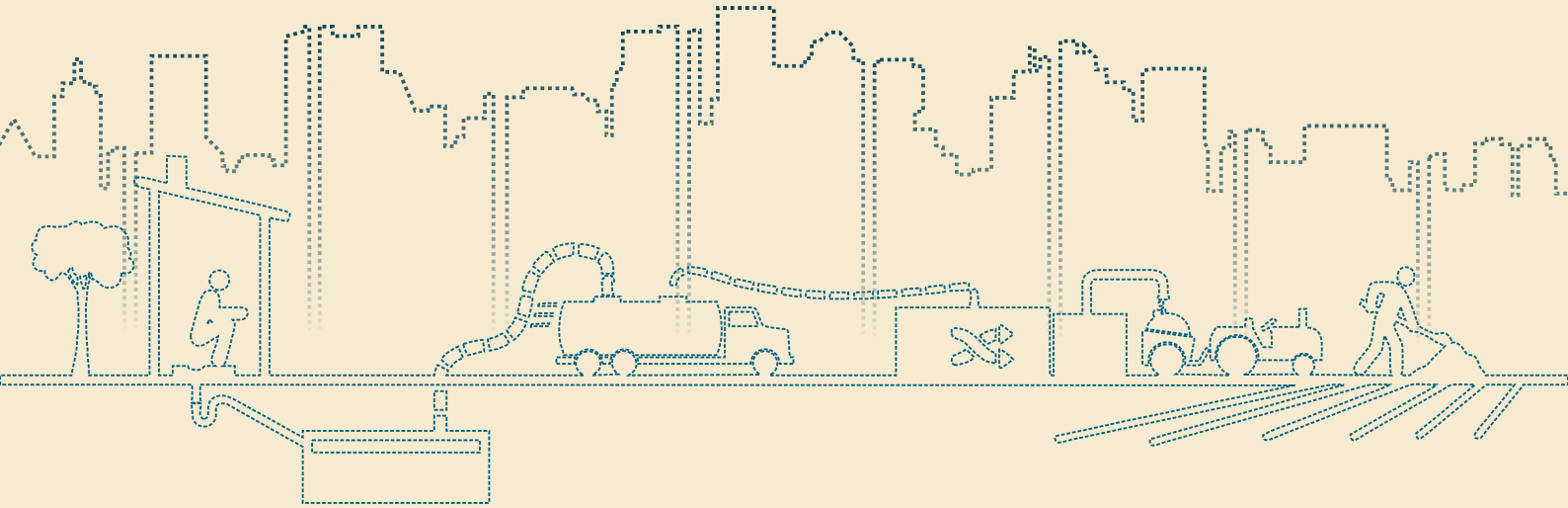
National Workshop on

Non-Networked Sanitation Systems for India

Mussoorie, February 27-28, 2019

Participant's Handbook



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Why non-networked Sanitation Systems

Increasing access to toilets in rural and urban areas has created the need for addressing the next level challenge of safe conveyance and treatment of faecal sludge and septage.

Rural sanitation coverage (toilet access) has increased to 98%, more than 92 million new toilets have been built, 600 districts are declared Open Defecation Free (ODF). More than 5.4 million toilets have been built in urban areas. Sewerage connectivity that was only 33% of the households of urban India in 2011, is likely to reach 60% by 2020.

However, challenges like low efficiency of existing centralised Sewage Treatment Plants (STPs), high cost infrastructure requirement for additional STPs, expanding urban population and water scarcity requires an exploration of co-treatment of septage and sewage. Non-networked sanitation solutions for urban and rural India are an emerging priority.

Purpose of Workshop

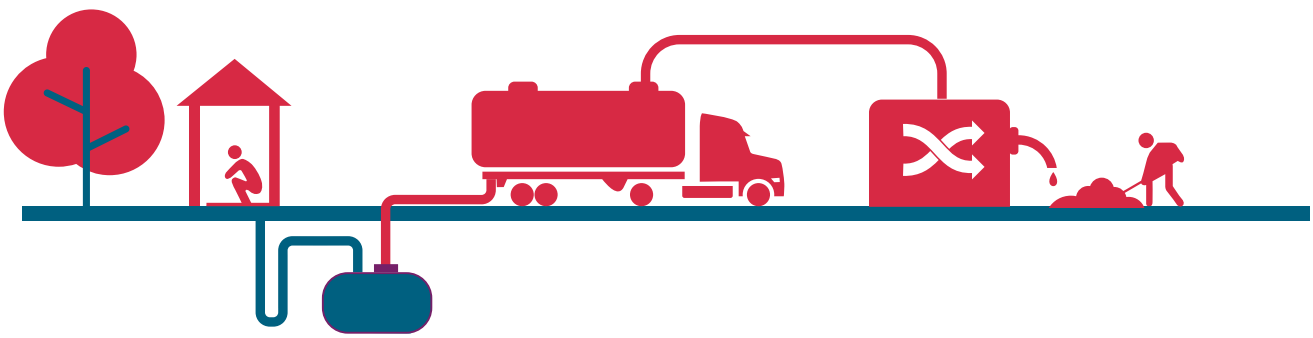
The workshop is a first of its kind national learning event for practitioners and training institutions to come together and share both rural and urban initiatives and experiences for addressing liquid waste management. The workshop will felicitate initiatives taken to address septage management in our towns and districts.

The workshop has a thematic learning focus covering: Policy and Institutions, Technology, Financing and Capacity Building.

A non-sewered sanitation system is:

- Not connected to a networked sewer system and
- Collects, conveys, and fully treats the specific input, to allow for safe reuse or disposal of the generated output.

A paradigm shift in favour of Decentralised and Non-Networked Sanitation Systems is needed to ensure effective universal sanitation coverage, beyond access to toilets.



Content

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PROGRAMME OUTLINE

WEDNESDAY 27/02

REGISTRATION	**09:00 AM – 10:00 AM**	
OPENING SESSION	**10:00 AM – 10:45 AM**	**Welcome address:** Ms. Utkarsha Kavadi, Senior Executive Director, AIILSG Mumbai **Workshop Overview:** Mr. Depinder Singh Kapur, Senior Domain Expert, NIUA **Address:** Mr. Shailesh Bagauli IAS, Secretary Urban Development, Govt. of Uttarakhand **Inaugural Address:** Mr. Madan Kaushik, Cabinet Minister, Urban Development, Govt. of Uttarakhand **Vote of thanks:** Mr. B. S. Bisht, Programme Director, NCGG
SESSION 1	**10:45 AM – 11:40 AM**	**Policy Context: Moving Beyond Toilets – ODF+ and ODF++**
TEA BREAK	**11:40 AM – 12:00 PM**	
SESSION 2	**12:00 PM – 01:30 PM**	**Technology Options and Selection Criteria / Framework Best Practices and Initiatives in Rural and Urban Non-Networked Sanitation**
LUNCH BREAK	**01:30 PM – 02:30 PM**	
SESSION 3	**02:30 PM – 03:30 PM**	**Non-Networked Sanitation –Context & Priorities for Uttarakhand State**
TEA BREAK	**03:30 PM – 04:00 PM**	
SESSION 4	**04:00 PM – 04:45 PM**	**Legal and Institutional Challenges - Non-Networked Sanitation**
SESSION 5	**04:45 PM – 05:30 PM**	**Felicitating Champions – Cities / Towns and Districts**

CULTURAL EVENING AND DINNER 07:30 PM ONWARDS

PROGRAMME OUTLINE

THURSDAY 28/02

SESSION 6	09:30 AM – 10:45 AM	Financing and Contracting
SESSION 7	10:45 AM – 11:30 AM	Capacity Building for Non-Networked Sanitation
TEA BREAK	11:30 AM – 12:00 PM	
SESSION 8	12:00 PM – 01:00 PM	Recommendations and Way Forward
	01:00 PM – 01:30 PM	Closing Remarks
LUNCH	01:30 PM ONWARDS	

Learning Note 1

POLICIES

Policy context in urban and rural sanitation

Framework created at national level to ensure and encourage acceptance and implementation of non-networked sanitation systems in states and towns

Background

With the given impetus on the non-networked sanitation systems for Indian towns, the national Urban Faecal Sludge and Septage Management (FSSM) Policy was launched in February, 2017. This learning note, anchored by All India Institute of Local Self-Government, Mumbai is the review of this policy framework and its adoption in various states, along with an overview of rural FSSM policy.

Urban Context

1. Policy interventions in sanitation in the last two decades

a. Mission/programmes/schemes at national level

Sanitation has been at the forefront of urban policies in India in recent times. Yet need for sanitation improvements has been realised by the government much earlier. Urban policies on basic services in India conventionally associated sanitation to water supply and provision of sewerage systems in cities.

It was finally recognised by the Sixth five-year Plan (1980-85) that urban development comprises of both the provision of safe water supply and adequate sanitation and acknowledged that the situation of urban sewerage and sanitation is more inadequate than water supply. Post this, various schemes were launched to improve the situation of sanitation in urban areas.

- The Integrated Low Cost Sanitation Scheme (ILCS) was launched in 1980 to provide financial support for the conversion of dry latrines into twin pit-pour flush latrines and to construct new toilets for the economically weaker households with no toilets. The scheme ended in 2014.
- The Jawaharlal Nehru National Urban Renewal Mission (JNNURM) was launched in 2005 to improve infrastructure provisions and basic services for the urban poor covering a variety of sectors like roads, water supply, sewerage, drainage, solid waste management and transport.
- 1999 witnessed the formulation of Total Sanitation Campaign (TSC) which was started as a demand driven, community led programme with major IEC inputs to make sanitation a felt need of the people. TSC was later renamed the Nirmal Bharat Abhiyan in 2012.

Even though all these schemes and programmes bought sanitation issues to the forefront, access to sanitation still remained a challenge in the country. The census of 2011 states that in 4,041 statutory towns, close to eight million households did not have access to toilets and defecate in the open. To address these challenges, the Nirmal Bharat Abhiyan was reorganised into the Swachh Bharat Mission (SBM) in 2014. It comprised of two sub-missions, SBM-G for rural areas and SBM-U for urban areas.

b. Launch of Swachh Bharat Mission

The Swachh Bharat Mission (SBM) originated from the vision of the Government articulated in the address of The President of India to the Joint Session of Parliament on 9th June 2014. To accelerate the efforts to achieve universal sanitation coverage and to put focus on safe sanitation, the Prime Minister of India launched the SBM on 2nd October, 2014. SBM is being implemented by the Ministry of Housing and Urban Affairs (MoHUA) and by the Ministry of Drinking Water and Sanitation (Mo DWS) for urban and rural areas respectively. The objectives of this mission were:

- Elimination of open defecation
- Eradication of Manual Scavenging
- Modern and Scientific Municipal Solid Waste Management
- To effect behavioral change regarding healthy sanitation practices
- Generate awareness about sanitation and its linkage with public health
- Capacity Augmentation for ULBs to create an enabling environment for private sector participation in Capex (capital expenditure) and Opex (operation and maintenance)

The mission aimed at eliminating open defecation by beneficiary led construction of individual toilets. Access to community toilets was to be strengthened for households which could not build individual toilets due to lack of space. The SBM Urban guidelines stated that if a sewerage system is available within 30 metres from the proposed household toilet, only the toilet superstructure may be constructed and connected to the existing sewerage system. In the event that a sewerage system is not available within 30 meters from the proposed household toilet, in addition to the construction of the toilet superstructure, an on-site treatment system (such as twin pits, septic tanks, bio-digesters, or bio-tanks) should also be constructed for the collection, treatment and/or disposal of sewage at, or near the point of generation. As a result of this a large number of individual toilets, mainly with septic tanks/pit latrines due to lack of sewer networks, have been built under the Mission.

c. Impact of SBM (drastic increase in number of toilets with onsite sanitation systems)

In the mission period from 2014, there has been a drastic increase in the number of toilets in all the States in the country. 54,64,727 toilets have been built in urban areas (as per SBM Urban portal) and 9,22,22,254 toilets in rural areas (as per SBM Gramin portal) and the numbers are growing every day. A substantial proportion of these toilets is dependent on on-site sanitation systems. The nationwide mission implemented in a way so as to reach common masses in an effective manner has been successful not just in eradicating open defecation from various towns but also creating consciousness in terms of need for sanitation and cleanliness.

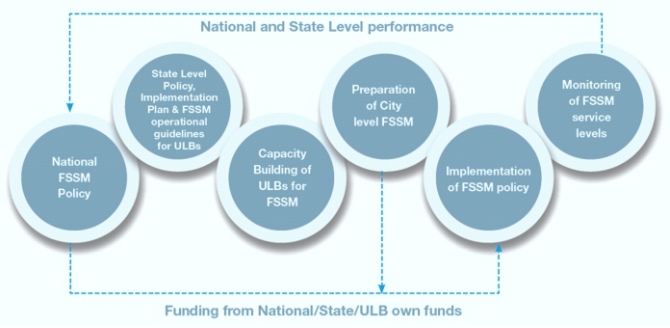
b. Emergence of national Faecal Sludge and Septage management (FSSM) policy and expected outcomes

According to the data released in the report "Inventorization of Sewage treatment plants, 2015" by the Central Pollution Control Board, out of the 816 municipal sewage treatment plants (STPs) listed across India, 522 are operational (only 64% are functioning), 79 STPs are Non-Operational, 145 STPs are under construction and 70 STPs are proposed. A large number of toilets in India are dependent on on-site sanitation systems. With the increasing number of toilets under SBM, this number is increasing as these toilets have arrangements like septic tanks/pit latrines where sewerage network is not available. Thus, the component of containment in the service chain is being addressed under the mission but the treatment of this waste is still a challenge.

In contrast with the large proportion of on-site sanitation systems, limited attention has been accorded to their proper construction, maintenance, management and safe disposal of faecal sludge and septage from such septic tanks and pit latrines. This problem of faecal sludge and septage needed to be addressed in a holistic manner, with a strategy that was appropriate and affordable for all areas, considering the local situation. It also needed suitable regulations, and institutional framework, capacity building and education and awareness among all stakeholders. In response to this, the then MoUD now MoHUA and a host of research and civil society organisations jointly drafted and signed a National Declaration on FSSM on 9th September, 2016 followed by the national FSSM policy launched in February 2017.

Implementation approach:

In line with the National FSSM Policy each state is expected to develop and issue an FSSM Implementation Strategy and Planning Guidelines. Each ULB is expected to develop a detailed FSSM plan in conformity to the National FSSM policy and respective State guidelines on FSSM.



Expected outcomes of the policy:

As this Policy is implemented across the country, it is expected to have significant benefits in terms of improved public health indicators, reduced pollution of water bodies, groundwater from human waste, and resource recovery leading to reuse of treated waste and other end products. Some key projected outcomes are:

- Containment of all human waste in 100% of the towns and cities.

- Safe collection and conveyance of human waste to treatment and disposal sites.
- Cost-effective solution for management of human waste through integrated network sewerage, small bore sewerage, and faecal sludge and septage management.
- Clarity among different stakeholders on identifying and implementing best and economically viable sanitation solutions.
- Technical capability among ULBs to effectively implement FSSM.
- Scheduled emptying of septic tanks or other containment systems at an interval of 2-3 years as recommended by CPHEEO Sewerage & Sewage Treatment Manual and the MoHUA Advisory on Septage Management (2013).
- Safe disposal of all collected faecal sludge and septage at designated sites (sewage treatment plants, faecal sludge treatment facilities for safe and scientific disposal, etc.).
- Continuous improvements in efficiency and effectiveness in the entire FSSM chain: containment, collection, conveyance, treatment and disposal.
- Preventing Contamination of water bodies and groundwater from human waste (faecal matter) in all the towns and cities across India.
- Nuisance from faecal sludge reduced to minimum levels, resulting in nuisance-free living space in urban India
- Maximum reuse of treated sludge as fertilizer in farmlands, parks, gardens and other such avenues, reuse of treated sewage, as source of energy where feasible, and any other productive uses.
- Drastic reduction in incidences of diseases due to safe & sustainable FSSM services.

c. Reflections/impact of national FSSM policy in various states

The launch of national policy on FSSM has given an impetus to addressing faecal sludge and septage management in cities where sewer systems are not possible or partially possible/available. This has led to awareness to address sanitation challenges at state and city level. Many states like Maharashtra, Odisha, Tamil Nadu, Chattisgarh, Jharkhand, Bihar, Uttar Pradesh, Rajasthan, Telangana etc. have drafted their own FSSM policies or operative guidelines for ULBs which are aspired to be implemented at city level. The policy has given flexibility to states to assess their institutional framework and draft their own approach towards FSSM implementation plans. This has led to state specific policies which address their own concerns based on their respective priorities.

