires a continuous and appropriate set of operation and maintenance (O&M) activities to ensure its long-term functionality and sustainability.

Operation: Activities that are necessary to enable a sustained and effective collection, transportation, and treatment of faecal sludge and septage (FSS). Maintenance = activities that ensure long-term operation of equipment and infrastructure.

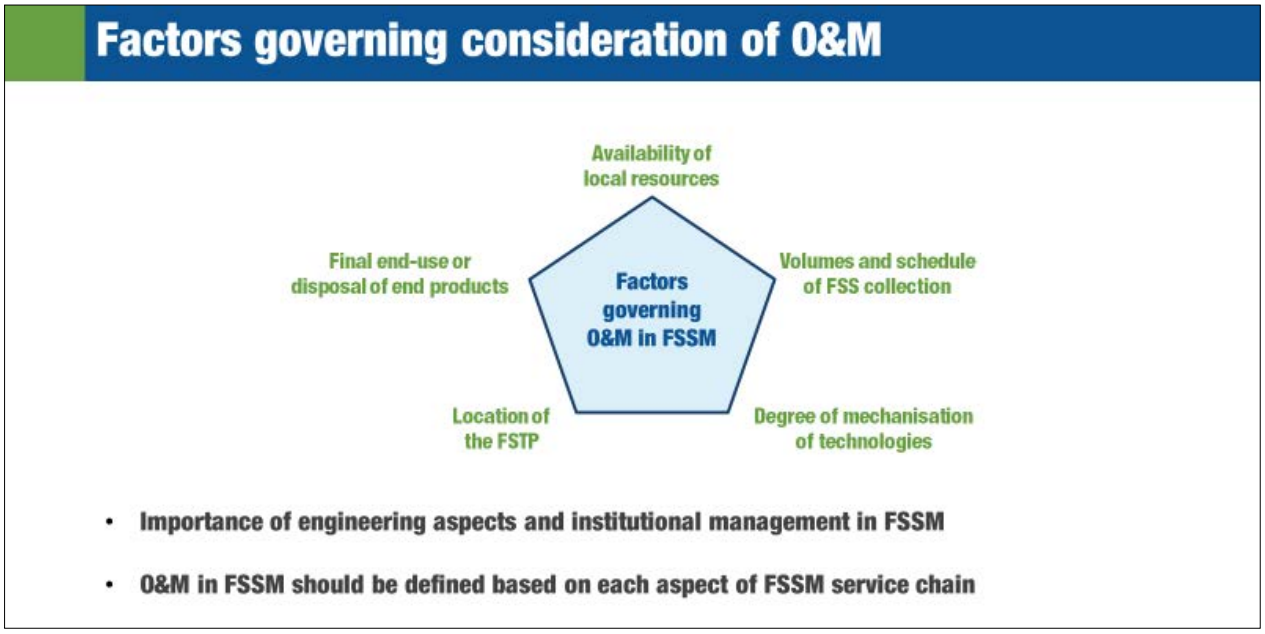
Since O&M looks into all the activities that make up the FSSM service chain, it is necessary to prepare an O&M plan while planning an FSSM project. This will help the decision makers in having a detailed and complete overview of the resources required for implementing a successful FSSM project (resources = manpower, time, and financial investments).

Key parameters in O&M



There are multiple aspects for O&M in FSSM. The user interface and containment are a private space and the household owner decides the design, access, materials, construction quality etc. for it. The households have right to proper sanitation and hence, through SBM-Urban the households were provided subsidy to build the toilet and appropriate containment unit. The emptying and conveyance are heavily crowded by private desludging operators; however, these operators provide public service to the households. This provides an opportunity to the entrepreneurs to start businesses and provide improved services to capture the market. The cost of O&M in this case is dependent on the kind of desludging practiced, distance of the treatment facility etc. The treatment-reuse/disposal is provided by the local government and is also run by them. The O&M cost of this stage is dependent on the technology, regulations, cost of consumables etc.

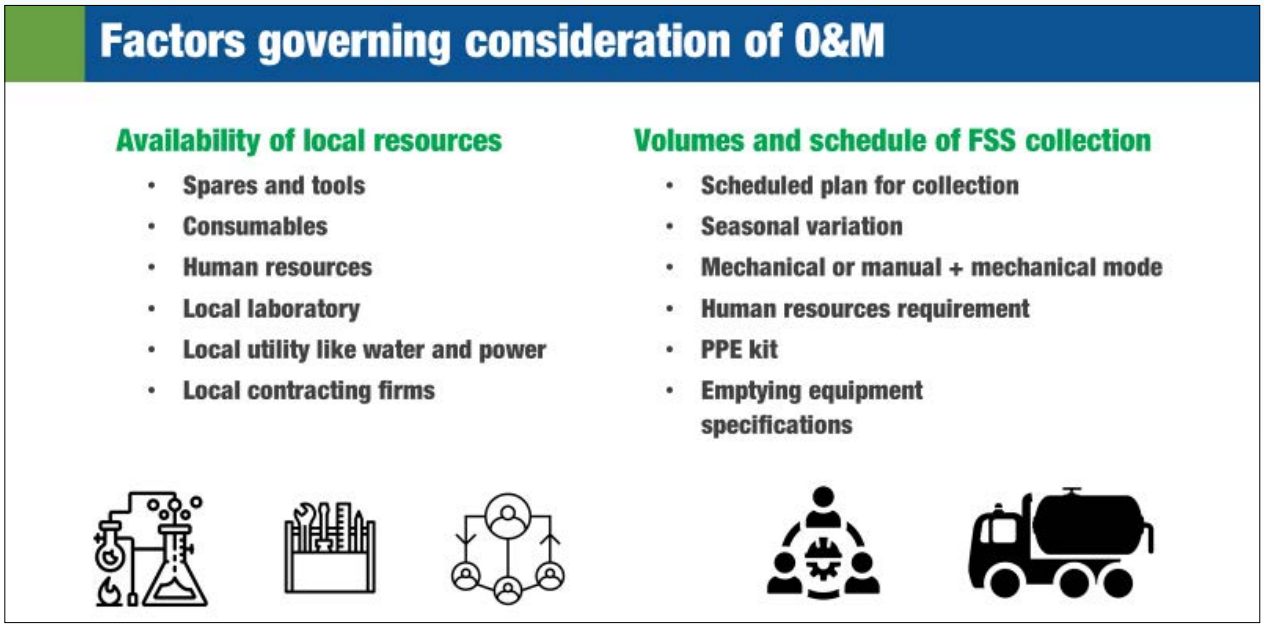
10.1 Factors for O&M Planning



It is important to prepare an O&M plan for FSSM that is realistic, representing the local context, and easily implementable by stakeholders involved in the project. This can be achieved by considering five factors which are: a) Availability of local resources, b) Volumes and schedule of FSS collection, c) Degree of mechanisation of technologies, d) Location of the FSTP, and e) Final end-use or disposal of end products.

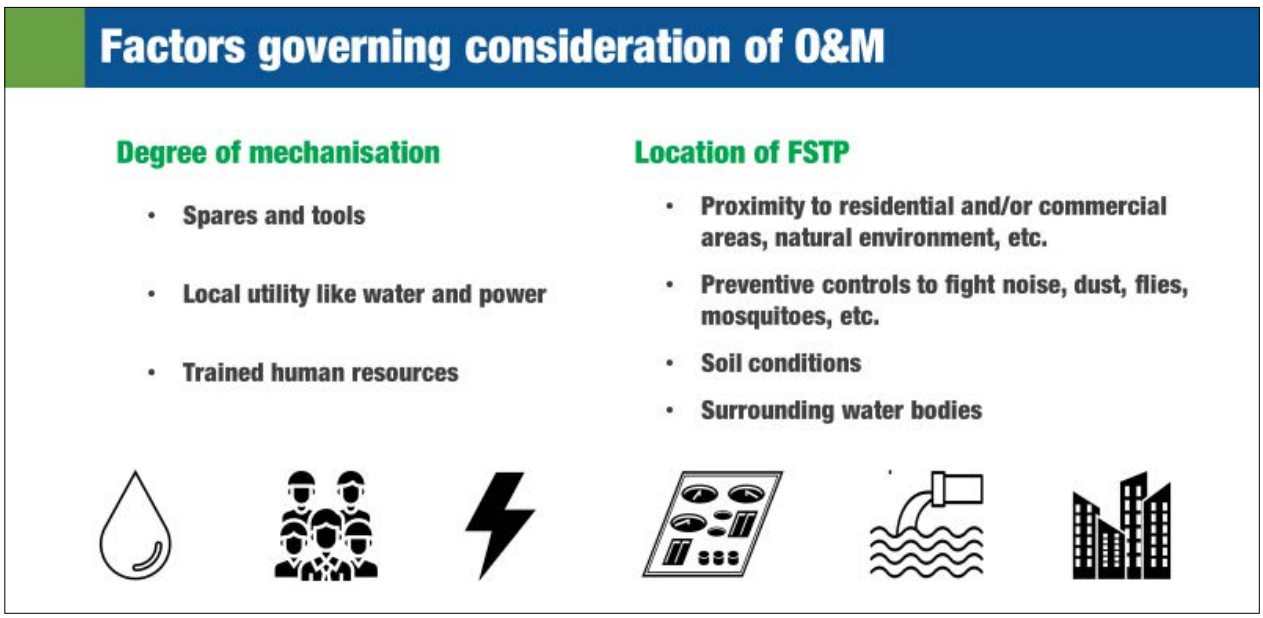
Furthermore, O&M plans should always be prepared while conceptualising the overall FSSM project. This is very critical in gathering all the details in the project including engineering aspects for technology integration and adoption as well as institutional management for implementing the FSSM project.

An O&M plan in an FSSM project will have to be comprehensively prepared taking into consideration each step of the FSSM service chain; for example, an O&M plan of FSS treatment will have a separate list of documents pertaining to civil works, electro-mechanical works, and additional components that are required in an FSTP. Another example of O&M plan for sludge collection and transportation will have a list of documents giving SOPs about desludging, usage of desludging pumps and equipment, etc.