States and cities have been urged to include FSSM as part of their AMRUT State Level Implementation Plans. Further, The AMRUT- Sub Mission introduced by MoHUA, specifically focuses on septage management in 500 AMRUT cities across the country. Due to availability of funding from various organizations and multinational agencies, focus is also on research and technical support to the state and cities unlike the conventional capital expenditure funding provision. The national competition of Swachh Survekshan, ODF+/ODF++ protocol launched by the MoHUA and the assessment done for 400 towns to rank the cities based on their cleanliness, sanitation and waste management also has dedicated indicators towards FSSM.

Many state governments have earmarked budget allocation for FSSM (around 100 million USD). Co-treatment is being promoted for more than 900 STPs all over the country. New FSSM mission is being planned for around 600 small towns. The efforts are being made for developing required institutional framework, strengthening local capacities, generating awareness and exploring involvement of private sector at appropriate levels of sanitation value chain. Focus has been also given on technological innovations, monitoring systems, quality assurance as well as introducing gender and social lens including community engagement.

Sources

- National Policy on Faecal Sludge and Septage Management, February 2017 (http://amrut.gov.in/writereaddata/FSSM_Policy_Report_23Feb.pdf)
- Guidelines for Swachh Bharat Mission Urban, Revised as on 5th October 2017 (http://164.100.228.143:8080/sbm/content/writereaddata/SBM_Guideline.pdf)
- Swachh Bharat Mission (Urban): Need vs. Planning, June 2018, Sama Khan, Centre for Policy and research (https://www.researchgate.net/publication/325781457_Swachh_Bharat_Mission_Urban_Need_vs_Planning)
- National Urban Sanitation policy, 2008
- Demand for household sanitation: The case of India (No. 154), Banerjee, A., Banik, M., & Dalmia, A. (2016). United Nations Economic and Social Commission for Asia and the Pacific (ESCAP). (https://www.econstor.eu/bitstream/10419/154752/1/845965964.pdf)
- Draft Rural Policy on Solid Liquid Resource Management – FSSM
- (http://swachhbharatmission.gov.in/SLRM/Download.aspx?FileName=FSM_Resource%20Book.pdf)
- State policies on FSSM (https://scbp.niua.org/govt-state-reports)

2.Summary of state level policies in FSSM

Sr. No	State	Population in Lakhs	No. of ULBs	Prepared in (Year)	Policy goals/ Objectives	Implementation Approach	Expected Outcomes
1	**Bihar**	1040.99	143	Jun-18	• To set context priorities, direction & to facilitate statewide implementation of FSSM services in all ULBs such that safe and sustainable sanitation becomes a reality for all in each household, street, town and city.	• Stakeholder's identification and engagement. • Baseline information assessment. • Suggest institutional framework, current economic model and business model. • Monitoring and grievance redressed systems. • Awareness generation capacity building for all stakeholders.	• Coverage of adequate sanitation system • Improved Collection efficiency of sanitation system • Adequacy of treatment capacity of sanitation system • Improved quality of treatment of sanitation system • Reuse and recycling and its extent in sanitation system
2	**Chhattisgarh**	255.45	168	Jun-17 (Draft)	• Establish FSSM as a central component in delivery of safe sanitation service. • Ensuring timely collection & treatment, optimum resource recovery, greater awareness and active participation. • Creating and enabling institutional & regulatory framework, innovation in service, delivery and management.	• IEC and stakeholder engagement • Institutional and Regulatory Framework • Partnership Building • Funding and financing • Implementation support and delivery • Monitoring and Evaluation • Capacity Building & training.	• Safe handling and complete containment of FSS during collection, conveyance, treatment and disposal. • Significant reduction in contamination of soil and water • Improvement in public health indicators including morbidity and mortality rates and reduced incidences of water borne diseases. • New opportunities based on cost recovery and profit generating business models.
3	**Gujarat**	604.39	159	2017	• Make all ULBs fully sanitized by 2019 and ensure safe sanitation to all citizens. • Suggest and identify methods, means and resources towards creation of an enabling environment for realizing safe and sustainable FSSM. • Define the roles and responsibilities of key stakeholders for effective implementation of FSSM service in the state. • Without compromising the strict environmental discharge standards, adopt an appropriate, affordable and incremental approach towards achieving these standards.	• By October 2019, all ULBs in Gujarat to mainstream FSSM and achieve the vision of National FSSM policy. • State to provide technical and financial support to ULBs for implementing FSSM in cities. • The ULBs to refer to the standard operating procedure for FSSM provided in guidelines for 'ODF towns' under Mahatma Gandhi Swachhata Mission.	• 100% containment of human waste of town and cities. • Safe collection and conveyance of human waste to treatment and disposal sites. • Cost effective solution for management of human waste through integrated network sewerage, small bore sewerage, and faecal sludge and Septage management. • Scheduled emptying of septic tanks at an interval of 2-3 years • Safe disposal of collected septage at designated site • Maximum use of treated sludge as fertilizer in farmlands, parks, gardens and other such avenues, reuse of treated sewage, as source of energy where feasible, and any other productive uses.

Sr. No	State	Population in Lakhs	No. of ULBs	Prepared in (Year)	Policy goals/ Objectives	Implementation Approach	Expected Outcomes
4	**Jharkhand**	329.88	45	2017 (Draft)	• To set the context, priorities, and direction for, and to facilitate, statewide implementation of FSSM services in all ULBs such that safe and sustainable sanitation becomes a reality for all in each household, street, town and city.	• A 3-phase approach designed to implement the policy. • To be implemented in the financial year 2017-18, in all the notified Nagar Nigam. • In the financial year 2018-19, to be implemented in all the notified Nagar Parisad. • In the financial year 2019-20 it will be implemented in in all the notified Nagar Panchayats.	• Safe containment, collection and conveyance of 100% human waste to treatment and disposal sites. • Scheduled emptying of septic tanks at an interval of 2-3 years and disposal of collected waste at designated sites. • Contamination of water bodies and groundwater from human waste reduced to zero levels in all cities. • Maximum reuse of treated sludge and treated wastewater.
5	**Madhya Pradesh**	726.26	379	Mar-17	• To make cities and towns totally sanitized, healthy and livable, ensure, and sustain good public health and environmental outcomes for all their citizens. • To ensure improved health status of urban population, especially the poor and under privileged, through the provision of sustainable sanitation services and protection of environment.	• Separate System: Sewerage system to carry domestic sewage while drainage system for storm water. • Water reclamation centers to reclaim water after treatment of domestic sewage. • Grit chamber, Primary sedimentation tank, Reaction Tank, Secondary sedimentation tank, Chlorination Tank followed by sand filtration for treatment. • Reverse osmosis filtration may be used for tertiary treatment.	• Sludge produced from the treatment process shall be processed so that it can be used as a fertilizer and soil conditioner. • Sludge maybe dewatered, thickened and incinerated. Ashes maybe used for land fill
6	**Maharashtra**	1123.74	392	Feb-16	• To facilitate all ULBs in Maharashtra to prepare an integrated FSSM plan and implement in cities. • This would cover aspects across the service chain of on-site sanitation including safe collection, conveyance, treatment and disposal/reuse of the treated FS. • To provide ULBs with knowledge and procedures of preparing a septage management plan.	• Preparation of plan for septage management • Exploring private sector participation for septage management activities. • Awareness generation and capacity building activities. • Record keeping, reporting (MIS), and monitoring and feedback systems. • Financial Resource mobilization plan	• Converting insanitary toilets into sanitary toilets. Ensuring 100% access to toilets. Prepare database on toilets. • Providing access covers for regular cleaning. Enforcing regulations on septic tanks design. Data base of properties with septic tanks. • Preparing a schedule for periodic cleaning of septic tanks, to ensure that all septic tanks are cleaned at least once in 3 years. • Installing treatment facility for treatment of septage. • Revenue from safe dumping of treated faecal matter and or the sale of septage at a fixed rate.

Sr. No	State	Population in Lakhs	No. of ULBs	Prepared in (Year)	Policy goals/ Objectives	Implementation Approach	Expected Outcomes
7	**Rajasthan**	685.48	190	2018 (Draft)	• To establish FSSM as a central component in delivery of safe sanitation service by creating a favorable Environment for its effective implementation across all urban areas in a pragmatic, sustainable and participatory manner. • Ensuring timely and safe collection and transport of faecal sludge and septage & complete treatment of all collected waste. • The treatment facility would maximize reuse of treated wastewater and sludge.	• Full scale FSSM with dedicated FSTP to be implemented in cities without centralized network (existing or proposed) and in small and medium towns (Class- III, IV & V except district headquarters). • Partial FSSM with decentralized FSTP or co-treatment at STP shall be implemented in cities with partial coverage of sewerage network. • In large cities where areas are inaccessible to desludging vehicles, decentralized systems shall be adopted.	• Enhancement of sanitation coverage • Environmental improvement, significant reduction in contamination of soil and water (surface and underground) due to human waste. • Safe waste handling and better Public Health • Employment Generation Skilled manpower for FSSM through incremental capacity building program, also evolving opportunities under FSSM as mainstream career prospects for young professionals.
8	**Tamil Nadu**	721.47	135	Sept-2014	• To decentralize the septage management system and to improve the existing facility. • To ensure that proper design of containment systems • To ensure safe transportation of sludge	• Design and construction of Septic tanks • Septage Transportation • Treatment and Disposal with cluster level FSTP. • STP to have decanting facility designed for septage for 5 year planning horizon • Fees/Charge for Collection. • To have licensed operators for transport • Information Education and Communication	• All septic tanks are constructed as per standard design and all insanitary latrines are converted to sanitary ones • Periodic and safe collection of all sewage generated in the Local Body by residential, commercial institution. • All stakeholders to be given periodical training on safe and best practices in septage management
9	**Telangana**	351.94	73	Mar 2018	• To establish safe, hygienic and sustainable sanitation systems. • To enable city to capture the wastewater generated from all sources within the city boundaries and treat to the required standard for a clean, healthy and sanctioned city keeping into consideration the public and environmental health outcomes.	• At household, community and ward level with a suitable transport and treatment option, grey water and black water to be collected and treated separately. • The cities shall select the technologies in a manner that the reduction of contaminants in wastewater and septage achieved to the discharge standards.	• Achieve 100% public health and hygiene protection. • Best-designated conjunctive use and management of the water & wastewater resource efficiency, recovery and sustainability.

Sr. No	State	Population in Lakhs	No. of ULBs	Prepared in (Year)	Policy goals/ Objectives	Implementation Approach	Expected Outcomes
10	**Uttar Pradesh**	1998.12	635	Feb-18	• To set context, priorities, and direction for, and to facilitate, statewide implementation of FSSM services in all ULBs such that safe and sustainable sanitation becomes a reality for all in each household, street, town and city.	• Stakeholder's identification and engagement • Task force with collection and analysis of baseline data. • Suggested institutional framework. • FSSM strategy integrated state and city sanitation plans in overall conformity to the national policy. • Monitoring and grievance redressal systems.	• Treatment of adequate sanitation system • Enhanced Collection efficiency of sanitation system • Adequacy of treatment capacity of Sanitation System • Quality of treatment of sanitation system • Extent of reuse and recycling in sanitation system
11	**Odisha**	453.47	114	2017	• Goal is to make all cities and towns in the state very clean, sanitized, safe, healthy and livable, managed by ULBs with active citizen and stakeholder participation.	• Drafting and issuing of sanitation management guidelines for the ULBs - Environmental, Technical standards, public health indicators. • Safety standards for workers. • ULB accountable with regard to service delivery and assets created and managed. • Service delivery could be through agencies contracted by the ULB but all non-household assets would be owned by the ULB with clear lease arrangements for users. • ULB to have key regulatory role over all agencies/ households in the city for outcomes and stipulated process standards, subject to due cognizance of law.	• Urban areas are Open Defecation Free (ODF) and Open discharge free (ODF++) . • Sewage, septage/faecal sludge, and liquid waste is safely managed, treated, and disposed. • Safety standards and guidelines followed in the physical handling and management of waste. • Cities / towns do not discharge untreated waste (water and faecal waste) into the water bodies of Odisha

Draft policy on Solid Liquid Resource Management (SLRM) - FSSM

Introduction

The Ministry of Drinking Water and Sanitation (MoDWS) prepared the draft policy on Solid Liquid Resource Management (SLRM) with an aim to serve as a platform for building a rural SLRM implementation framework to various stakeholders from districts and states across India. Through this document MoDWS aims to create a repository for FSSM and bring forward various policy frameworks, technologies and service agreements for census towns and rural areas. Some of the key highlights from the policy have been summarized to give an overview of the draft policy. This draft policy is available at http://swachhbharatmission.gov.in/SLRM/Download.aspx?FileName=FSM_Resource%20Book.pdf

1. Background and context

According to Census 2011, out of the total of 1210.2 million population in India, the size of the rural population is 833.1 million which constitutes 68.84% of the total population. Census Towns are currently administered as rural areas.

In the last four years the flagship mission of Central government-Swachh Bharat Mission (SBM) has been able to achieve significant strides by providing access to toilets and encouraging their sustainable use in the urban and rural underserved areas of India. SBM-G aims to fulfil the objectives in rural areas at an estimated allocation of Rs. 134 thousand crore, out of which the Central share is Rs. 1,00 thousand crore (75%). More than 300 plus districts in India are now ODF with a toilet coverage of nearly 79% in rural India.

The problem related to rural areas is that maximum septic tanks are prevalent in this area. Since septic tanks form the part of rural areas they are not treated by the existing treatment facilities in the urban region. There is a lack of sewer lines which connect the toilets in such areas to the existing STPs in the nearby area, faecal sludge generated by the septic tanks are collected and disposed either in water bodies or open land. Proper management of accumulated faecal sludge poses a challenge with no formal mechanism in place.

2. Policy, legal, regulatory and possible administrative framework

The National Urban Sanitation Policy of 2008 brought a paradigm shift in India's approach from 'conventional centralized sewerage network' approach of urban sanitation to a more holistic approach The Ministry of Housing and Urban Affairs has also released a primer on FSSM as well as a Rapid Assessment Tool to estimate the budget needs for FSSM.

Few states have already formulated guidelines for FSSM. A National Policy on FSSM exists, but it is dedicated towards the urban areas. There is a void of a National Policy for FSSM for rural areas.

With SBM-G aiming at providing every HH with sanitary household toilet facilities, the quantum of excreta in the containment systems in the rural areas is expected to increase significantly. Thus addressing the issue of safe containment, management and disposal of waste resources from toilets is of high priority which creates a crucial need for appropriate and adequate legal and regulatory provisions for FSSM in the rural areas. The legal control and regulations required for FSSM in rural areas are mainly for management of on-site sanitation related to households and premise owners and related to collection, transport and treatment of septage.

The 14th FC identified core functions of Panchayati Raj Iaws include sanitation, solid waste management and drainage. In the rural areas District Panchayats have the responsibility for consolidation of district sanitation plans, and for providing essential support Taluka and Gram Panchayats in relation to sanitation. Overall it is observed that there is adequate legal power in the hands of the State Government and District Authority to mandate and enforce on-site containment, but specific rules and regulations need to be issued in order for these powers to be effective. Also, the provisions in the existing legislation of FSSM in rural areas are largely unused therefore there is crucial need for regulations, government order and byelaws.

3. Technology options

FSSM Value Chain includes safe containment, safe emptying and transportation, treatment and disposal/reuse. Each of these value chain components need to be addressed properly to prevent health and environmental impacts due to indiscriminate disposal of hazardous faecal waste. For rural areas it is difficult to have network based solution with scattered locations and low population so the most technologically viable option is the FSTP. In order to do this it is essential to understand the key characteristics of faecal sludge. The apt and acceptable approach for rural areas can be the following:

- Establishing and managing of Faecal Sludge and Septage Treatment (FSTP) facilities
- Establishing and managing complete FSSM value chain

Overall implementation with approvals construction can take time. Thus intermediate solutions are suggested like trenching, co treatment in common FSTP for multiple villages/ towns.

4. Service level agreements

Beyond the point of access across the value chain there remains a high risk of contamination during operations if not done with proper care and hygiene. Hence, service level agreements and scope of work for all stakeholders in the process are identified in the policy to ensure proper commitment and consistent delivery in lines with the requirement. A designated agency to be appointed at the block or gram panchayat level that monitors the services.

The non-compliance of service level agreements can be penalized as pre decided by the authority.

5. Way forward

For rural areas to move forward with FSSM it is imperative to acknowledge the importance of FSSM as a legitimate solution and understand the need for having septage management in all the areas. It is important to set up framework and have distributed responsibilities so that the work does not overlap. One entity of government should be solely responsible for sanitation such that overall management is not fragmented creating loss of interest. Increase local expertise, institutional capacities, technical staff and disseminate the overall knowledge of FSSM such that there is access of material for the non-technical resources also. Explore business models and technologies that are suitable and sustainable in local context.