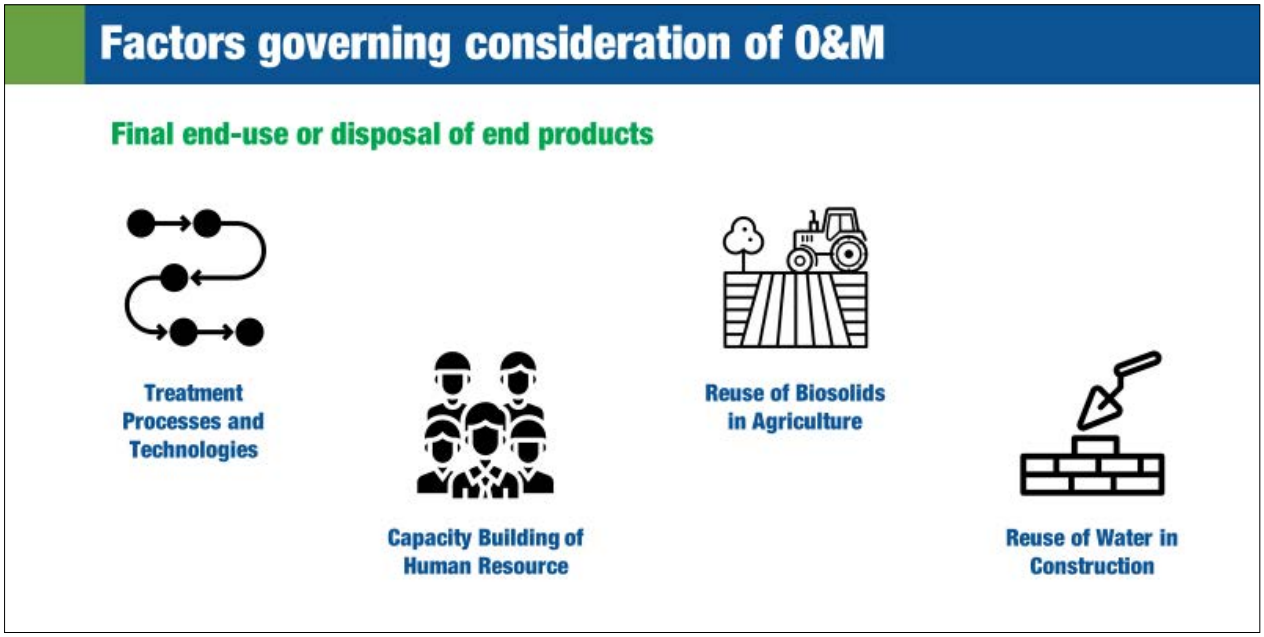
Availability of local resources - This factor basically takes into consideration the resources available in the local setting. This is because it determines both the cost of construction (example, technology selection and building materials) and the costs of O&M requirements. Designing every aspect of the FSSM service chain based on the inventory of local resources will help keep the CAPEX and OPEX in a financially viable range. Having a financially viable FSSM project is important for the decision-makers to understand the significance of investment and realise how to operate the sanitation services effectively. Additionally, making use of local resources will help the citizens to easily understand the importance of the FSSM service as well as understand the best practices associated with it.

Volumes and schedule of FSS collection - Latest policy guidelines related to FSSM in India outlines an important aspect i.e. schedule for desludging. This is necessary to ensure regular maintenance of containment systems and continuous flow of specific quantities of waste to treatment plants. In addition to this, it also helps in streamlining the service chain operations such as desludging and conveyance as well as manpower required to operate the service chain, specifications of equipment used in the service chain, etc.



Degree of mechanisation - Similar to sewerage infrastructure projects, any FSSM project can have a certain degree of mechanisation to ensure safe, hygienic and efficient service provision. Mechanisation does not necessarily mean converting all aspects of FSSM into a mechanised system and eliminating human interventions. In an FSSM service chain, it is ideal to adopt interventions that assist human interventions with electro-mechanical technologies. In fact, it is important to note that using human resources to enter containment systems for cleaning and desludging is punishable under Indian laws. As a result, one can see the adoption of vacuum-mounted tractor/ truck operated by sanitation workers for desludging of septic tanks and pit systems as a way to mechanise this aspect of FSSM service chain. Similarly, mechanisation can be adopted at the treatment end by adopting mechanised treatment methods.

Location of FSTP - In an O&M plan, the location of a faecal sludge treatment plant is very important. An FSTP is often associated with nuisances such as odours, flies and mosquitoes, and noise. The main interventions for prevention of such nuisances should be included in O&M plans for an FSTP located near to residential and/or commercial areas. All such interventions with regards to an FSTP should be clearly defined and planned in advance to have a complete O&M plan.



Final end-use or disposal of end products - End-use or disposal of treated products has an influence on the technologies and processes needed to achieve the required level of treatment. Furthermore, it has an impact on the costs and capacity building efforts required to operate and maintain equipment. For example, a system that yields biosolids which are treated, dried, and disposed of in a landfill or used as soil supplement in agriculture, both do not require high pathogen reduction, less rigorous treatment, and lower O&M costs involved. In comparison, a system that yields biosolids to be used as food crops that are directly consumed without cooking. Understanding of the financial investments required for specific O&M and monitoring tasks for specific enduse activities is important for planning the FSSM project.

Additional factors to remember

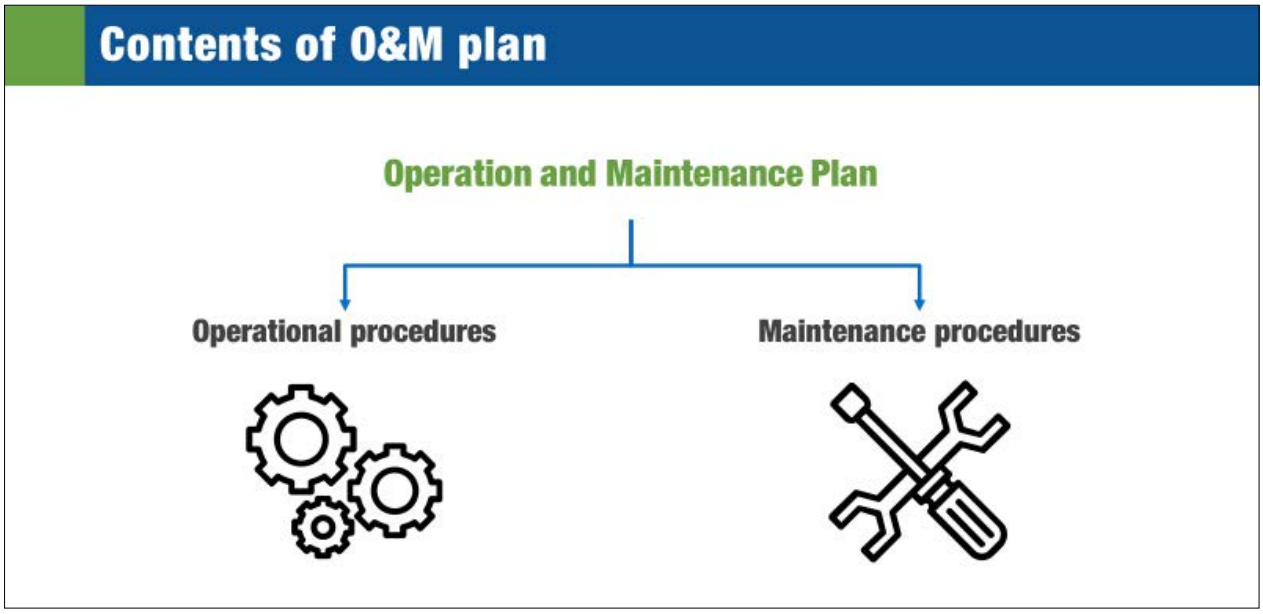
- **Addressing O&M practices of on-site sanitation units**
  - **Septic tank**
  - **Soak pits, Soakaway Zones**
- **Financial investment needed during the life cycle of an FSSM project**
  - **Electro mechanical components**
  - **Electrical and Plumbing**

Source: US Environmental Protection Agency

While the earlier slides are specifically looking into the collection, conveyance, and treatment aspects of the FSSM service chain, there are two other important factors to be kept in mind with regards to O&M in FSSM.

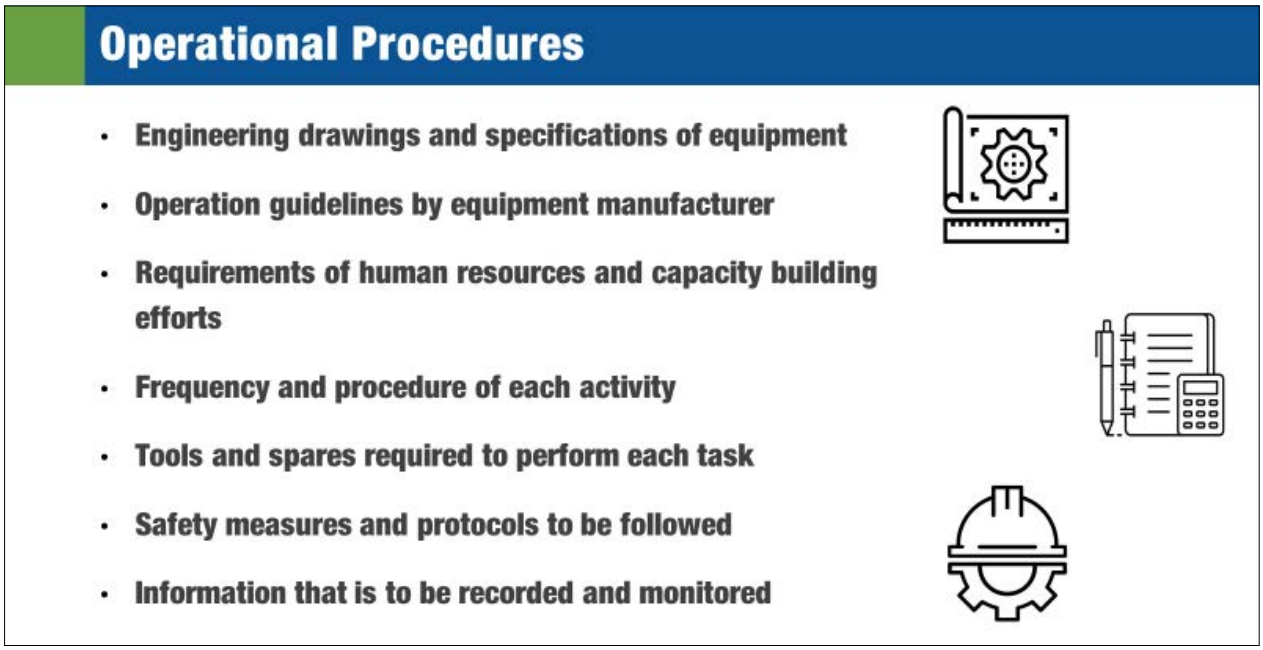
1. Providing guidance or creating awareness regarding best practices on how to use the on-site sanitation systems. This initial aspect of the FSSM service chain falls under the purview of the owners of buildings that have their toilets connected to an OSS system. An example is shown in the image that acts a good communication material giving the “Do’s and Don’ts” while using septic tanks. It is necessary to educate the citizens about these best practices as they will affect the O&M practices that follow in the FSSM service chain.
2. Financial investments that need to be earmarked both as capital and operational expenses while planning the project. Estimation of CAPEX tends to be easier in comparison to OPEX. The reason behind this could be lack of proper planning of O&M activities during the design stage of the project. It is important for the ULB to draw a comprehensive financial flow diagram that will indicate important financial aspects like capital investment, source of revenue, points of expenditure during O&M, etc. Such a flow diagram will present a good idea to the decision-makers about the type of treatment technology, equipment, etc. to be adopted for a sustainable and effective FSSM project.

10.2 Aspects of O&M: - Contents of O&M plan Asset management



An O&M plan gives details on a wide range of items like tasks, materials, equipment, tools, sampling, monitoring and safety procedures. These items make up the complete mechanism of an FSSM service chain and allow it to function properly.