6. Draft model faecal sludge management regulations (district level)

The policy also includes a model draft of Regulations that District Authorities can enforce for implementation of FSSM in their areas. The highlights of the regulations have been summarized.

a.Purpose and scope

- To provide a regulatory framework for construction, routine maintenance, regular cleaning and emptying of septic tanks; transportation, treatment and safe disposal of septage
- To prescribe the actions to be taken by the owners of the premises connected to septic tanks and septage transporters to ensure compliance with their obligations
- To provide for appropriate inspection and enforcement mechanisms
- To ensure cost recovery on a sustainable basis for proper septage management
- To facilitate participation of private and non-Government sector in septage management.

b.General design, construction requirements and registration of septic tanks

The design, construction and installation of septic tanks shall be in accordance with the provisions of the National laws etc. The owner of a premises with a septic tank shall apply to the Collector to have the septic tank details entered in the register of septic tanks maintained by the Corporation. On receipt of details the Collector shall issue a registration certificate for the premise with septic tank.

c. Registration of septage transporter and vehicle

Registration as Septage Transporter/ Vehicle is necessary for any person to engage in collection, transport and disposal related activities. Based on conditions as listed by the district authority, it shall have the authority to approve or reject any license. In case of violation of any law the district authority may have the right to cancel or suspend any license as they may deem fit.

d. Operation and maintenance of septic tanks

The owner of the premise is responsible for the operation and maintenance of septic tank. The owner has to check the quantity of sludge at least once a year and inform the District Authority if the level is about 2/3rd of the height of tank for desludging. The owners shall also pay a user charge as notified by the District Authority for desludging.

e. Supervision of septic tanks

The Collector is required to engage resources to prepare a two year rotational plan for supervision and monitoring of Septic tanks. The Supervisors as appointed by the district authority shall have dedicated powers for inspection of tanks and premises. They shall inform households 10 days prior and after inspection submit a report to the district authority in 21 days along with advisory note for tanks that contravene the regulations.

f. Transport of septage to treatment facility

As per the regulations a manifest form with date, origin of sludge, quantity, estimated volume and identity of transporter are mandatory for transport of sludge and the records need to be maintained for 3 years. The safe transport of sludge in registered and maintained vehicles to designated treatment facility is the responsibility of the transporter. The transporter shall contain the sludge and disinfect the area in case of accidental spillage.

g. Septage treatment and disposal

The regulations require the septage to be processed and treated in the treatment facilities approved and notified by the District Authority from time to time in accordance with laws and standards. The sanitation and maintenance of the treatment facility along with testing of septage input quality is the responsibility of the operator. The treated septage shall be disposed only at a specified location authorized and notified by the Corporation from time to time, in compliance with the Environment (Protection) Act, 1986 and the Water (Prevention and Control of Pollution) Act, 1974.

h. Septage treatment and disposal

The administration and enforcement of the Regulations is vested with the Collector of the District Authority. The District Authority can also notify a District Septage Management Committee (DSMC) to provide technical advice to the Collector in relation to the administration and enforcement of these Regulations if required. The responsibility of record keeping of information for all stages of septage management id of the District Authority.

Learning Note 2

TECHNOLOGIES

Technology options and selection criteria/framework

Overview of various treatment technology options for non-networked sanitation systems and their selection criteria for Indian towns

Background

With increasing acceptance of non-networked sanitation systems as an alternative to conventional sewerage network, need is felt to assess various technology options for safe treatment of faecal sludge that are sustainable and locally suitable. This learning note is anchored by Consortium for DEWATS Dissemination Society (CDD), India in consultation with other SCBP partners attempts to compile various technology options, along with their selection criteria.

Key definitions

Faecal Sludge - refers to the material, mainly consisting of faecal solids and urine, which accumulates at the bottom of a pit, tank, or vault. The material that collects in pits that either receive or retain little or no wastewater consists almost entirely of faecal sludge. Material removed from dry pits, containerized systems and those wet systems in which percolation from the sides and base of the pit removes all excess water, will consist almost entirely of faecal sludge.

Septage - refers to the solids and liquids which are removed from a pit, tank, or vault in a wet sanitation system. Septage comprises faecal sludge, the supernatant water that accumulates above it, and material that is lighter than water that forms a scum layer on the liquid surface.

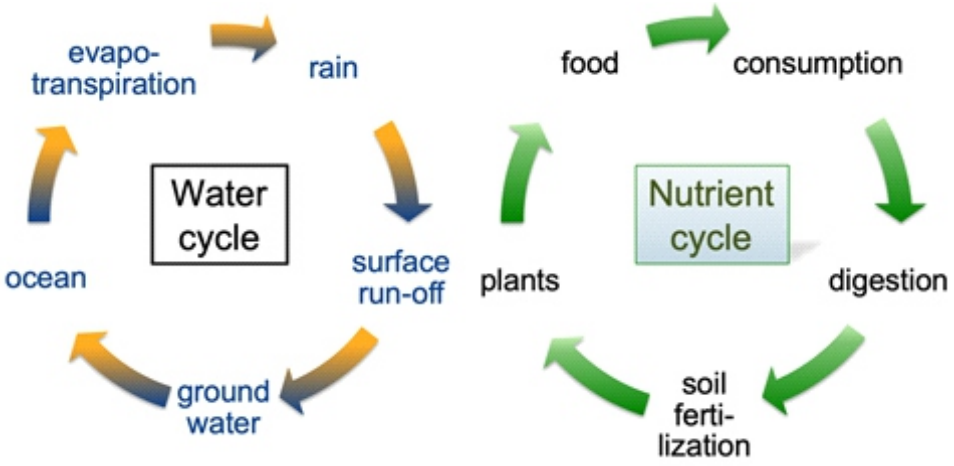
On-site sanitation technology - An on-site sanitation technology is a system used neat to the source of the waste generated with the primary purpose to store and isolate the excreta from human contact. Examples of on-site sanitation systems include pits, twin pits, septic tanks, etc. Typically they perform a minimal function of treatment. Faecal Sludge is the solids that are retained in these on-site systems. Please note that advanced on-site treatment technologies are referred to as Decentralised wastewater treatment systems and hence should not be confused with on-site sanitation systems.

Wastewater and its impact on ecology

The term wastewater can be understood more easily if we break it into two of its constituent words – Waste and water. Wastewater which we usually consider as something harmful for both humans and the environment consists of those essential elements on which life thrives – water and nutrients. Wastewater management is hence essentially about extracting these valuable products from the waste and reinvesting it back into nature.

The planet, as we all know has many built-in systems and processes to recycle. Two such processes which are of key interest to people dealing with wastewater is the nutrient cycle and the water cycle. The figure below indicates how these cycles work in nature.

Both these cycles work independently of each other with little or no aid from human beings. However, with the intervention of human beings and the spread of civilisation, these two cycles have started intertwining with each other to create a complex eco-system, disrupting the course of nature.



Explaining this in more details - Human beings have begun using soil extensively for the cultivation of food crops, these food crops germinate and grow by up-taking the nutrients available in the soil (a majority of the nutrients are identified as nitrogen, phosphorous and potassium). These nutrients get implanted in the plant, which then becomes food for human consumption. In the process of consumption and digestion, the human body is only able to assimilate a fraction of nutrients that are consumed, and hence a majority of these nutrients are excreted out of the human systems in the form of faeces.

Over recent years of human developmental engineering, we have found a way to flush away these faeces from our living space by using water as a media. In most human settlements, water is drawn from a fresh source such as stream, river or rain and utilised for human consumptions including flushing of faecal waste. Organic pollution of groundwater happens in cases where wastewater enters underground water streams directly. In this process, not only is the water cycle interrupted, but the nutrients in the faeces are not transferred to a new medium instead of going back to the soil. This has now created certain problems; firstly since the nutrient cycle was disrupted and introduced into another media – water, this shall over a while create a scarcity of nutrients in the soil and hence require external inputs of nutrients. This is easily verifiable by various research indicating the reduction in natural soil fertility and an increase in consumption of chemical fertilisers.

The second problem is that of interrupting the water cycle and making it unfit for further use. The water which carries these nutrients, start supporting life forms such as microorganisms, phytoplankton's etc. which then feed on these nutrients and also consume the oxygen that is available in these water bodies and thereby deplete the dissolved oxygen. This leads to a failure of water as a media to support several lifeforms which survived on this dissolved oxygen.

Thirdly, due to many other human interventions which lead to various climatic changes, the water cycle has been affected leading to a reduced transfer of water form from one stage to another in the cycle. This has left a surplus in few stages such as oceans (which is again being proved by the rise in sea levels) and deficit in other parts of the cycle such as groundwater and surface water bodies (freshwater). Most of the surface water that can be found in an urban setting or near developed human settlements are wastewater, i.e. water contaminated with nutrients and other by-products of human activities. This makes the availability of water for human consumption scarce, leading to deprivation and conflicts.

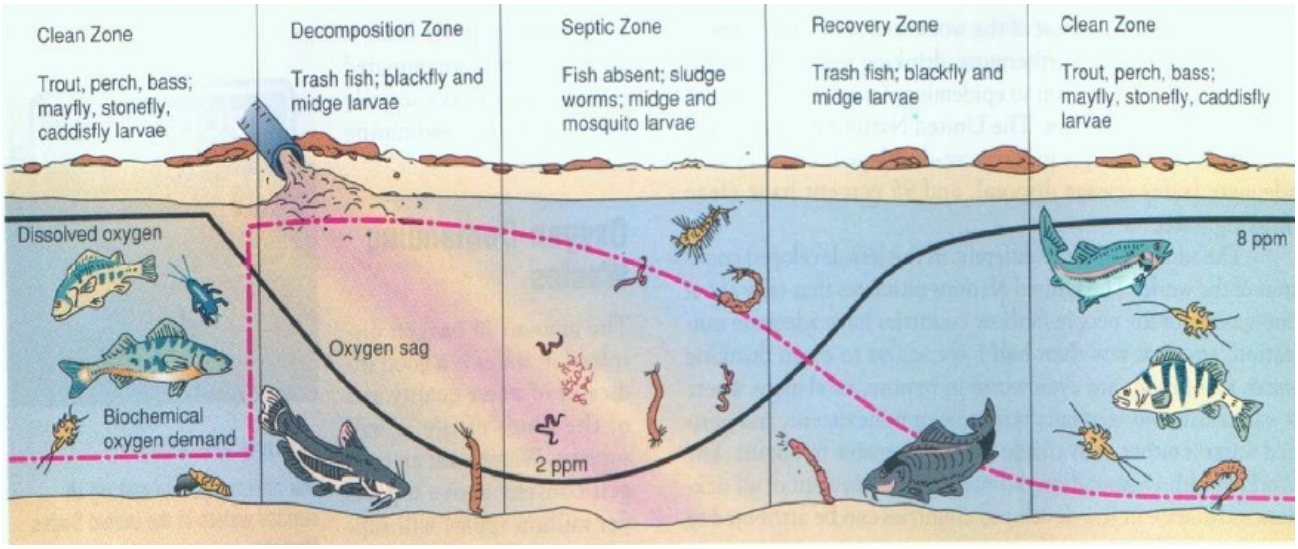
To sum it up, the cycles which were independent of each other have started mixing due to human actions and thereby causing multiplied ill- effects in human health, economy, social relationships and environment.

How to solve this entanglement?

Nature has some resilience to manage the changes humans willfully bring upon it. Like, river and water bodies have eco-systems within them which help fix the freely available nutrients (this happens by nutrient uptake by plants and other autotrophs). Similarly, a flowing water body absorbs the oxygen present in the atmosphere and increases the dissolved oxygen content naturally over its flow regime. The below figure (next page) indicates how nature can mitigate the ill effects of pollution (sewage) that is being dumped into the river and how the eco-system can come back to its original form.

The degree of pollution and more particularly the content of dissolved oxygen (DO), can be assumed from the variety of plant and animal species found in the water. The colour of the stream of river and lakes is yet another indicator of the quality of the water. Green or green-brownish water is indicative of high nutrient supply due to algae, a reddish-rosy colour indicates facultative algae and is suspicious of a severe lack of free oxygen, black is often indicative of complete anaerobic conditions of suspended matter.

Also, nature has a way of helping itself as in the case of lakes and rivers that dry-out in long dry seasons when the remains of organic matter compost and are fully mineralised

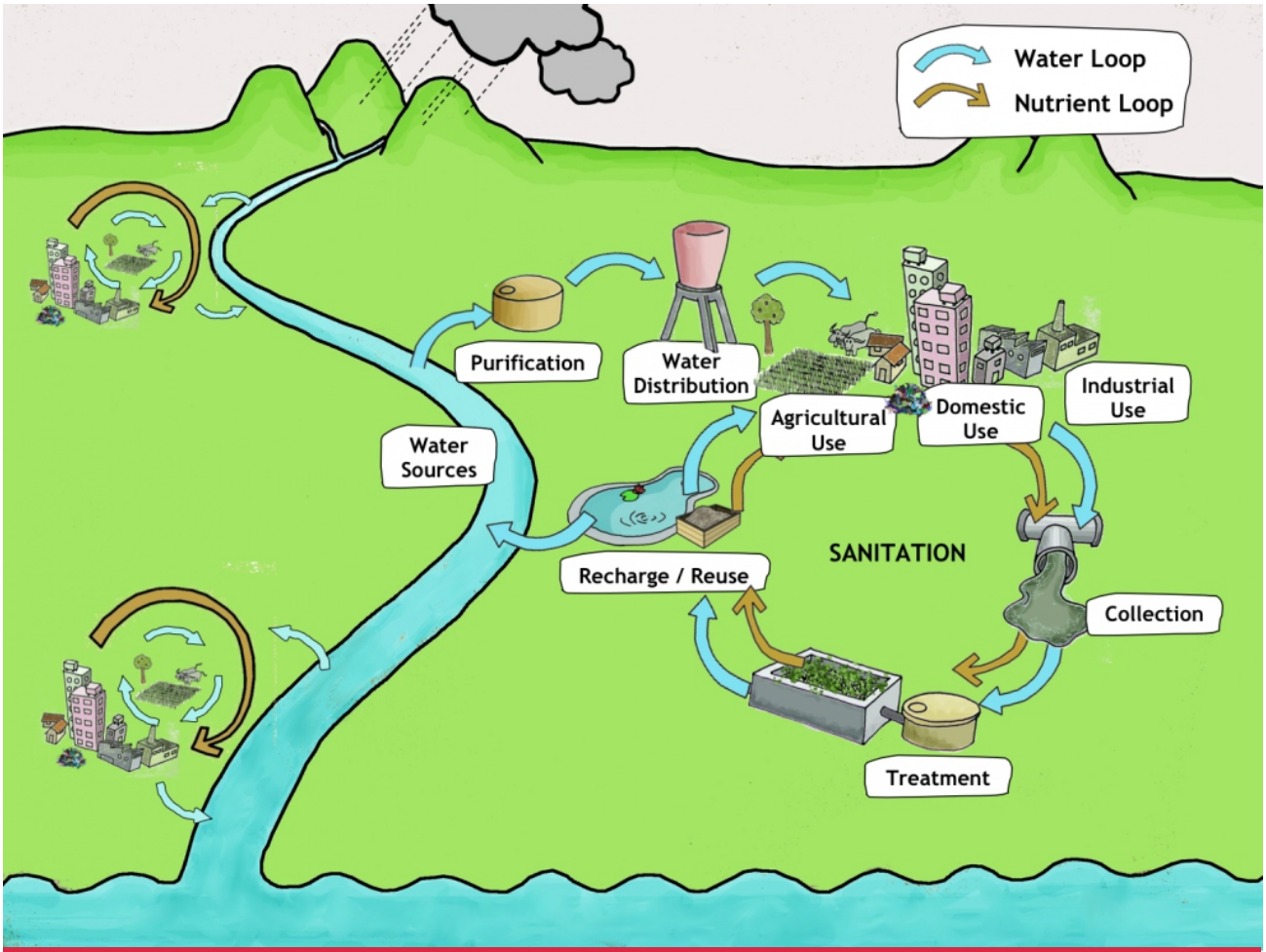


before the next rains come. Minerals retain their fertilising quality even after drying. This is why sludge at the bottom of dried lakes, canals or rivers is better brought to the fields before it is washed away into the receiving water by the first heavy rains and it's rich nutrient value is lost.

However, given the quantum of wastewater that is generated due to human activities and changes in agricultural practices, many times the effects surpass the ability of nature to manage these wastes and hence necessitates human intervention such as treating the wastewater or aiding the river in treatment.

Environmental engineering

The term 'treatment' means the separation of pollution (solids) and stabilisation of pollutants. In turn, stabilisation implies the degradation of organic matter until the point at which chemical or biological reactions stop. Treatment can also mean the removal of toxic or otherwise dangerous substances (for example heavy metals or phosphorus) which are likely to distort sustainable biological cycles, even after stabilisation of the organic matter. In environmental engineering, the objectives of treatment are threefold – a) to reduce or remove microorganisms that are present in water and which may be harmful to humans, b) to reduce the



An image of a typical city with well-established systems to manage the water and the nutrient cycle.

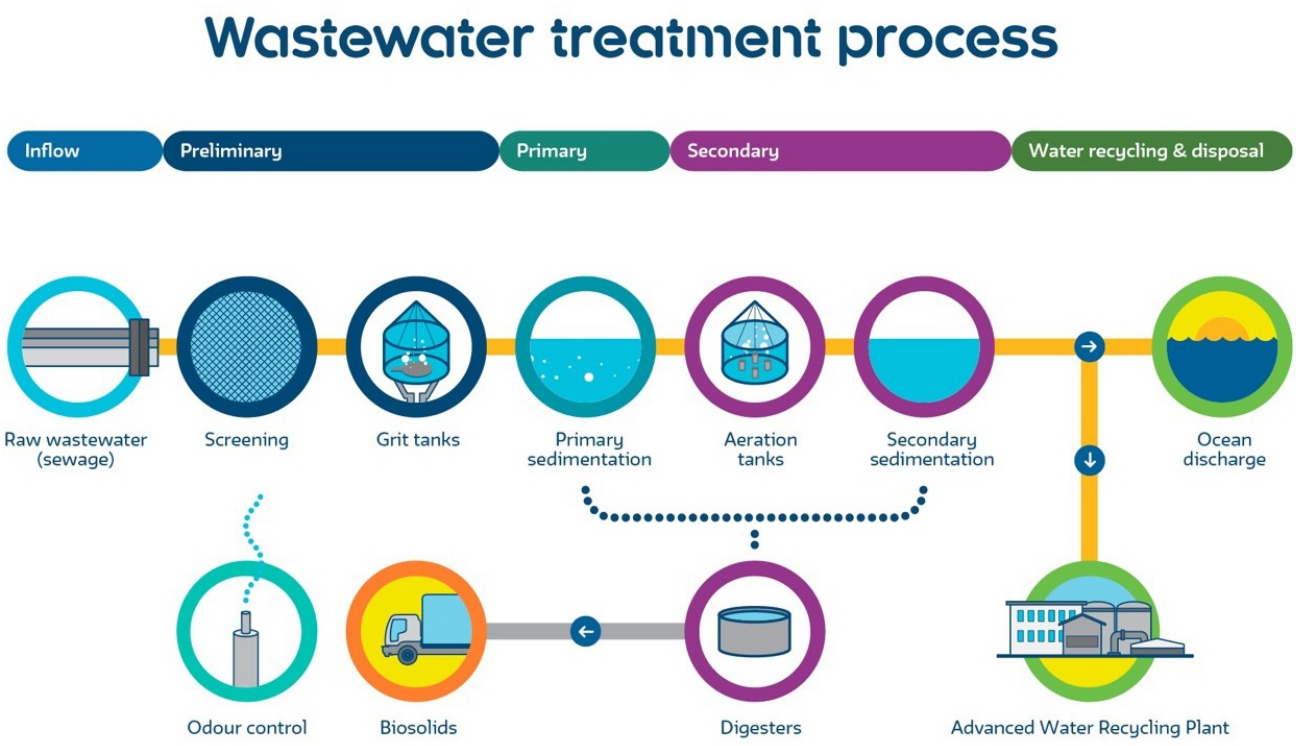
organic and inorganic pollution present in wastewater which may impact the natural ecosystem and c) to make meaningful gains by being able to reuse the by-products of treatment.
Wastewater typically consists of the following matter:

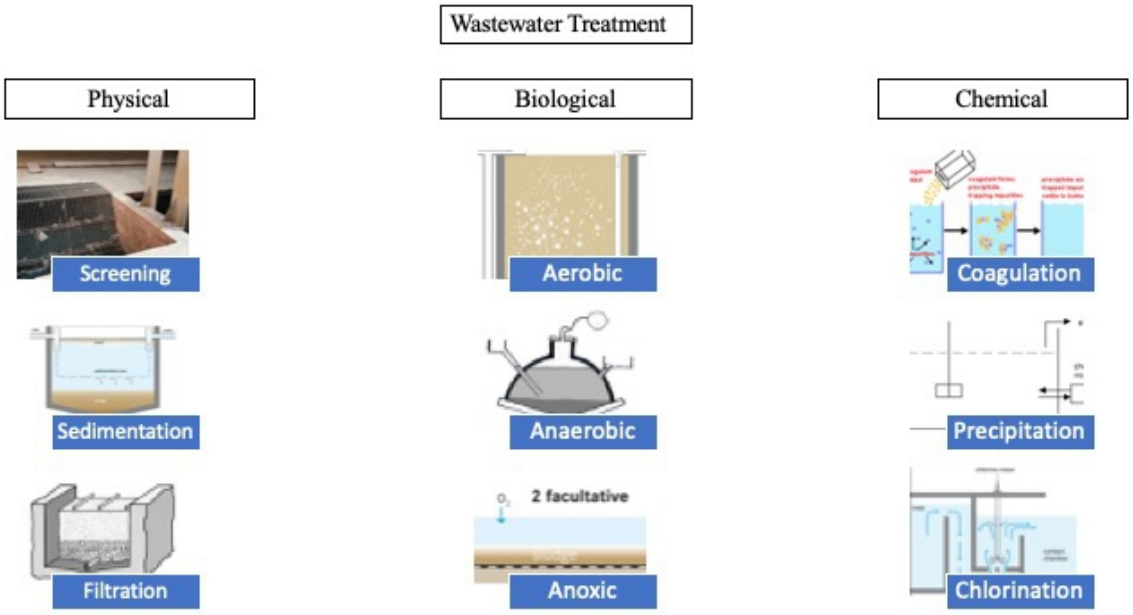
A) Water – >95 %
B) Inorganics (chemically reactive)
C) Organics (Biologically reactive)
D) Inert (grit)

Most treatments of wastewater mimic the processes that nature follows to reduce to mitigate the risk of these pollutants. Therefore, it comprised of various physical, biological and chemical processes that are engineered for efficiency. In the most common form of treatment, the first stage is to remove any heavy and floating particles from the wastewater. These can be done by various physical means such as gravity separation or chemically aided settling. Once these particles are removed, wastewater majorly contains suspended particles which are organic and inorganic in nature. The second stage of treatment is about stabilising these contents by providing a favourable environment for autotrophic microorganism (good bacteria – like the conversion of milk into curd) to do their job of converting them into simple compounds which can then be removed easily or let into nature. These micro-organisms convert the food available in these organic and inorganics into biomass and gasses. Based on the type of microorganisms the treatment process can be either a) aerobic – which requires oxygen for treating, b) Anaerobic – which can work in the absence of oxygen and c) anoxic – which does not require any external source of oxygen.

In the second stage, most of the organics and inorganics are removed by conversion into heavy particles which settles down or gases which are released into the atmosphere. After this stage, the wastewater is treated for removing any residual solids that may be left in it. Therefore, the third stage usually involves certain chemical and physical processes to remove these residual particles. Through these three stages, the wastewater is converted into water, which is close to its natural form, and the solids turned into biomass which can go back to the soil.

The below figure, shows a typical arrangement of a sewage treatment process, where all the above stages are represented:





Technology options

Wastewater generated at a household level can be broadly classified into two categories – a) grey water and b) black water. Grey water is the total of all wastewater generated from human activities such as bathing, cooking, washing utensils, floor cleaning etc. Blackwater is the combination of water and faecal waste that is flushed out from the toilet. In central business districts or metropolitan areas of big cities, both the grey water and black water are conveyed through a common conduit to a treatment plant. While this may seem like an ideal case, it is not a common system across the country. A primary reason for cities to still lag in adopting this is due to the huge investments that such type of collection, conveyance and treatment require. Hence, in most cases, where the above is not present, households discharge their wastewater separately, i.e. grey water in open drains or recharge pits and black water in septic tanks or pits.

As described above, households which are not connected to sewer lines (closed conduits conveying wastewater to a treatment plant or an area of disposal) dispose of their black water in onsite containment units such as septic tanks, holding tanks, pits, etc. Over a period of time, there is an accumulation of sludge inside these systems, this sludge which is typically partially digested faecal matter is called faecal sludge. The process of providing safe and sustainable systems for proper collection, transportation, treatment and disposal of faecal sludge is called faecal sludge management (FSM).

A critical part of faecal sludge management is providing a treatment system for safe conversation of human faeces into forms which can be reused back into nature or for other human activities. Treatment of faecal sludge though uses the same principles of wastewater treatment, is slightly different in its approach from sewage treatment. In sewage treatment, the emphasis is on removing the solids from water and treating the water, while in faecal sludge (it also includes septage) treatment the focus is on solids part of the sludge. Faecal sludge due to its accumulation in onsite containment units over long periods becomes concentrated in its solids and pollution content (organic and inorganic). Though as compared to sewage, faecal sludge, given its source of only black water (faeces mixed with flush water) contains majorly organic particles.

Treatment objectives

The basic objective of treatment is to render the material treated safe for either reuse or disposal to the environment. Faecal sludge treatment processes aim to do this by 'stabilising' faecal waste, converting it from its untreated condition, in which it is unpleasant, unstable, high in pathogens, and has a high oxygen demand, to products that are stable, low in pathogens, and have a low oxygen demand. All septage treatment processes and most faecal sludge treatment processes produce a liquid effluent and a sludge residue. Specific treatment objectives are as follows:

- Reduce the oxygen demand, suspended solids, and nutrient concentrations in the liquid fraction of the effluent as required to comply with national environmental regulations.
- Reduce pathogen concentrations in the liquid fraction to levels that allow safe discharge or reuse.
- Reduce the water content of sludge to the point at which the sludge acts as a solid, is much reduced in volume, and so is easier and cheaper to handle and transport.
- Reduce pathogen numbers in sludge to levels that allow its safe end use or disposal. Treated sludge intended for end users is usually referred to as a biosolid.

Stages of faecal sludge treatment

Faecal sludge and septage differ from municipal wastewater in two important respects. First, they are much stronger than municipal wastewater and, second as already noted, the volume received at treatment plants is much lower than the volume of wastewater generated by an equivalent population.

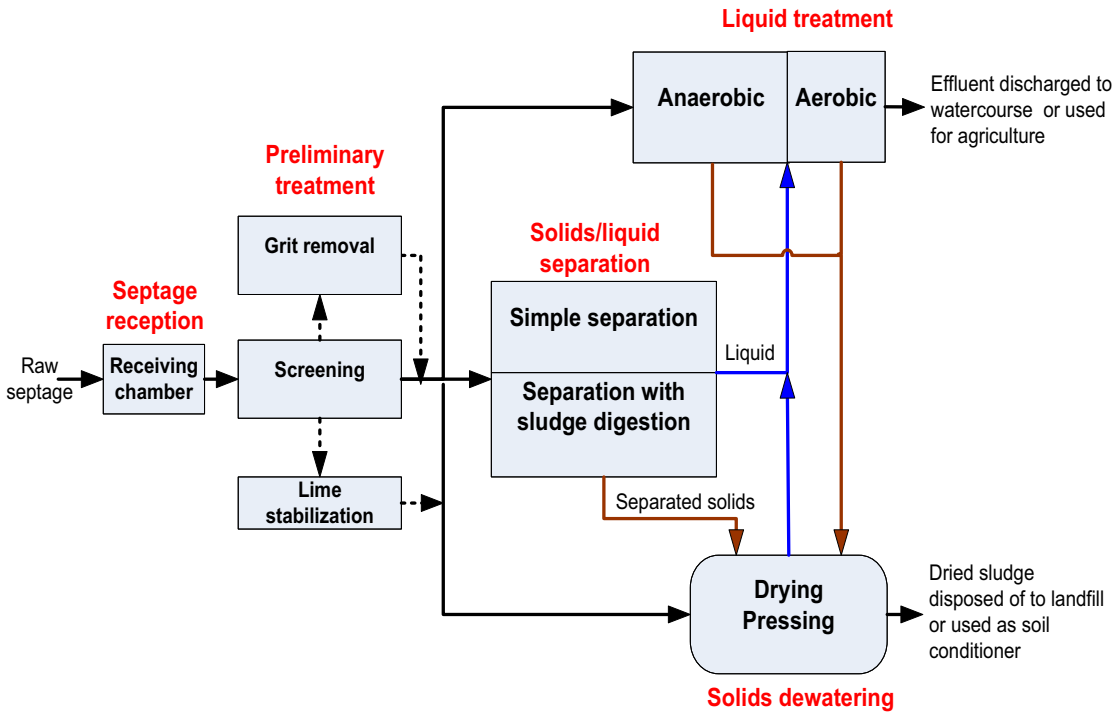
The high strength of faecal sludge and septage results in the following treatment challenges:

- Their high solids content leads to high sludge accumulation rates in tanks and ponds. Designers must allow for the operational implications of this.
- Their high organic strength increases their treatment needs well above those of conventional wastewater. This often creates a need for multiple treatment processes, deployed in series.
- The high ammonia content may inhibit biological processes, reducing the efficacy of treatment and resulting in liquid effluent nitrogen concentrations that exceed discharge standards.
- High nutrient concentrations in treated effluent may make it difficult to meet discharge standards. Most nutrients in faecal sludge and septage are present in dissolved form and remain in the liquid stream after sedimentation. This means that high nutrient levels in effluent may be an issue, particularly for co-treatment with wastewater. This will be true even after the initial solids-liquid separation of septage.

The biodegradability of the material to be treated will also affect treatment choices. Faecal sludge and septage differ from wastewater in the biodegradability of their liquid and solid fractions. Following are some insights from research done in this area:

- Digested faecal sludge contains a much higher proportion of non-biodegradable material.
- The biodegradable proportion of digested faecal sludge, while smaller than that of faecal sludge, is still likely to be significant.
- The reduced biodegradability of digested faecal sludge stems from the fact that it is partly stabilised, having experienced anaerobic conditions in pits and tanks for several years.
- Faecal sludge and septage treatment plants must include a number of treatment units, linked in a way that ensures effective achievement of the objectives. These units must provide some or all of the following functions:
- Faecal sludge/septage reception from vacuum tankers, smaller vehicles, and handcarts used for manual emptying.
- Removal of gross solids, grit, fats, oil, and grease (FOG), and floating objects. These might otherwise be caught in or clog pipes and/or settle in subsequent treatment units, causing blockages and impairing performance.
- Stabilisation of fresh faecal sludge to reduce odours and render it more amenable to follow-up treatment processes.
- Solids-liquid separation. This allows the size of subsequent treatment units in septage treatment plants to be reduced.
- Treatment of the liquid removed from septage or faecal sludge. This reduces the organic loading and ammonia and pathogen contents to levels that are compatible with the intended disposal/reuse arrangements for the liquid effluent.
- Solids dewatering.
- Reduction of the pathogen content of treated liquid and separated sludge. Pathogen levels must be compatible with the proposed disposal/reuse arrangements.

The image below shows the various stages of faecal sludge treatment and the treatment processes associated with it.



Treatment systems

In the sections above, we saw the various technologies associated with different stages in treatment. In creating a treatment system, technologies from various stages are chosen based on their functionality and compatibility are linked together in series or parallel arrangements to arrive at the designed objectives. In doing so, treatment systems can be broadly classified as a) nature-based systems, b) Mechanical aided systems and c) Thermal-based systems.

Nature based systems: The technologies used across the various stages of faecal sludge treatment are a replication of naturally occurring processes such as sedimentation, filtration, anaerobic digestion, drying etc. Since most of the treatment is done by different elements of nature, the operation and maintenance requirement of such type of systems are usually very low. However, to let nature do its job, it may require large spaces (area and volumes).

Mechanically aided FS treatment: In these systems, technologies are chosen to increase the natural processes of treatment. This is done by stimulating nature in a controlled environment using electromechanical methods of pressing, dewatering, aeration, etc. Most of the electromechanical machines employed from such treatment systems are used in the solid dewatering stage. However in certain cases, there are uses of aerators for sludge stabilisation; however, this is not so common in FS treatment.

Thermal-based FS treatment: In this system, electro-mechanical machines are used for exposing the sludge to high temperatures to kill the harmful pathogens and also to convert the sludge into bio-fuel. Temperatures in the range of 70 – 85 degree are sufficient to kill the disease-causing pathogens that are present in sludge, while higher temperatures are used for drying the sludge so that it can be used as a source of fuel in incinerators or furnaces.
A typical system using thermal treatment for faecal sludge is depicted below:

In addition to this, there are low-tech disposal options such as trenching and geo bags which can be used as intermediate solutions in areas where there are constraints in installing faecal sludge treatment facilities.