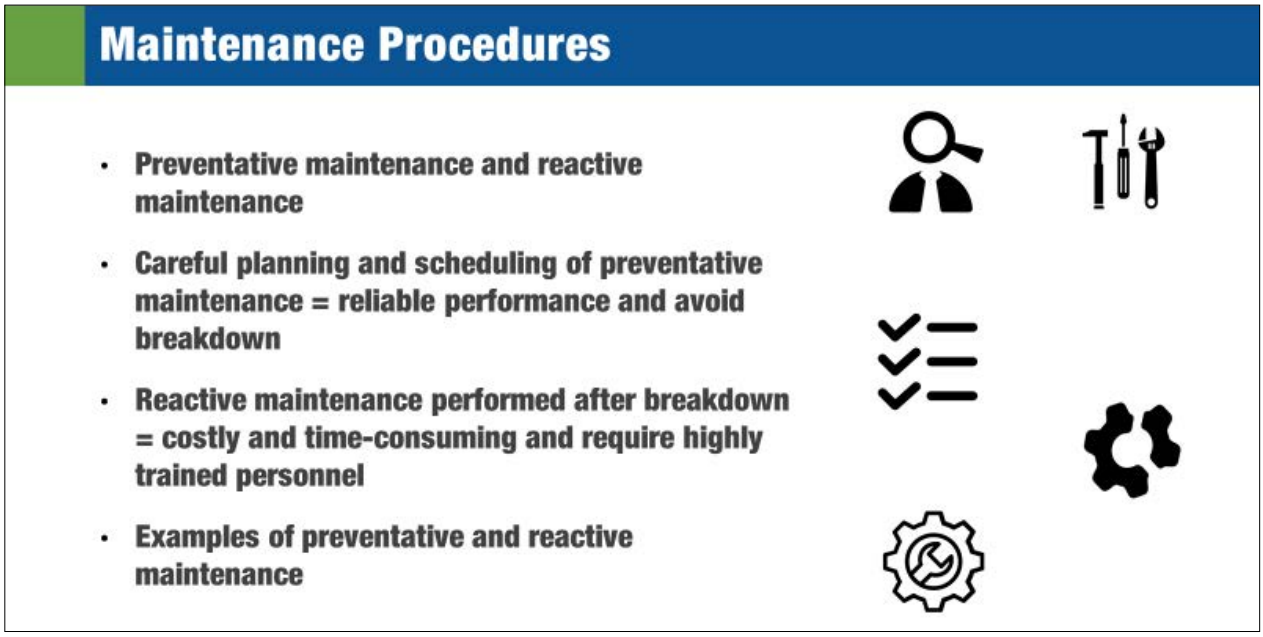
In simple terms, an O&M plan is made up of two parts: operational procedures and maintenance procedures. Operational procedures are a set of instructions to be followed while performing any activity along the FSSM service chain. On the other hand, maintenance procedures give a list of activities that should be performed along the life cycle of the project to ensure safe and efficient performance.



Operational procedures are generally clearly defined/outlined in the tender or RFP documents in the beginning of the project, i.e., during the implementation phase. This is important to provide clarity regarding the operational procedures required to ensure a safe and effective sanitation service provision. As the FSSM service chain has different aspects, the operational procedures for each of these aspects is prepared.

However, the major and common points to be covered in the preparation of operational procedures are given below. Covering these points in the operational procedures will help the stakeholders in understanding the extent of intervention required and how to use local resources as well as experience in adopting the best practices.

As a decision-maker, the local government department looking after the FSSM project can decide how to award the contract to the service provider of each aspect (either, separately or combined manner). However, it is necessary to enforce the strict adoption of operation procedures by the selected contractor.



Maintenance procedures are of two types: Preventative maintenance and reactive maintenance.

Preventative maintenance: It refers to the maintenance carried out in order to reduce the likelihood of equipment failure. It needs to be performed when the equipment is still functional to avoid any unexpected breakdown leading to disruption of system operation. Preventative maintenance should include a list of tasks, frequency of action steps, and step-by-step procedures for accomplishing the tasks. Furthermore, ignoring preventative maintenance can lead to an increase in the need for frequent reactive maintenance to be performed.

Reactive maintenance: It refers to the repairs that need to be carried out to make the equipment functional after its breakdown. Breakdown of equipment can lead to system failure and/or non-compliance. Moreover, performing reactive maintenance is often time consuming and costly because it involves either replacing a part or entire equipment. Also, depending upon the degree of mechanisation adopted in the FSSM service chain, the reactive maintenance would need specialised operators to perform the procedure that are often provided by the equipment manufacturer.

Some of the examples of preventative maintenance are scraping paint and repainting metal surfaces that are corroded, exercising complete operation of pump and valves both located in the desludging equipment and at the treatment plant, checking the quality of hose pipes used in desludging pipes, etc. On the other hand, examples of reactive maintenance could include replacement of the pump due damage to its gearbox, leaking of desludging tank structure, etc.

Key Points

- **Incorporate standards and technical specifications for materials and equipment**
- **Bureau of Indian Standards (BIS) codes, CPHEEO Manual on Sewerage and Sewage Treatment, National Policy on Faecal Sludge and Septage Management**
- **National missions and programs such as SBM, AMRUT 2.0, etc.**
- **O&M plans should factor in variables that affect functioning of FSSM service chain**
- **Specific consumables, equipment spares and tools, etc. require manufacturers' support**

The O&M plan should clearly state the standards and technical specifications of the materials used in civil construction and equipment used for electro-mechanical operation of the FSSM service chain. Additionally, it should also cover description with regards to health and safety protocols to be followed while providing sanitation services.