Treatment systems for Faecal Sludge

S.no	Technology	Preliminary treatment	Solid-liquid separation	Solid treatment and dewatering	Liquid treatment	End products
1.	Trenching	NA	NA	Sludge filling in trenches	NA	Bio-solids
2.	Geobag with constructed wetlands	NA	Geobags	NA	Constructed wetlands and polishing pond	Bio-solids
3.	Anaerobic digestion, DEWATS ™ with co-composting	Screening	Sedimentation tank	Stabilisation reactor, sludge drying beds and composting	Anaerobic baffled reactor, anaerobic filter, planted gravel filter	Co-compost
4.	Planted drying beds with DEWATS ™	NA	NA	Planted drying beds	Anaerobic baffled reactor, anaerobic filter, planted gravel filter and polishing pond	Bio-solids
5.	Thickening tank , DEWATS ™ and drying beds	Screening	Thickening tank	Sludge drying bed	Anaerobic baffled reactor, anaerobic filter, planted gravel filter and polishing pond	Bio-solids
6.	Screw press, belt dryer and pyrolysis	Screening	Screw press	Belt dryer and pyrolizer	Phytorid (or) Soil biotechnology (or) constructed wetlands	Bio-char
7.	Mechanical dewatering	Screening	Screw press	Drying beds	SBR (or) DEWATS ™	Bio-solids

Refers to the arrangement of modules involving settler, anaerobic baffle reactor, anaerobic filter, planted gravel filter and maturation pond (all of these or a few selected)

Treatment systems specific to rural areas

In rural areas, faecal sludge management can be carried out at a household by adopting twin pit -composting toilets. In this, the households alternate between the containment units, allowing time for the treatment of sludge, thereby producing end products which can directly be used as farm manure. Improvising on this, a community based faecal sludge management for rural areas would be building trenches and composting pits in farm lands where the disposed sludge is allowed to stabilise over long periods of time before being used into farming. However, in such practises the feasibility of contamination of ground and surface water bodies must be assessed before implementation.

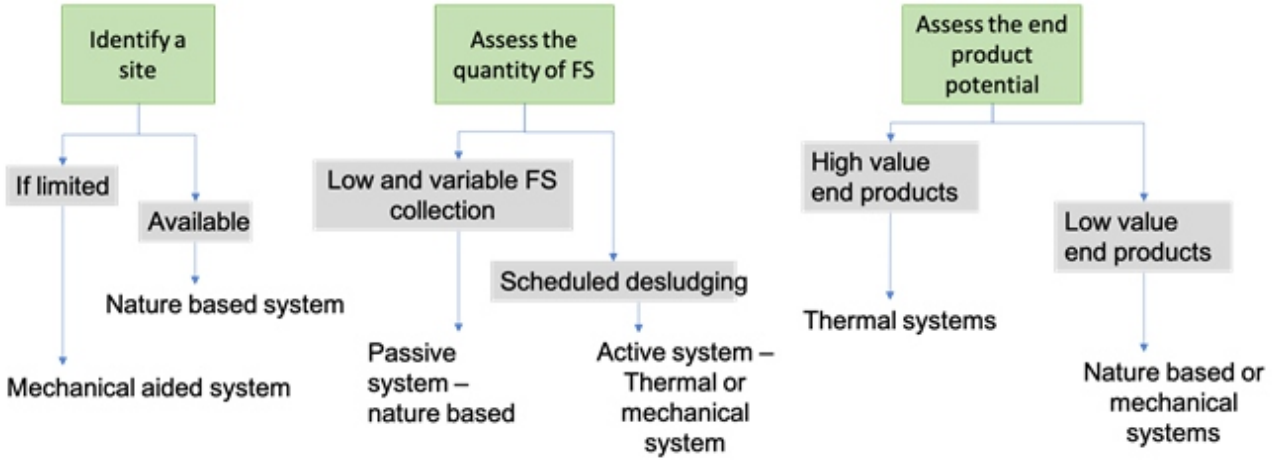
Rural areas where trenching is not feasible due to high ground water table or due to presence of surface water bodies, can adopt technologies such as drying beds and planted drying beds with a passive system for treatment of leachate – such as constructed wetlands.

Treatment system selection

Choices relating to overall treatment processes and individual treatment technologies will depend on:

- Fresh faecal sludge contains a high proportion of biodegradable material.
- the characteristics of the material to be treated;
- the proposed arrangements for end use/disposal of the products of treatment;
- the costs of the various options; and
- contextual factors such as land and power availability and the capabilities of the organisation that will be operating the treatment process.

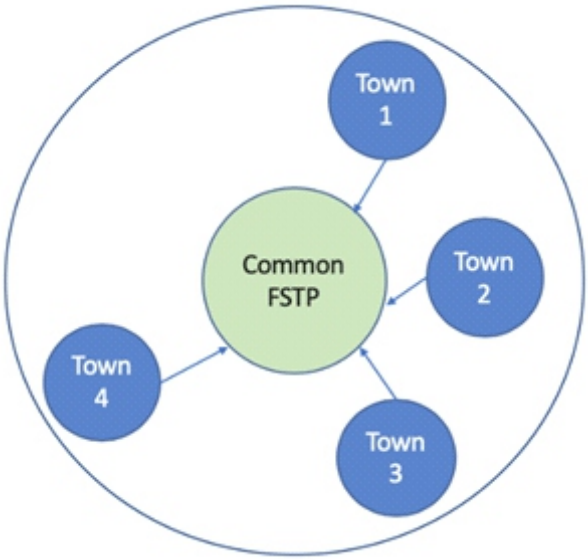
A suggested decision making flowchart for selection treatment systems is shown below:



Approach to treatment

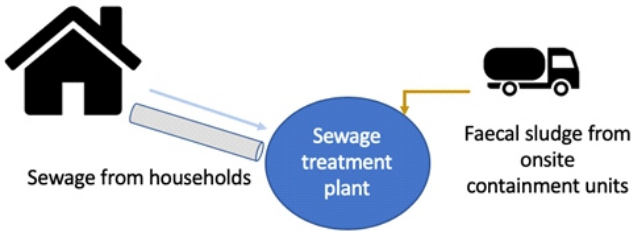
The existing approaches in the treatment of faecal sludge can be classified into the following types:

- **Clustering:** This refers to clustering nearby towns and providing them with a common faecal sludge treatment plant. The towns should be at a distance that is economically viable for the desludging operators to serve. A stakeholder consultation with the desludging operators and the municipal authorities of the town can help arrive at the feasible location for the treatment plant.

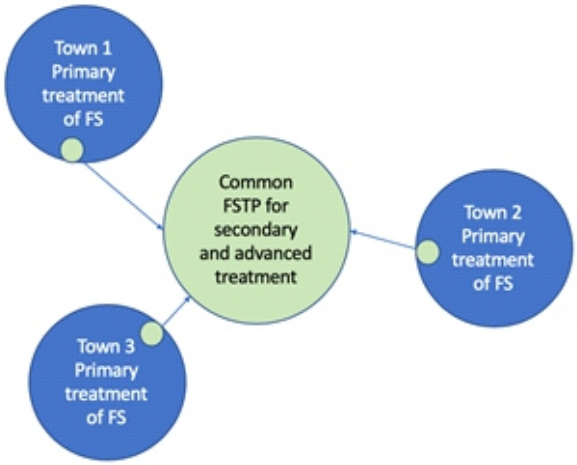


- **Co-treatment:** This method uses the existing sewage treatment infrastructure to treat faecal sludge. It can be done in the following ways:
  - Adding the faecal sludge at the headworks of the sewage treatment plant in a controlled manner.
  - Process the septage along with the bio-solids (i.e. sludge) produced during the wastewater treatment process.
  - Separate the septage liquid from the septage solids and process each separately: liquid with the domestic wastewater and solids with the STP biosolids.

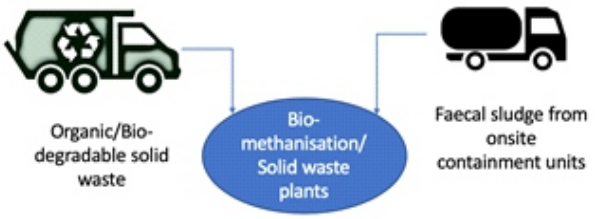
The present utilisation of the sewage treatment plant (STP) in terms of hydraulic load (quantity of sewage treated) and organic load (quantity of biodegradable components in the sewage) should be tested to determine the suitability of the STP for treating faecal sludge. The location of STP should be located one that can be easily serviced by desludging trucks. Co-treatment can help reduce infrastructure investment in treating faecal sludge.



- **Planetary model:** This refers to installing transfer stations throughout the city for collecting faecal sludge. These are dedicated facilities installed strategically throughout the municipality that serves as a drop off locations for collected faecal sludge. They may include a receiving station with screens, a tank for holding the collected waste, trash storage containers, and wash down facilities. Faecal sludge from the transfer station is then transferred to the treatment facility using bigger tankers. Presence of transfer station can make safe disposal of faecal sludge economical for small desludging truck operators who would otherwise have to travel very long distances in small trucks to safely dispose of the faecal sludge.



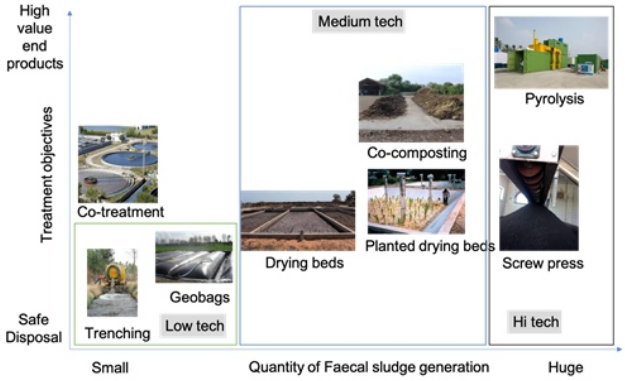
- **Co-digestion:** This refers to treating faecal sludge with wet organic solid waste. This reduces the need to have separate infrastructure for the treatment of faecal sludge and wet waste. Also, this ensures optimum use of infrastructure especially when the collection of faecal sludge is intermittent.



- **Co-location:** This refers to locating a faecal sludge treatment facility at an existing solid waste treatment or sewage treatment facility premises. This can help in reducing the time an effort consumed in finding another piece of land exclusively for faecal sludge treatment.
- **Standalone FSTP:** In cases where none of the above approaches is possible, the ULB must plan for a standalone FSTP.

The approach to treatment can also significantly vary based on the rural and urban divide. In India, there is significant difference between Urban and the rural areas in terms of administration, resources availability and the prioritisation of developmental issues. This can have an effect on the choice of technology options for treatment. For e.g.: a remotely located village with minimal availability of resources for maintaining the treatment systems may choose to opt for a system which is simple and easily to maintain. However a rural area located in the periphery of a urban settlement, could opt for a more mechanised system to use the land more judiciously. Similarly, based on the priority of the community towards treatment both urban areas and rural areas can choose incremental methods to adopt treatment system. For instance, they could adopt a low tech system such as trenching to solve the current issue indiscriminate disposal of faecal sludge and then plan to adopt more complex technologies based on their other objectives of treatment such as improved treatment, revenue from end products, low area foot print, etc.

The below diagrams indicate an approach for incremental treatment systems – using various parameters of treatment objectives, quantity of faecal sludge generation and the technology sophistication.



Treatment technology matrix

Selection of appropriate treatment technologies can depend on many factors such as a) End product requirement, b) Climatic conditions, c) Characteristics of faecal sludge and septage, d) availability of Capex and Land, e) Availability of Operation and maintenance ecosystem, among some of the major variables. The tables below provides some quick information about the various technology options for treating/safe disposal of faecal sludge and their characteristic features across the various above decision making variables.

Sr. No	Treatment Systems	Applicable areas	Effective treatment volumes	Land Requirement	ICAPEX (in INR)	OPEX3 (in INR)
1.	**Trenching**	• Suitable for low (less than 5 m^3) and fluctuating volumes of faecal sludge that needs treatment • Ideal for rural areas in arid or semi-arid regions, where the groundwater table is very low (more than 20 m below ground level). • It can also be used in peri-urban areas and fringe areas of a city, however site should be away from human habitation by at least 100 m. • The site should be away from surface water bodies by at least 200 m.	1 – 5 KLD	Huge , 0.2 – 0.25 m^2 per person equivalent	Nil	3,00,000
2.	**Geobag with constructed wetlands**	• Suitable for rural and peri-urban areas where FS loads are fluctuation and volumes are less than 103 per day. • Suitable for tourist places during peak seasons	1- 10 KLD	Medium, 0.04 m^2 per person equivalent		18,00,000
3	**Anaerobic digestion, DEWATS ™ with co-composting**	• Suitable for towns less than 1 lakh population and where demand based desludging is planned.	3- 30 KLD	Medium, 0.03 m^2 per person equivalent	7,00,000 per KLD	12,00,000
4	**Planted drying beds with DEWATS ™**	• Suitable for towns less than 50,000 population and where demand based desludging is in planning. (or) for certain parts of peri-urban areas • Ideal for fluctuating FS treatment volumes.	3-10 KLD	Medium, 0.04 m^2 per person equivalent	6,00,000 per KLD	10,00,000
5	**Thickening tank , DEWATS ™ and drying beds**	• Suitable for towns and cities up to 5 lakhs population with demand-based desludging (or) 1 lakhs for scheduled desludging	15 – 75 KLD	Medium, 0.03 m^2 per person equivalent	5,50,000 per KLD	24,00,000
6	**Screw press, belt dryer and pyrolysis**	• Suitable for cities with a population higher than one lakhs. • Suitable for cities with an industrial base	15– 70 KLD	Low, 0.01 m^2 per person equivalent	4,50,000 per KLD	24,00,000

Capital expenditure – tentative estimates
Operational expenditure- Estimated for highest capacity installations per annum
Kilo litres of faecal sludge per day that can be treated using the system
No treatment infrastructure required

List of Faecal Sludge treatment plants in India

Sr. No	Name of FSTP	City	State	Capacity in KLD	Brief description of technology
1	Devanahalli	Devanahalli	Karnataka	6 KLD	Gravity based biological treatment technology
2	Bansberia	Bansberia	West Bengal	50 KLD	Sludge Drying Beds
3	Brahmapuram	Cochin	Kerala	100 KLD	UASB + MBBR + Filters and Sludge Drying Beds
4	Leh	Leh	Jammu & Kashmir	12 KLD	Gravity based aerobic stabilization using Planted Drying Beds
5	Kanchipuram	Karunguzhi	Tamil Nadu	23.4 KLD	Screens, Sludge Drying Beds, Horizontal Planted Gravel Filters, Maturation Pond
6	Septage Treatment Plant of Puri (Konark+Pipili)	Puri (Konark+Pipili)	Odisha	50 KLD	Liquid Solid Separation (Co treatment with Sewerage Treatment plant)
7	Sanitation Resource Park	Warangal	Telangana	15 KLD	Screening, Pasteurization, Dewatering, Thermal drying and pyrolysis, Soil Bio filter
8	Sanitation Resource Park	Narsapur	Andhra Pradesh	15 KLD	Screening, Pasteurization, Dewatering, Thermal drying and pyrolysis, Phytorid
9	Wai FSTP	Wai	Maharshtra	Phase I - 30 KLD Phase II - 40 KLD Total - 70 KLD	Screening, Pasteurization, Dewatering, Thermal drying and pyrolysis, phytorid (phytorid and Screening for the CT load as desludging is done weekly)

As of 30 Oct 2018

Sr. No	Name of FSTP	City	State	Capacity in KLD	Brief description of technology
10	Tenali FSTP	Tenali	Andhra Pradesh	15 KLD	MBBR
11	Bhubaneswar FSTP	Bhubaneswar	Odisha	75 KLD	Liquid solid separation with DEWATS
12	Pilot FSTP plant in Jhansi	Jhansi	U.P.	6 KLD	Planted drying beds with Integrated Settler & Anaerobic Filter and Horizontal Planted Gravel Filter
13	Sambalpur FSTP	Sambalpur	Odisha	20 KLD	Liquid solid separation with DEWATS
14	Brahmapur FSTP	Brahmapur	Odisha	40 KLD	Liquid solid separation with DEWATS
15	Rourkela FSTP	Rourkela	Odisha	40 KLD	Liquid solid separation with DEWATS
16	Dhenkanal FSTP	Dhenkanal	Odisha	27 KLD	Screen and Grit Chamber, Stabilisation Reactor, Sludge Drying Bed, Integrated Anaerobic Baffled Reactor & Anaerobic Filter (ABR & AF), Planted Gravel Filter (PGF), Collection Tank, Sand and Carbon Filter, Pasteurization Unit.