For Indian context, the O&M plans are governed mainly as per the Bureau of Indian Standards (BIS) codes, the CPHEEO Manual on Sewerage and Sewage Treatment and the National Policy on Faecal Sludge and Septage Management. In addition to this, guidelines mentioned under national missions such as SBM, AMRUT 2.0, etc. are also to be considered where FSSM is mentioned as a priority area for intervention by the ULBs.

Being a sanitation service, FSSM is highly dependent on variables such as demography, water supply, climatic conditions, status of containment systems, sludge characteristics, etc. Hence, it is necessary to correctly identify these parameters while planning and designing the FSSM project. Additionally, these variables as well as the rationale behind them should be clearly mentioned in the project plans and documents. This is very helpful for all involved stakeholders to maintain and perform the required duties for a safe and effective FSSM project.

Use of specific consumables or chemicals like seed for microbial growth and requirements of external agencies for O&M have to be clearly mentioned by equipment supplier with details of name of supplier/agency, respective contact details, etc. This is critical while performing preventative as well as reactive maintenance procedures.

10.3 Monitoring

Monitoring

- Monitoring programme - an important tool in an FSSM project
- Provide information on all things that make up the FSSM service chain
- Misconception regarding the need for monitoring
- Monitoring - a step before O&M
- Preparing a monitoring plan involves asking why, what, how, when, and who!

O&M in FSSM requires a detailed understanding of technical processes along the service chain as well as the performance requirements at the treatment/disposal end. However, to ensure optimal, safe, and long-term sustainability of the FSSM project, additional information is required by service providers. And this additional information can be gathered through a monitoring programme.

A monitoring programme helps service providers in overlooking the FSSM service chain to ensure strict control over the activities covered under service provision.

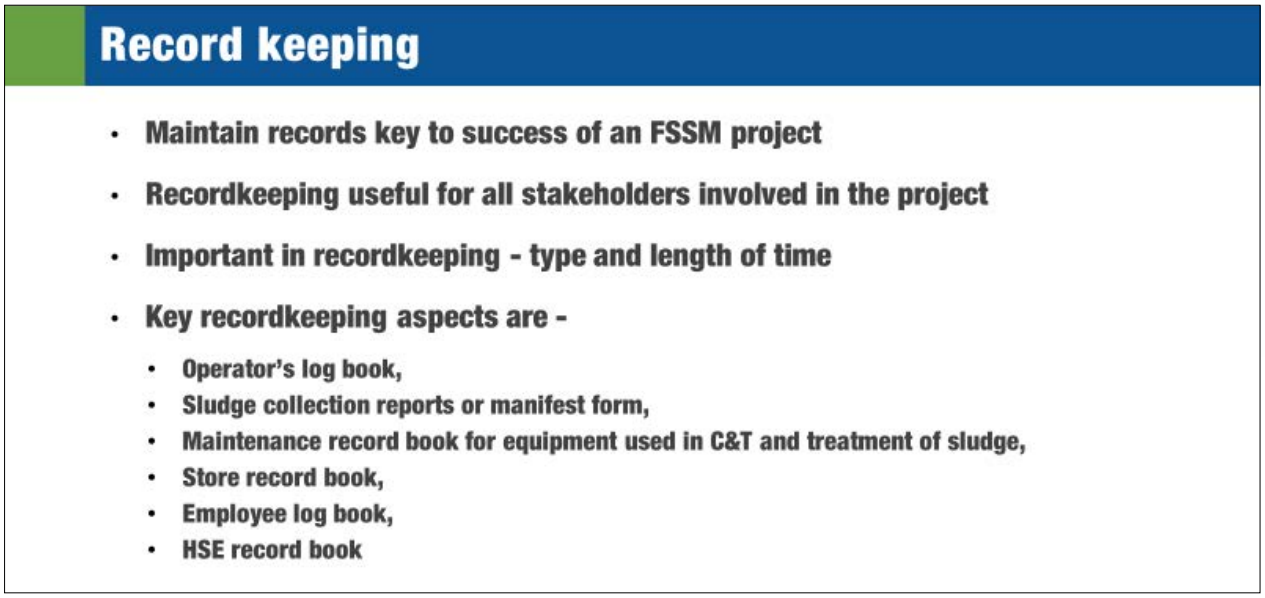
Preparing a monitoring programme involves specific planning, infrastructure, dedicated human resources, and finance. However, it is a misconception that monitoring is an expensive activity and is often avoided or overlooked. It should be kept in mind that monitoring is essential to understand the level and quality of FSSM. Moreover, data gathered through monitoring is also mandatory for regulating agencies to maintain a check on sanitation status of any city.

In simple terms, it can be understood that if a monitoring plan is defined and executed correctly, the FSSM service providers can determine whether it is necessary to perform any operational or maintenance procedures along the service chain.

Monitoring programme is designed to answer why the information is required, what information is required, how and when the information or sample will be collected on the field, and who will collect them.

Examples of activities involved in a monitoring programme are collection of visual or sensory inputs such as checking leakage of valves or hose pipes on a desludging truck, use of PPE kit while performing desludging operations, colour or odour of sludge in the treatment plant, laboratory analysis of sludge for critical parameters, etc.

10.4 Record keeping



Maintaining records of daily activities is key to the success of an FSSM project.

Recordkeeping helps stakeholders a lot as they bring forward fluctuations in data collected through monitoring programmes, operational problems that recur periodically, review mitigation measures and optimise O&M plans

The type of data to be collected in recordkeeping is decided by the service provider. It is reflected in the monitoring and O&M plans of the project. Similarly, the length of time for which the records are to be maintained plays an important role for stakeholders to evaluate the performance of the project and service provider.

Following are some examples of information to be considered for recordkeeping: (a) information on daily desludging trips through fees collected and manifest form, (b) operators log book on compliance, daily monitoring of parameters, treatment unit operating datasheet, and other records related to delivery of FSS to treatment plant, (c) maintenance records of equipment used in E&T and treatment plant, (d) store record book giving information about spare parts, consumables, chemicals, etc., (e) record on use of safety equipment such as PPE kit by operating personnel, and (f) employee records including schedules, time sheets, and injury reports.

Asset management

- Increases long-term effectiveness
- Full life-cycle costs of an asset include:
  - Cost of purchasing and installation;
  - Manpower required for O&M;
  - Tools for repair;
  - Essential chemicals and consumables; and
  - Replacement costs for components
- Should be a part of the O&M plan
- Inventory management for spares, consumable and tools

It is a holistic approach where the life of the assets involved in the project is maintained with a view to increase or maximise their long-term effectiveness.

Full-lifecycle costs of an asset should include the following items (shown in slide)

Asset management is crucial for large scale projects such as FSSM, sewerage infrastructure in a city, etc. and should be a part of the O&M plan (maintenance procedures).

One of the tools for asset management involves preparing a detailed asset inventory. Preparing an asset inventory helps in identifying and prioritising components that are crucial in an FSSM project so that they can be replenished once they are used. An asset inventory should give an overview of current state of assets, their required level of service, important assets critical to the project, minimum life-cycle costs, and necessary long-term funding strategy.

10.5 Health and safety

Occupational Health and Safety

- Health and safety - an integral part of the project
- Health and Safety Plan is always project specific
- Main topics included in an health and safety plan
  - PPE and safety measures for O&M
  - Infection control and hygiene measures
  - Protection against occupational hazards
  - Safety during operating electro-mechanical equipment
  - Emergency contact procedures

Hazard: Ergonomic & Biological Hazard

Inherently safe design: Easy access for raking the screens

Engineering control: A raking tool with long handle so as to avoid splashes of waste on to the hands and body.

Source: Saniverse Environmental Solutions

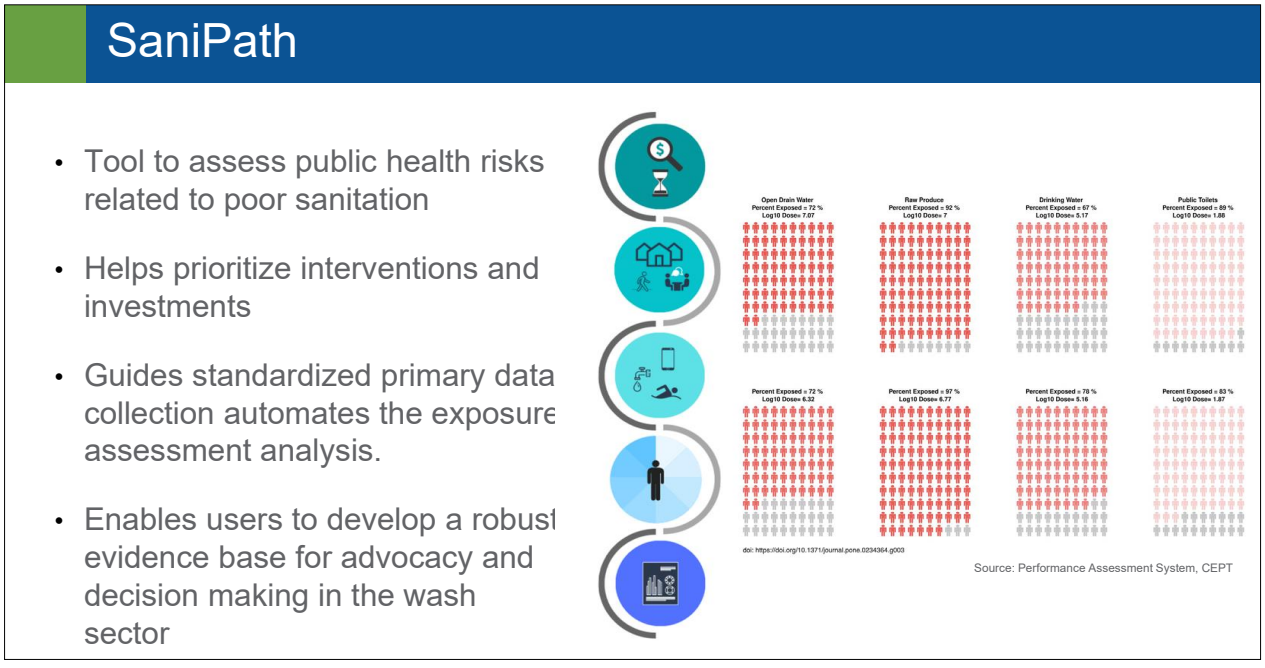
Health and safety aspects are an integral part of the O&M plan but are often not given adequate attention. In an FSSM project, each aspect of the service chain involves a combination of human resources and technology to perform the activities. Therefore, health and safety hazards should be an important consideration in an FSSM project.

Health and Safety Plan looks at procedures, practices, and equipment that have to be used by operators for performing activities in a safe manner. Furthermore, a health and safety plan is specific to a particular project and cannot be replicated completely. While the aspects of other plans can be used as a reference, it is necessary to create a health and safety plan while preparing an FSSM project plan.