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Tayler, K. (2018). Faecal Sludge and Septage Treatment: A guide for low- and middle-income countries. London: Practical Action.
Tide Technocrats. (2018). Thermal treatment for faecal sludge - Pyrolysis. Presentation made at Design Engineers workshop - CASS, Bangalore. bangalore Tide Technocrats.
Narayana, D. (2019, February). Context setting in FSM. Presentation made at FSM training, CASS, Bangalore. Bangalore, India.
Sasse, L. (1998). DEWATS - Treatment and Approaches.

Learning Note 3

CASE STUDIES

Source: http://www.urbannewsdigest.in/2013/02/better-bhubaneswar/

Case 1

Bhubaneswar, Odisha

1. Introduction

Bhubaneswar treatment plant treats both solid and liquid parts of septage in an integrated way. The low cost technology, easy operation and maintenance demonstrates a scalable and sustainable model for septage management in India.

2. City overview

Bhubaneswar, the capital of Odisha, is located in the eastern coastal plains along the Eastern Ghats. The area under the jurisdiction of the Bhubaneswar Municipal Corporation covers 186 square kilometer.

Name of the city and state:	**Bhubaneshwar, Odisha**
Population (census 2011):	**8,46,402**

Existing sanitation situation:

- *Connectivity to sewer network is 26%*
- *Majority of the population of the city are dependent upon Onsite Sanitation*

3. Approach

a. Planning

FSSM approach in Odisha is a state centric strategy. The Septage Treatment Plant (SeTP) of Bhubaneshwar has been constructed under the Atal Mission for Rejuvenation and Urban Transformation (AMRUT) programme by Odisha Water Supply and Sewerage Board (OWSSB). The operation and maintenance of the plant is also by OWSSB. The criteria for technology selection was for it to be low cost and non-mechanized so that operation and maintenance can be done by the local staff.

b. Conveyance

Cesspool emptier vehicle procured by the State of Odisha

Odisha Government purchased cesspool vehicles for ULBs using state funds in early 2015 and ensured availability of

cesspool vehicles with all the ULBs for safe collection and transport of faecal sludge/septage. The GoO has taken measures to facilitate private sector engagement in FSSM by providing cesspool emptying licenses. The private operators are responsible for operating and maintaining the cesspool emptier vehicles. Currently, desludging activity is carried out in the state by both ULB-operated and ULB-contracted cesspool emptier vehicles (operated by private players). Licensing of cesspool emptier vehicle operators to private players has also resulted in a substantial reduction in the tariff payable by the customer.

Integrated command center in Bhubaneswar

ULBs in Odisha are using technology as an enabler to integrate and improve FSSM service delivery. Under Smart City Mission, Bhubaneswar Municipal Corporation (BMC) is implementing the smart FSSM system, which enables the components of FSSM, to be remotely monitored using wireless sensors installed inside the tank of cesspool emptier vehicles. The waste collection shall then be managed via a web portal from Intelligent City Operations Management Centre (ICOMC). Radio-frequency identification (RFID)-based system allows real-time tracking of faecal sludge dumping by the corporation.

c. Technology

Septage treatment plant at Bhubaneswar is of 75KLD capacity spread over the area of 1 Ha. There is a receiving/inlet chamber for the sludge where it is screened


Sludge drying beds with movable sheds


Planted gravel filter

and goes into the settler cum thickener tank. Settler cum thickening tanks are constructed for separation of solid and liquid components of the faecal sludge.

The SeTP is designed to treat the liquid part of the septage using DEWATS technology. DEWATS is chosen as a preferred technology, given the comparative advantage of technology, in terms of its minimum electricity requirement and ease of operations through semi-skilled personnel. The solids from the settler tank go to the sludge drying bed with movable sheds. After drying the sludge goes to the compost shed. After composting the sludge is reused.

The SeTP covers an area of 2.47 acres out of which 1.3 acres have been utilized for landscaping and plantation which not only enhances the aesthetics of the plant but it also helps in garner citizens support and raise awareness on importance of treating faecal sludge and septage.

d. Financing

The project has been constructed under AMRUT by 50:50 cost sharing basis. The total project cost is 3.5 crores which includes O&M cost of 5 years.

4. Observations and comments

a.Sustainability of the project

The treatment plant has been designed by using non-mechanized technology which has made the project cost effective. The use of non-mechanized technology enables the ULB to appoint locally available semi-skilled labor to work at the treatment plant, thus reducing the cost and dependency on a private contractor. Additionally, solar photovoltaic (PV) panels of 10kw capacity are installed to generate grid connected solar power to make the plant energy surplus.

b. Replicability

The SeTP of Bhubaneswar is a non-mechanized treatment plant which has been designed with simple components making them easy to replicate. Furthermore, these components can be rapidly built to be brought under operation. For small and medium scale cities, with limited financial resources, the case of Bhubaneswar is a replicable option.

This technology requires more area as compared to mechanical technology options, so this treatment process can be opted by cities which has large land parcels available which can be developed as SeTP.

Sources:

- *Odisha's Journey of Faecal Sludge and Septage Management, towards sustainable sanitation goals by Ernst & Young LLP.*
- *Septage Treatment Facility in Bhubaneswar & Puri, Design Approach and overview of SeTP- Presentation by Mr. Binod Kumar Sahoo, Project Director, OWSSB, Odisha*

Source: https://pas.org.in

Case 2

Wai, Maharashtra

1. Introduction

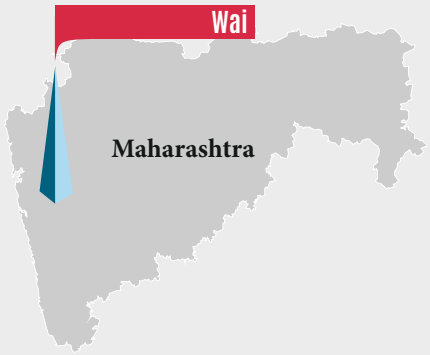
Wai city have moved from a demand based emptying system to a regular service oriented emptying system by implementing scheduled desludging.

2. City overview

Name of the city and state:	**Wai, Maharashtra**
Population (census 2011):	**~ 43,000 (census - 36,025)**

Existing sanitation situation:

- *More than 80% of households have individual household toilets. The rest have access to well-maintained community toilets.*
- *The city does not have any underground drainage system and toilets in city are connected to septic tanks and pit latrines.*



3. Approach

a. Planning

The journey of Wai towards improvement of sanitation in2013 started with making of a City Sanitation Plan with an innovative approach to adopt non sewered options for waste water management. After achieving the ODF status, city aimed at sustaining the ODF status which focused on increasing the individual toilet coverage and achieving ODF++ status as per MoHUA's protocol which deals with safe collection and disposal of fecal matter. The city through its city-wide septage management plan, planned and implemented:

- Regularly desludging the septic tanks of all the properties once in every 3 years.
- Treating the septage in a scientific and safe manner prior to disposal.

This city is one of the first cities in India to implement a schedule septic tank emptying service.

b. Conveyance

The city formulated a scheduled emptying plan wherein all the septic tanks in the city would be emptied once in 3 years and the collected septage will be treated at a dedicated septage treatment facility. To achieve the same, the entire city is divided in 3 zones and the city aims to empty the

septic tanks of 1 zone per year. Initially, around 2% (~100) septic tanks were cleaned annually in Wai and these services were being provided by two WMC operated truck against a charge. However, Wai is now going to empty 33% i.e. 2000 septic tanks annually. This service is being provided by a private contractor which was selected through competitive tendering process. A service based contract for 3 years has been signed.

Impact of scheduled desludging

In Wai, scheduled desludging is operational since 30th May 2018. Since the implementation of scheduled emptying of septic tanks 7-8 tanks septic tanks are desludged every day as compared to 7-8 tanks being emptied every month. Within 5 months 350+ tanks have been desludged.

c. Technology

Wai Municipal Council allocated land near the solid waste management processing site for an FSTP of capacity 70 cu.m/day. The FSTP and schedule emptying service in Wai was inaugurated in May 2018. It is a thermal FSTP with engineered pasteurization, dewatering and waste water treatment unit. The reuse of energy produced during the pyrolysis of fecal sludge makes the setup more efficient and saves valuable energy. Reuse of treated septage and water is being explored and discussions are going on with local famers, government officials and agro based industries for reuse.

d. Financing

The FSTP at Wai was initiated as a pilot project wherein capital cost was funded by BMGF. Wai Municipal Council opened an independent escrow account for payment of private contractor for emptying service which protected it against payment delay. The scheduled desludging service is financed through the city governments' own funds. A sanitation tax is levied on the citizens which amounts to much less than what each family needed to pay for emergency desludging. This tax, along with surplus from property tax collection, funds the O&M of emptying and treatment.

4. Observations and comments

a.Sustainability of the project

WMC with the help of external consultants developed a 'performance-based contract' for scheduled emptying of septic tanks which enforce performance standards and safety compliance for septic tanks emptying. This contract is a balanced agreement which protect the interests of all parties – private sector, city governments and citizens.

This city is one of the first cities in India to roll out such a service for emptying septic tanks on schedule basis. Through a competitive tendering process, a private ltd. Company from Pune with pan India presence was selected to provide the emptying service. Due to extensive IEC conducted by the city for awareness, so far, out of the total properties visited for emptying the tanks, around 90% agreed to get their tanks emptied as per the schedule.

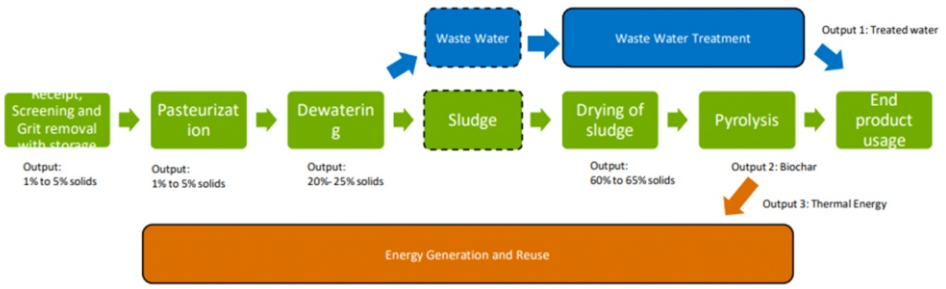
b.Replicability and scaling up

Wai is the 1st city in India to implement scheduled emptying program and one of the few towns to treat it in a safe manner. Various innovative tools have been used for assessment and implementation of sanitation related activities such as performance-based contract for emptying, financing models such as sanitation tax and opening of escrow account, mobile based applications for monitoring the service, etc. The model contracts and other tools are customizable and can be used by other cities. The learnings of Wai has also been adopted in the NFSSM policy and FSSM primer that GoI has rolled out.

Sources:

- *Wai Municipal Council*
- *https://pas.org.in*

The Thermal Faecal Sludge and Septage treatment process



Site pictures of treatment plant

Source: https://pas.org.in

Case 3

Sinnar, Maharashtra

1. Introduction

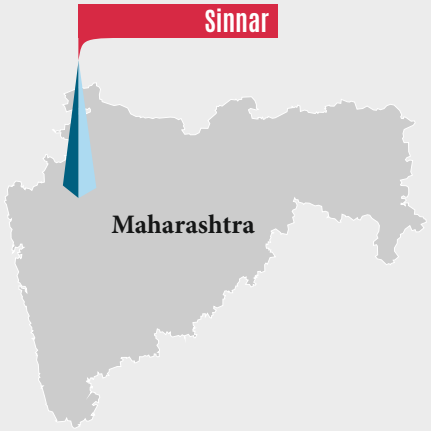
Sinnar city has undertaken FSSM and constructed an FSTP which is fully funded by the city government's own funds thus making it a sustainable model.

2. City overview

Name of the city and state:	**Sinnar, Maharashtra**
Population (census 2011):	**~ 72,000 (census- 65,251)**

Existing sanitation situation:

- *More than 75% of households have individual household toilets. The rest have access to well-maintained community toilets.*
- *The city does not have any underground drainage system and toilets in city are connected to septic tanks and pit latrines.*



3. Approach

a. Planning

In 2013, Sinnar Municipal Council (SMC) prepared city sanitation plan as the first step to undertake city-wide sanitation assessment using performance indicators to assess situation across the sanitation value chain. This was done to make the city ODF and adopting a non-sewered approach to wastewater management. The city is now focused on sustaining this status by achieving higher coverage of toilets and also on fecal sludge management for becoming ODF++. A city council resolution was passed for implementing FSSM plan which included scheduled emptying services on a 3-year cycle and the collected waste to be treated at a dedicated FSTP. The plan ensures that onsite sanitation systems function well and desludging services are provided to all on a scheduled basis at an interval of 3 years and all the collected sludge is treated through a simple and efficient treatment facility.

b. Conveyance

The city plans to move consumer complaint system to service oriented system. Currently, the city has one truck of 3 kl capacity which is owned and operated by the ULB itself, with which septage cleaning is done as demanded by the users. Households generally pay Rs 400-800 to the ULB to get their tanks cleaned. A scheduled cleaning plan is

envisioned where service will be provided to all properties spanning across 3 years. For this the ULB has procured three additional trucks of 5 kL capacity, which will be operated by private contractor. The existing truck will be used to de-sludge public and community toilets.

c. Technology

SMC allocated land near the solid waste processing site for 70 cu.m/day capacity FSTP. The ULB has prepared performance based contract for scheduled desludging and for the treatment plant. The FSTP is constructed with UASB + SDB technology with performance based Design-Build-Operate-Transfer (DBOT). Two private companies with pan India presence were selected – one each for emptying and FSTP. The FSTP is currently under construction and will commence soon. Scheduled emptying service is set to start with the FSTP.

d.Stakeholder engagement

For decision making and taking feedback on the proposals, discussions were undertaken with various stakeholders like the Mayor, Chief officer, councilors, sanitation engineer, supervisor, etc. In the larger citizen group, for dissemination of the toilet scheme and ensuring success of scheduled emptying services, various awareness drives were held by ULB officials, Self Help Women groups and NGOs. Discussions were also held with various financing institutions to provide toilet loans. Lastly, meetings with private sector was undertaken to understand their business concerns in engaging with the Municipalities and providing quality services for both emptying and treatment.

Sinnar Municipal Council through consultants has used various tools and methods for sanitation planning such as - SaniTab, a mobile based app supported by a web dashboard for conducting and assessing household sanitation surveys; toolkit for Private Sector Participation (PSP) to provide resources for cities to engage the private sector and; IFSM toolkit consisting of resources for citywide FSSM assessment and interventions.

e.Financing

Sinnar Municipal Council has invested in funds received under 14th Finance Commission in the capital costs of the FSTP. Sanitation tax is added as an additional charge on property tax ranging from Rs 60-300 per annum per property which is much less than what each family needed to pay for demand desludging. This tax, along with surplus from property tax collection, funds the O&M. Sinnar Municipal Council opened an independent escrow account for payment of private contractor for emptying service which protects it against payment delay. In this way it ensures regular payment to the private sector. SMC has set up 'Sinnar Swachhata Kosh' to converge all CSR / donor funds mobilized from Industrial estate in the city. These funds have supported the Council to implement the sanitation schemes for ODF sustainability and ODF+/++.

4.Observations and comments

a.Sustainability of the project

By considering FSM as a public service, the ULB has ensured that all residents including the slum dwellers and low income community residents- are served. The payment mechanism through taxes ensures that the poor pay much less than the non-poor, thus ensuring equity and affordability in FSM services.

b.Replicability and scaling up

The project implemented for making Sinnar ODF and then ODF+ have been driven by the local council by using its own funds making it a sustainable model to be replicated in cities of India. All the stakeholders in the city – the elected representatives, community based organizations and NGOs have extended their support to the city which is crucial for the successful implementation of the project. The learnings from Sinnar have been adopted in the NFSSM policy and FSSM primer that GoI has rolled out in 2017.

Sources:

- *Sinnar Municipal Council*
- *https://pas.org.in*

Source: https://www.flickr.com/photos/kartz/12533958484

Case 4

Leh, Jammu & Kashmir

1. Introduction

The first of its kind Faecal Sludge treatment plant built at high altitude and extreme climatic conditions.

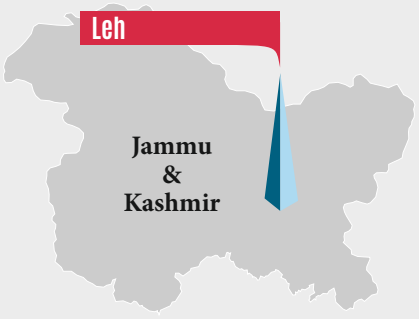
2. City overview

Leh city, situated at an altitude of 12,000 feet in Jammu and Kashmir is one of the highest cities in the world. Due to its geographical conditions, the city is self-sustainable, but the influx of tourists in last 10 years are threatening the fragile eco-system and polluting natural resources.