The preparation of a health and safety plan is the responsibility of the decision makers or group of people responsible for planning the entire FSSM project. Such a plan will encompass the health and safety aspects of sludge collection and transportation as well as FSTP. And it is also important to enforce its adoption by service providers. In fact, the service providers are also required to prepare health and safety plans that they promise to follow during service provision. Additionally, they can be asked to submit their credentials with regards to occupational safety and health according to the national guidelines.

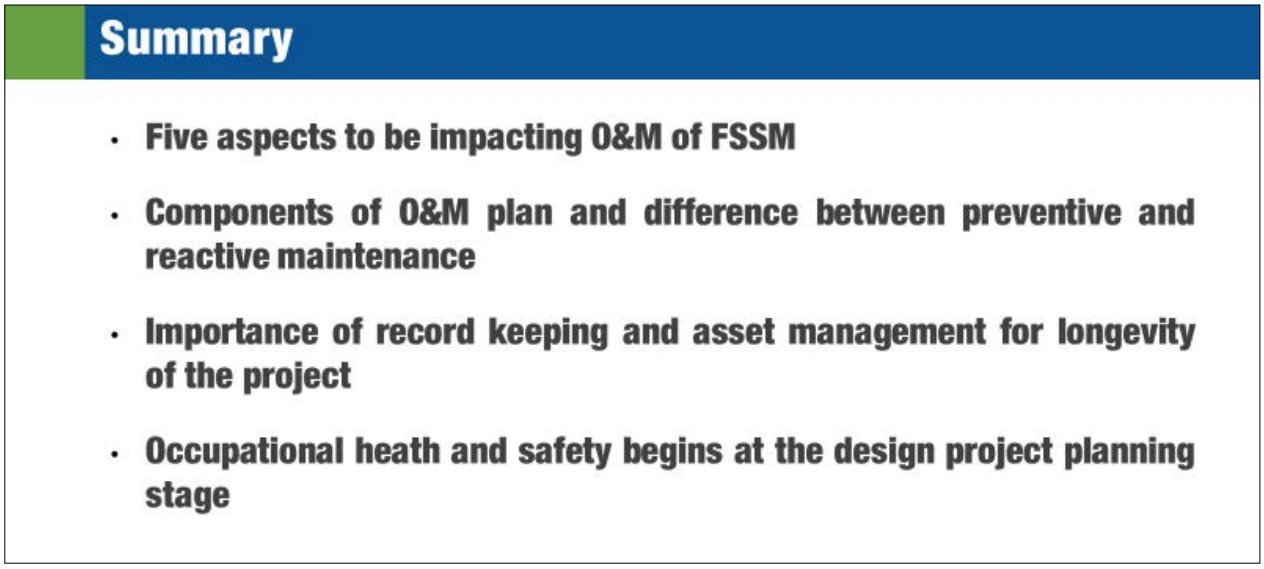
Topics included in an HSE plan: PPE and safety measures for O&M, infection control and hygiene measures, protection against occupational hazards, safety during operating electro-mechanical equipment, emergency contact procedures.

10.5.1 Tool for Assessment



The SaniPath Exposure Assessment is designed to assess public health risks related to poor sanitation and to help prioritize interventions and investments based on the exposures that have the most significant public health impact. The SaniPath Exposure Assessment Tool ("the Tool"), was developed by the Centre for Global Safe WASH at Emory University to identify and compare

the risk of exposure to faecal contamination across multiple exposure pathways associated with inadequate sanitation and faecal sludge management. This approach follows the framework for quantitative microbial risk assessment, with an emphasis on hazard identification, exposure assessment, risk characterization, and risk management. The Tool guides standardized primary data collection automates the exposure assessment analysis. It visualizes the results in a way that is accessible and understandable to people with a variety of backgrounds. It enables users to develop a robust evidence base for advocacy and decision making in the WASH sector. The Tool is free and open access for all, including those who may want to use it or further improve and build upon it.



Maintaining records of daily activities is key to the success of an FSSM project. Recordkeeping helps stakeholders a lot as they bring forward fluctuations in data collected through monitoring programmes, operational problems that recur periodically, review mitigation measures and optimise O&M plans.

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Notes

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Download our latest reports, research briefs
and training modules at:

scbp.niua.org

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.

About SCBP

The Sanitation Capacity Building Platform (SCBP) is an initiative of the National Institute of Urban Affairs (NIUA) to address urban sanitation challenges in India. SCBP, supported by Bill & Melinda Gates Foundation (BMGF) is an organic and growing collaboration of credible national and international organisations, universities, training centres, resource centres, non-governmental organisations, academia, consultants and experts. SCBP supports national urban sanitation missions, states and ULBs, by developing and sourcing the best capacity building, policy guidance, technological, institutional, financial and behaviour change advise for FSSM. SCBP provides a unique opportunity for:

- Sharing and cross learning among the partner organisations, to pool in their knowledge resources on all aspects of urban sanitation capacity building;
- Developing training modules, learning and advocacy material including key messages and content, assessment reports and collating knowledge products on FSSM. Through its website (scbp.niua.org), SCBP is striving to create a resource centre on learning and advocacy materials, relevant government reports, policy documents and case studies;
- Dissemination of FSSM research, advocacy and outreach to State governments and ULBs.

Its strength is its ability to bring together partners to contribute towards developing state sanitation policy, training of trainers and training content development, technical and social assessments, training programme delivery, research and documentation.

National Institute of Urban Affairs

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FAECAL SLUDGE AND SEPTAGE MANAGEMENT—PLANNING MODULE

PART A: PRESENTATION SLIDES