Name of the city and state:	**Leh, Jammu & Kashmir**
Population (census 2011):	**30,870**

Existing sanitation situation:

- *Currently the city is dependent on pit latrines/septic tanks and soak pits for containment.*
- *The city is building a sewerage system that in the near future will connect about 40% of the city.*



3. Approach

a. Planning

Currently, households, hotels and guesthouses use on-site containment systems of septic tanks and soak pits. As most of the septic tanks are poorly designed and the underground water table is high (only 30 feet in some places), the risk of water contamination is very high. Hence an FSTP was envisioned in such a way that will handle these local challenges of poor onsite sanitation systems, high altitude, extreme climatic conditions, as well as highly variable sludge inflow since activities will be minimal in the winter. Also since the tourist footfall is high, septic tanks can be cleaned only at night due to high pedestrian and vehicular traffic on the streets.

b. Conveyance

Hotels have been directed by the Municipal Committee of Leh (MCL) to get their septic tanks cleaned out once a year due to high water table. Notices for the same has to be sent out 20 days before the scheduled cleaning. As per MCL,

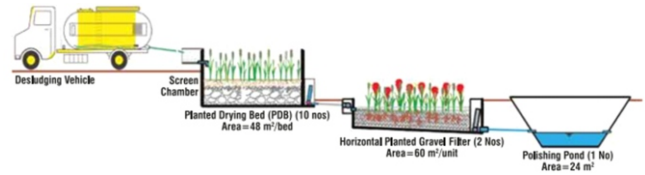
Vacuum emptier in Leh MCl

failure/ non-compliance on behalf of hotels to get their septic tanks cleaned as per schedule would lead to their hotel permits not being renewed. Many roads in the city are narrow with high gradients, making it difficult for desludging. New small vehicles are being manufactured for the same.

c. Technology

The crucial factor while designing for the FSTP was the challenges of high altitude, extreme climatic conditions as well as high variable sludge inflow as activities are minimal in winters. Design capacity of the treatment plant is 12 m3/day. To tackle the weather which can disrupt scheduled cleaning services and thus the daily volume of faecal sludge collected, Planted Drying Beds have been constructed. A DEWATS module is used to treat water which will keep the operations simple and cost very low. It is a gravity based system in which natural and biological treatment is used with no use of chemicals or electricity. The end product of the treatment plant which is, treated water and compost, will be used for landscaping of the children's park located adjacent to the plant and other city beautification projects.

FSTP features




Polishing pond at FSTP, Leh


A view of the Faecal Sludge Treatment Plant at Leh

d. Stakeholder engagement

MCL faced the issues of shortage of technical expertise amongst local authorities who can design, implement and operate the system. Hence, Leh council appointed a private company to form India's first Public Private Partnership in FSM to finance and design, build, operate and transfer (DBOT) the entire system. A five year partnership contract was formed which outlined the operating responsibilities, payment terms and revenue models between the MCL and the company.

MCL	Private agency
⊙ To provide the land for the FSTP ⊙ To provide 2 suction trucks it already owns for cleaning services ⊙ To charge and collect a fee from every household, hotel and guesthouses for compulsory FSM services ⊙ To send customers a notice of cleaning 20 days in advance, based on schedule created by the agency	⊙ To invest capital to construct the FSTP ⊙ To create a monthly schedule and clean septic tanks- large ones each year, smaller ones every two years ⊙ To be paid a part of the fees collected from customers, after the septic tank is cleaned ⊙ To train all employees, ensure use of proper safety gear and provide periodic health checks to operators

Source: 1 FSM for Leh by BORDA (https://www.borda-sa.org/wpcontent/uploads/2018/08/BORDA_FSM_for_Leh_HF.pdf)

e. Financing

To reduce the complexities of municipal budget allocation and government tendering processes which can delay implementation, Leh MCl formed five year partnership with a private agency. The agency had an incentive for speedy construction of FSTP so as to start earning in return to its investment as soon as possible, which minimized the stoppage and delays of the project. The ULB has zero investment in the project and will only pay when the services are successfully delivered. As only one agency is responsible for designing, building and operating the entire system for five years, it is fully accountable for any problems or failure. For the simple operations of the plant skilled operator is not required which as further minimized the O&M costs. Construction cost of the project is Rs. 52 lakhs (5 lakhs/m3) built over the period of 7 weeks.

4. Observations and comments

a. Sustainability of the project

While the plant is designed keeping high altitude and cold temperatures, careful monitoring is being undertaken especially in the initial years, to understand the performance and ensure compliance with regulations and standards to ensure that the plant functions optimally and avoid any breakdowns. The FSTP of Leh has been specifically designed to operate optimally in Leh's geographic location and extreme climatic conditions i.e. low temperatures, dry climate and strong sunshine through the year. It is also designed for highly variable sludge inflow since activities will be minimal in the winter. Furthermore, the capacity of the treatment plant can be easily increased by building PDB modules. Challenge of desludging in high gravity narrow lanes need to be addressed.

b. Replicability and scaling up

Similar approach as that of Leh of establishing a low cost, low maintenance modular FSTP can be replicated in cities located in hilly areas of the country at high altitudes with extreme climatic conditions to address sanitation challenges in their respective cities.

Sources:

- *Faecal Sludge Treatment Plant (FSTP), Leh by BORDA, India 2017*
- *FSM for Leh, by BORDA*
- *Collaboration is everything: high-altitude faecal sludge management (FSM) in Leh, India by BORDA*

Source: https://www.flickr.com/photos/rmsguhan/2404588831

Case 5

Nesapakkam, Chennai, Tamil Nadu

1. Introduction

The STP at Nesapakkam in Chennai undertakes co-treatment of septage along with sewage for unsewered urbanized areas lying in vicinity of the STP.

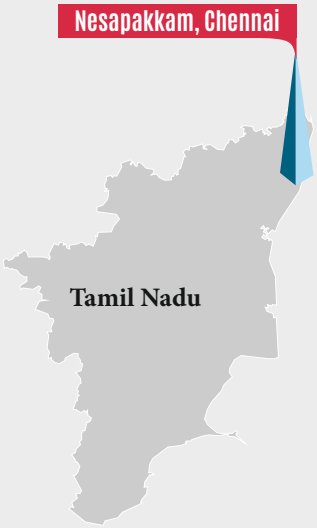
2. City overview

Chennai, the capital of Tamil Nadu, is located in the northern part of the state. In October 2011, the jurisdiction of the Chennai Municipal Corporation (CMC) was expanded to include 42 local bodies lying contiguous to the core city increasing the Corporation's area from 176 to 426 sq.km. In 2016, the CMC was renamed as the Greater Chennai Municipal Corporation (GCMC).

Name of the city and state:	**Chennai, Tamil Nadu**
Population (census 2011):	**7.1 million**

Existing sanitation situation:

- *96 percent households in the core city (erstwhile CMC area) had access to individual toilets and 3.8 percent were using public toilets.*
- *While the former CMC area is fully covered with UGSS, the adjacent local bodies (urban and rural) which were incorporated in 2011 have a significant proportion of the households which have toilets with septic tanks.*



3. Approach

a. Planning

Chennai initiated co-treatment of septage at STPs in the early 2000s. The Operative Guidelines for Septage Management for Urban and Rural Local Bodies of Tamil Nadu suggests a decentralised approach to septage management wherein clusters of ULBs have been identified for treatment of collected septage at earmarked STPs in the state. With respect to co-treatment, the guidelines recommend that each STP should create a decanting facility designed on the basis of the expected volumes of septage for a five year planning horizon.

At present, co-treatment is being undertaken at three locations namely, Nesapakkam, Perungudi and Kodungaiyur. Nesapakkam services the south western part of the city and is spread over an area of 45 acres.

b. Conveyance

52 private desludging trucks, each with a capacity of 9,000 Litres (9kL), are registered with the Nesapakkam STP. Each

truck makes multiple trips every day and about 200 truckloads of septage are unloaded on a daily basis. While septage disposal is permitted only at the decanting facility located at the STP, CMWSSB permits septage discharge at specific pumping stations within the city during monsoon season due to high demand for desludging and therefore higher septage volumes.

c. Technology

The Nesapakkam site has three treatment trains with a combined installed capacity of 117 MLD (23 MLD, 40 MLD and 54 MLD respectively). All three STPs are based on an 'Activated Sludge Process' (ASP) Technology. The combined waste water flow ranges from 95 to 100 MLD. The presence of spare treatment capacity (of up to 17-22 MLD) enabled implementation of co-treatment of septage.

The facility receives about 200 truckloads or about 1.8 MLD of septage daily which is blended with around 100 MLD of sewage (around 2%). A decanting station has been created at the STP for desludging trucks to discharge septage. The decanting station has sufficient space for up to 4 desludging trucks to empty simultaneously and has parking area for another 3-4 trucks.

The decanting station comprises of a covered receiving tank followed by grit removal chamber and screens. The receiving tank is covered and connected to an odour control air scrubbing unit. Septage from the receiving tank flows into the trunk sewer line passing outside the decanting facility and flows into the terminal SPS feeding into the STP.

Figure 1: Simultaneous decanting in process
Figure 2: Receiving tank – decanting station
Figure 3: Odour Control Air Scrubbing Unit

Retrofits or additions to the treatment process:

- Increase in aeration capacity
- Increase in sludge handling load

d.Stakeholder engagement

Private operators have been involved through registration with the Nesapakkam STP ensuring safe and economical option for discharging septage.

e.Financing

Capital Cost: The STP had to incur capital expenditure of about INR 2,00,00,000 for creating a special decanting facility for discharge of septage. No additional retrofits or modifications requiring capital investment were made at the STP to enable co-treatment.

O & M cost: Annual O&M cost of the plant along with Co-Treatment INR 4,99,04,000 per year.

4.Observations and comments

a.Sustainability of the project

It is estimated that co-treatment of septage is able to provide septage treatment solution for between 180,000 to 600,000 households with septic tanks. Thus the initiative has been successful in addressing sanitation challenges in the unsewered parts of GCMC. Due to regularization of private desludging operators, 52 private trucks are registered with the Nesapakkam STP have been provided with a safe and economical option for discharging septage. The initiative has ensured that unauthorized dumping of septage in the city's waterways has reduced substantially. The user charges collected from private desludging operators /trucks is resulting in generating revenue to the tune of 6 million per year.

b.Replicability and scaling up

The enabling environment through Operative Guidelines for Septage Management for Urban and Rural Local Bodies had led to a decentralised approach to septage management wherein clusters of ULBs have been identified for treatment of collected septage at assigned STPs in the state. The ULBs have been entrusted with the responsibility of implementing the operative guidelines in areas under their jurisdiction.

This case showcases optimum utilization of existing infrastructure by making use of the existing STPs for co-treatment of septage with sewage. Regularisation of private operators has also ensured that septage is unloaded at a dedicated facility without being haphazardly disposed in the environment. This method can be adopted in larger cities where STPs are available. Co-treatment can help serve non-networked areas within and around the city.

Sources:

- *This case study has been adapted from a study conducted by Mr. Sanjay Gupta, Independent consultant*

Source: https://sq.wikipedia.org/wiki/Puri

Case 6

Puri, Odisha

1. Introduction

Puri SeTP employs co-treatment method for treatment of septage where solids are treated through drying beds and the liquid faction is treated in Sewerage Treatment Plant (STP) co-located with SeTP.

2. City overview

Puri is a city in the state of Odisha in eastern India. It is situated on the Bay of Bengal, 60 kilometers south of the state capital of Bhubaneswar. With the 12th-century Jagannatha Temple located in its heart, Puri is a pilgrimage town with high floating population.

Name of the city and state:	**Puri, Odisha**
Population (census 2011):	**2,00,564**

Existing sanitation situation:

- *Majority of the population of the city are dependent upon onsite sanitation*

3. Approach

a. Planning

The approach for FSSM in Odisha is state centric. The SeTP of Puri has been constructed under the Atal Mission for Rejuvenation and Urban Transformation (AMRUT) programme by Odisha Water Supply and Sewarage Board (OWSSB). The plant in Puri employs co-treatment for septage management.

b. Conveyance

In October 2017, Puri Municipality appointed a private contractor to provide emptying services Rs. 790/- per trip. As a result of lower price and in time services, the Municipality saw an increase in the number of trips being emptied at the plant.

Cesspool emptier vehicle procured by the State of Odisha

Cesspool vehicles

Odisha Government purchased cesspool vehicles for ULBs using state funds in early 2015 and ensured availability of cesspool vehicles with all the ULBs for safe collection and transport of faecal sludge/septage. The Puri Municipality has 6 numbers of cesspool vehicles out of which 4 were procured by the OWSSB and handed over to the ULB while the other two were procured by the ULB. The 4 newly procured vehicles are of 3000 L capacity and have been handed over to the private agency under the contract.

c.Technology

An SeTP of 50 KLD capacity was constructed by Orissa Water Supply and Sewerage Board (OWSSB) in October 2017. The treatment plant was constructed under AMRUT scheme. The septage at this treatment plant is co-treated by treating solids in SeTP and the liquid in the co-located STP. The septage is emptied at the receiving chamber. It then goes to the settling cum thickener tank of SeTP which allows heavier particles of the unloaded septage to settle down to the bottom of tank while the lighter part of septage (i.e. water and oil) remains above. The sludge (settled soils) gets thickened in the settling-cum-thickener tank and removed by pumping at regular interval to the sludge drying bed for removal of moisture content. These sludge drying beds are the underutilized drying beds of STP which have been modified for treating septage to save infrastructure cost. The leachate from sludge drying bed is collected in the leachate sump which is pumped to the pre-treatment unit of Sewage Treatment Plant (STP) which is co-located with the SeTP for further treatment and disposal.

d.Financing

The project has been constructed under AMRUT by 50:50 cost sharing basis. The total project cost is 1.75 crores.

4.Observations and comments

a.Sustainability of the project

The treatment plant has been designed by using non-mechanized technology which has made the project cost effective. This treatment plant has made use of existing STP where the liquid faction is treated and construction of only SeTP which treats solids. The drying bed is also constructed in place of the sludge drying bed for STP which is utilized only biannually when the sludge from STP is removed. This has reduced the cost of the project thus making it sustainable for the ULB.

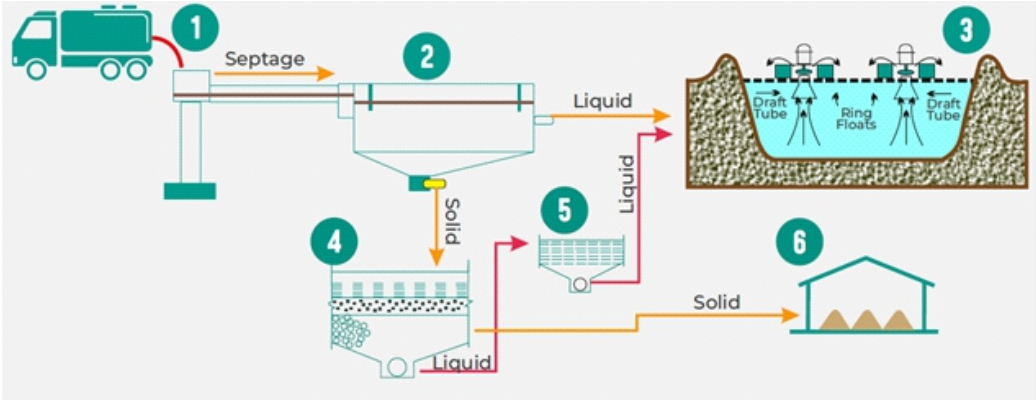
b.Replicability

In India, there are lot of cities with STPs which still have on site sanitation in their cities. Such cities can adopt co-treatment for treating the septage with low investment. Such co-treatment plants can be receiving SeTPs to other smaller cities from peripheral areas.

Sources:

- *Odisha's Journey of Faecal Sludge and Septage Management, towards sustainable sanitation goals by Ernst & Young LLP.*
- *Septage Treatment Facility in Bhubaneswar & Puri, Design Approach and overview of SeTP- Presentation by Binod Kumar Sahoo, Project Director, OWSSB*

Treatment process flow diagram




Settling cum Thickening Tank


Sludge Drying Bed with movable Shed

Learning Note 4

CAPACITIES

Capacity building for non-networked sanitation

Lessons from collaborative partners engagement of Training Modules Review Committee

Background

Challenges of water and sanitation sector are increasingly cantering on managing demand and reducing wastewater footprint. The days of endlessly increasing the supply of drinking water are over. Creating an enabling environment of norms and regulations, translation of policy into funds and functionaries in place to deliver and enforcing institutional accountability, is a frontier area where the capacity building needs to focus today. All these constitute a holistic scope for capacity building for FSSM.

Capacity Building

Capacity is "the ability of people, organisations and society as a whole to manage their affairs successfully". **Capacity development** is the "process of unleashing, strengthening and maintaining of such capacity"(OECD/DAC)

Capacity Building is more than just development of training modules and providing trainings and exposure visits. In a UNDP symposium in 1991 on "A Strategy for Water Sector Capacity Building, following were identified as components of capacity building" :

- The creation of an enabling environment with appropriate policy and legal frameworks;
- Institutional development, including community participation (of women in particular);
- Human resources development and strengthening of managerial systems.

Capacity building has to be integrated into the normal functioning of an organisation, as on job training and mentoring from within. An organisation has to create opportunities for its staff to grow professionally and acquire knowledge and skills, to remain relevant and seize opportunities for growth. A learning environment that allows this to happen on the job, cannot be replaced by training and capacity building from outside. Most organisations suffer from the lack of a learning culture that hinders knowledge and skills assimilation opportunities for its staff and partners. Capacity building of Staff and officials of Urban Local Bodies and Para State Technical Agencies, including administrative and executive staff engaged in the designing, implementation and maintenance of water supply and waste water treatment systems, is a necessity for ensuring sustainable and equitable water and sanitation services.

Sanitation and urbanisation in India

The total urban population of India, as per Census of India - 2011, is 377 million, which is majorly spread across 7935 urban centers - 4041 statutory towns and 3894 census towns. Statutory towns are administered by Urban Local Bodies which is responsible for delivery of infrastructure services, and census towns are administered via rural administration, provision of urban services is not mandatory in these areas. Though the number of census towns has trebled over a decade, the increase in number of statutory towns has been much slower. There is a large gap between the wastewater generated and actually treated. Out of about 61754 million litres per day (MLD) of sewage generated, treatment capacity exists for only 32% (about 22963 MLD). As per the CPCB report- Status of Sewage Treatment in India, municipal waste water generated in 35 metropolitan cities shows

Table : Urban canters in India (Source: Census of India 2011, Office of the Registrar General & Census Commissioner, Ministry of Home Affairs, Government of India.)

Types of Urban Units and Numbers	Census - 2001	Census - 2011
Statutory towns	3,799	4,041
Census towns	1,362	3,894
Urban agglomeration	384	475
Out growths	962	981

that all these cities collectively generate 15,644 MLD of sewage. But these cities have sewage treatment capacity of only 8040 MLD (51% of the total sewage with Delhi and Mumbai together accounting for 55% of treatment capacity of these 35 metropolitan cities). The total treatment capacity gap between the waste water generation and its treatment in Class I and Class II cities of India combined is also as high as 70%.

Implementation of on-site sanitation services remains a problematic area in most Indian cities. Data related to availability of sanitation services, collection of faecal sewage and sewage treatment remains unknown to most urban bodies. Municipal corporations in many Indian cities have been known to employ manual scavengers to clean septic tanks, a practice deemed illegal by the Supreme Court. Inappropriate tank sizes are another problem which occur due to lack of defined norms with regard to tank sizes. Other problems such as lack of infrastructure among municipal bodies, lack of proper sewage treatment facilities and poor awareness among people on how untreated faecal sewage poses health risks has created several gaps in urban sanitation. As of today, more than 400 Faecal Sludge Treatment Plants and several towns have committed to co treatment of septage with sewage in their existing STPs. Different technology options ranging from DEWATS to Thermal and Membrane based technologies are being tried out.

Capacity building approach of SCBP

Sanitation Capacity Building Platform (SCBP) is an initiative of the National Institute of Urban Affairs (NIUA) for addressing urban sanitation challenges in India. The Platform, supported by BMGF is an organic and growing collaboration of credible national and international organizations, universities, training centers, resource centers, non-governmental organizations, academia, consultants and experts. The Platform 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.

The partners of the platform are - CEPT University, Consortium for DEWATS Dissemination (CDD) Society & BORDA, Ecosan Services Foundation (ESF), WaterAid, iDECK, Centre for Policy Research (CPR), All India Institute of Local Self Government (AIILSG), Administrative Staff College of India (ASCI), Urban Management Centre (UMC), CSTEP and WASH institute. SCBP is part of the National Faecal Sludge and Septage Management Alliance (NFSSMA) at the national level. The strength of the Platform is its ability to bring together partners to contribute towards the development of State Sanitation Policy, Training of Trainers and Training Content Development, Technical and Social Assessments, Training Programme delivery, Research, and Documentation.

Capacity building support under SCBP was initiated in 2016 with intensive engagement in six towns in three states (Uttar Pradesh, Bihar, and Andhra Pradesh). Starting from six towns focus, the programme was expanded, reaching a large number of government officials from 300 towns directly and indirectly around 2000 officials in 10 states of India and many private sector consultants, training institutes and academia. The Platform has supported FSSM capacity building intensively in two states - Uttar Pradesh and Rajasthan and recently has initiated work in Uttarakhand. At the national level, the platform has conducted FSSM capacity building through engagement with nodal training institutes to reach out to more towns and states (Madhya Pradesh, Karnataka, Kerala, West Bengal, Jharkhand, Bihar, Andhra Pradesh, Telangana, Chhattisgarh, and Odisha).

SCBP has identified nodal national training institutes and provided FSSM training modules and trainers from among the SCBP partners in the short run. And by linking these state-level institutes with state universities and technical institutes in the long run. The financial sustainability of the training institutes is a matter of concern as central and state grants fund them and these are not sufficient to provide useful quality training materials, regular staff and hired resource persons.

SCBP also extended the Collaboration with Academic Institutes to further the agenda of capacity building under SCBP. NIUA initiated a multi-disciplinary engagement with academic institutes for:

- Integration of non-sewered sanitation & FSSM into course curriculum – through electives, minor programmes, studio exercise, summer/ winter schools
- Research and learning events on non-sewered sanitation & FSSM: Cap stone projects & dissertation at under graduate, post graduate and PhD level, workshops at state level, thematic learning events
- Professional courses: thematic certificate courses – technology, management, Faculty Development Programmes

Capacity building for non sewered sanitation systems: State level normative framework

Capacity Building for FSSM emerged as a priority for almost all partners of the NFSSMA members.

A review was undertaken in 2018 by Alliance partners under a Training Modules Review Committee (TMRC) to assess the scope of capacity building in terms of:

⇨ Identify priority stakeholders

- ⇨ Review training modules content and structure
- ⇨ Identity priority training institutes to revise/develop, and
- ⇨ Explore strategies for a scaled up and effective capacity building intervention.

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.

Capacity building goal

To enable a paradigm shift in favour of decentralised and non-networked sanitation systems to achieve universal treatment of faecal waste and improvement in health and living conditions.

Recommended approach/steps

The framework is not meant to be prescriptive. Any support organisation can decide at which stage their state is in adopting non sewered sanitation and decide where to intervene.

Step 1: Developing a state perspective, strategy and approach

As a start-up activity, support a state government to 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.

Step 2: Securing buy-in for FSSM at the highest administrative, technical and political levels

Unless there is buy-in at the highest level of the State Urban Development department, functionaries of most if not all small and medium towns may not be in a position to select an alternative treatment option for FSSM. There is no blueprint or sequential process that can be prescribed.

Exposure visit of senior officials to functioning Faecal Sludge Treatment Plants(now operational in some towns/states of India) is powerful advocacy. Short presentations and handout notes that highlight the issue of challenges after construction of toilets – are powerful advocacy for decentralised and non sewered sanitation systems.

An MoU or a formal commitment to work on FSSM that the state signs with a support agency, can be helpful in forging commitment of the state.

Step 3: Developing a state FSSM policy

Each State is expected to develop and issue the FSSM Implementation Strategy and Plan Guidelines. Based on the National FSSM Policy 2017, the state has to develop a state FSSM Policy. This provides an enabling environment and commitment from the highest level, for ULBs to take up FSSM. The policy will identify the issues of safe sanitation in urban areas and provides an outline for establishing and effectively operationalizing FSSM at state and city level.

The policy should address the enabling provisions in the form of suitable regulation and institutional framework, capacity building, education and awareness among all stakeholders.

Step 4: Developing partnerships for capacity building and training of trainers

Once there is clarity of engagement, the following strategic planning can be done to design a state-specific training strategy and plan.

- ⇨ 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.

There is a list of 35 nodal national training institutes empanelled by the MoHUA, The ToTs of nodal training institutes for FSSM should focus on providing a conceptual clarity, establish the need for non sewered sanitation systems, a basic understanding of technology approaches and their selection criteria and the operational potential of regular de sludging of septic tanks.

Developing content relevant to the particular state is best done in collaboration with partner academic institutes and experts. NFSSMA partners can provide the initial trainers for delivering training. Innovative exercise based content development should be a regular priority.

Step 5: Designing targeted capacity building modules and method of delivery

A review process of all the training modules developed by all the partners of the (NFSSMA) provided clarity on the priorities and standardisation of content for priority training modules.

The Training Modules Review Committee(TMRC) recommended the following Modules for review and revision as priority modules for ULB officials and para state agencies in the following sequence:

- → FSM 0.1 Orientation training to maximum number of ULB and para state agencies staff: 1 Day
- → FSM 0.2 Exposure visit cum Technical training on technology options for select ULBs and para state agencies: 2 Days
- → FSM 0.3 Advanced Training on Technology: 3 Days

FSM 0.1. Experience of NIUA and CEPT shows that FSSM Orientation Modules should be conducted state wide for maximum number of ULBs for securing impact. These can be done at Division level for a cluster of ULBs and the whole state can be covered in an intensive 3 to 6 months orientation training drive. By bringing together a cluster of ULBs, peer to peer learning is also possible.

FSM 0.2. Given the successful establishment of Faecal Sludge Treatment Plants using different technologies, organising trainings that are a mix of classroom sessions and exposure visits, is an effective option. Hence an exposure visit based technology training module is recommended. This has a cost implication for travel, board and lodging. The strategy recommended by TMRC was that participants should be identified from the orientation trainings. Only those participants are invited who showed interest in implementing some technical or even regulatory interventions to address FSSM. Participants can be a mix of technical and administrative staff of ULBs.

FSM 0.3. The purpose of this training module is to convey a wholistic understanding of the planning, designing and technology selection for setting up of an FSTP. It should have a one day field visit component. Participants should be from para state agencies and ULBs, engineers who are engaged in designing, implementation/setting up and in operations of FSTPs.

The TMRC is in the process of revising existing training modules and producing updated modules.

In addition to the above 3 Training Modules on FSSM, the officials may also attend more specialized training modules for private sector.

The TMRC review identified the inadequacy of long duration training modules to address multiple priorities. The TMRC also recognised the strengths of different Alliance partners and their ability to anchor separate modules where participants could go and complete a set of comprehensive trainings. Accordingly it was decided that a 3 set capacity building training module needs to be developed for private sector trainings.

- → FSM 0.4 Finance and Contracting module : 2 days
- → FSM 0.5 Advanced Technology, Planning and Design module: 3 days
- → FSM 0.6 Advanced Technology module for preparing DPRs: 4 days

These 3 set capacity building trainings can be conducted over a 6 month to one year period. The participants should demand and pay for atleast a part of the cost of training. However support may be needed to pay for these trainings. Content and curriculum of these training programmes also needs to be developed and updated on a regular basis.

Additional training needs to be provided for :

- Community engagement awareness
- Addressing sanitation workers safety and ending manual scavenging
- Operation and maintenance of FSTPs. For operators of treatment plants.
- Training modules for masons and contractors
- Short modules for elected representatives
- Specialised Certificate Courses for professionals

Step 6: Promoting new research, documentation and dissemination

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.

Step 7: Developing an operational strategy for FSSM

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.

Hands-on support for implementing incremental FSSM improvements at the town level will be a critical capacity building input. It is imperative to strengthen the ULBs by creating a cadre of permanent professional staff for town planning that can also handle FSSM. In the absence of permanent staff hiring, facilitate the hiring of a professional team of town planners and managers at the state level for ULBs to support them in planning and implementation.

Conclusion

The entire capacity building support engagement for a state, as explained in the note, may be planned and delivered in a 2 year time frame.

State governments may however demand technical support for developing Detailed Project Reports(DPRs) and technical guidance for selection of appropriate and low cost technology options. A guidance note on technology options and selection criteria is available separately. 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. Alongwith 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 goals.

Training Modules

	Training modules	Elected Representatives / Chairpersons / Mayors and Ward Councillor	Executive Officers / Commissioners of small Towns	Mid Level Engineers	Junior Technical and Administrative Staff / Sanitary Inspector etc	Commissioners / Senior Officials/ Senior Engineers	Pollution Control Board	Town Planner
FSSM 0.1	Orientation Training	Half day Training on Roles of Elected Representative, 74th Amendment Roles of Elected Representatives in relation to FSSM	One day orientation for mixed group of audience - urbanisation , integrated waste water management, city wide inclusive sanitation, sanitation safety planning		Sensitisation/ consultation - need to develop videos, posters, handouts on case studies	Half day consultation /workshop on policy, regulations and financing Advocacy material - policy briefs, handouts / fact sheet on existing / upcoming FSTPs, Co-treatment videos on FSSM and FSTPs	Half day consultation/ workshop on regulatory and statutory aspects of FSSM and FSTP management	One day Orientation Training on linkage between urbanisation and sanitation. Linkage between planning tools / documents Rules & Legislations of the two interconnected sector -land use planning and sanitation
FSSM 0.2	Exposure Visits	Two day training and exposure visit along with EO (one day class room, one day site visit). Policy and regulations, basic technology financing for FSSM		Three days training and exposure visit - 2 days class room and one day exposure Technology options for emptying, transportation, treatment and co-treatment of septage at STPs procurement and funding estimation	One day exposure visit to state level good practice on solid and liquid waste management	Two day peer learning / Twining programme Exposure visit ot FSTP & interaction with senior state / ULB officials	Two days training and exposure visit on regulatory and statutory aspects of FSSM and FSTP manangement - one day class room & one day exposure	
FSSM 0.3	Advanced Training			Three days advanced training - two days class room, one day field visit Assessment and planning design of treatment module, O & M, financing, DPR review, financing and procurement		Internation exposure visit		

Sanitation Capacity Building Platform

Sanitation Capacity Building Platform(SCBP) is a platform anchored by NIUA and works as a collaborative initiative of experts and organisations committed to support and build the capacity of Urban Local Bodies, National Nodal Traiining Institutions, Academia and Private sector : to Plan, Design and Implement decentralized sanitation solutions. The Platform lends support to Ministry of Housing and Urban Affairs (MoHUA), Government of India, by focussing on urban sanitation and supports states and cities to move beyond Open Defecation Free (ODF) status by addressing the safe disposal and treatment of human faeces.

The Platform promotes non networked sanitation systems and has been operational since 2016. Over the last 3 years SCBP has developed as a credible platform including : 20 partners of the National Faecal Sludge and Septage Management Alliance(NFSSMA), 8 Nodal National Training Institutes and 9 universities partners. Together this Platform has developed a portfolio of standardised FSSM training modules, policy papers, technical reports and research.

SCBP Portal scbp.niua.org is a knowledge platform on decentralised urban sanitation.

NIUA

National Institute of Urban Affairs (NIUA) is premier institute for research, capacity building and dissemination of knowledge for the urban sector in India. It is registered as an autonomous body under the Ministry of Urban Development, Government of India. NIUA conducts research in emerging themes such as urbanization, urban policy and planning, municipal finance and governance, land economics, transit oriented development, urban livelihoods, environment and climate change and smart cities. In its mission to promote evidence-based policy-making and urban scholarship, NIUA is currently engaged in inter-disciplinary research and proactive engagements with change agents, which involve projects that create & maintain digital interface solutions.
Website: https://www.niua.org/

NCGG

The National Centre for Good Governance (NCGG) is an autonomous institute under the aegis of Department of Administrative Reforms and Public Grievances, Government of India. The NCGG has been set up to assist in bringing about governance reforms through studies, training, knowledge sharing and promotion of good ideas. It seeks to carry out policy relevant research and prepare case studies; curate training courses for civil servants from India and other developing countries; provide a platform for sharing of existing knowledge and pro-actively seek out and develop ideas for their implementation in the government, both at the States and the Central level.
Website: http://www.ncgg.org.in/

AIILSG

All India Institute of Local Self-Government (AIILSG) has been the steadfast friend, philosopher and guide to Urban Local Bodies (ULBs) across the Country. For more than eight decades it has contributed to the principles and practice of urban governance, education, research and capacity building. It has designed and developed a vast array of training literature and courses and trained more than 1.5 million stakeholders in diverse areas of urban governance and urban services delivery.
Website: http://www.aiilsg.org/

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