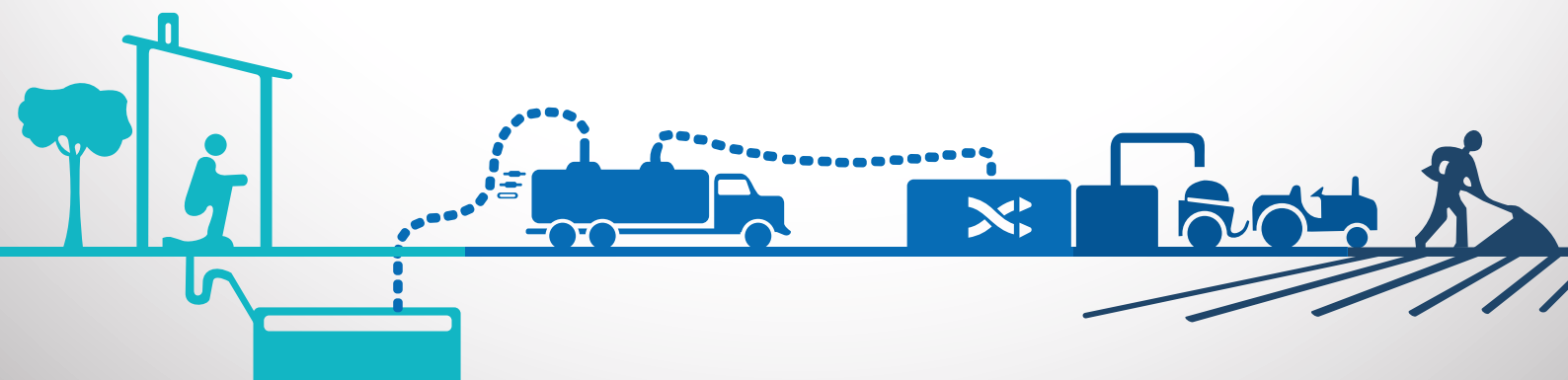


FAECAL SLUDGE AND SEPTAGE MANAGEMENT IN URBAN AREAS

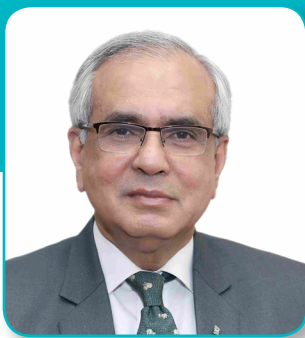
SERVICE & BUSINESS MODELS



January 2021

FAECAL SLUDGE AND SEPTAGE MANAGEMENT IN URBAN AREAS

SERVICE & BUSINESS MODELS



Message

Vice Chairperson, NITI Aayog

The clarion call of the Hon'ble Prime Minister at the launch of Swachh Bharat Mission (SBM) triggered remarkable attention towards the sanitation sector in India. SBM went on to become one of the world's biggest sanitation drives that accelerated access to sanitation. It helped India achieve its target of eliminating open defecation. This phenomenal feat has been a result of visionary leadership at all tiers of government coupled with extensive involvement of the citizens with a single-minded pursuit of making India an ODF country.

Given the rapid pace of urbanization, Indian cities need to become exemplary models of sustainable urban development. With construction of more than 9 crore toilets across urban and rural parts of India, not only the legacy problem of access to sanitation has been addressed, but also the establishment of effective faecal waste management systems has received due emphasis. The next targets in the urban sanitation sector are the ODF+, ODF++, and Water + certifications for ULBs which focus on entire sanitation service chain as well as wastewater treatment. To achieve optimum health outcomes associated with sanitation services and prevent faecal contamination in the environment, city level Faecal Sludge and Septage Management (FSSM) planning assumes great importance.

Many cities have implemented successful models of FSSM systems with optimal private sector participation, use of latest technologies, and greater mechanization of operations. This document covers best practices of FSSM witnessed across India. It also documents the various service and business models adopted for implementing FSSM projects. It is hoped that this will act as an important guiding repository of experiences, that will allow better implementation of novel and tailored sanitation solutions.

I compliment the NFSSM alliance and the Managing Urbanization vertical at NITI Aayog led by Additional Secretary, Dr K. Rajeswara Rao, for this timely initiative, and his team comprising Deputy Advisor, Dr. Biswanath Bishoi, and Young Professional, Mr Dhiraj Santdasani for all their efforts. My sincere thanks to all the sector experts and practitioners who contributed towards preparing this report.

A handwritten signature in black ink, appearing to read 'Rajiv Kumar'.

Dr. Rajiv Kumar

Vice Chairperson, NITI Aayog



Foreword

CEO, NITI Aayog

Over the last few years, India's tryst with sanitation has reached center stage, mostly due to the efforts channeled under the government's flagship sanitation scheme, the Swachh Bharat Mission. The program has been extremely successful in accelerating access to safe sanitation through the creation of household toilets across urban and rural parts of the country and helped India achieve its target of preventing open defecation. The government is determined to further improve the public health outcomes through the next set of targets in the sector; ODF+, ODF++, and Water+ certifications. With many Indian households reliant on on-site sanitation systems for its affordability; disposal and treatment of faecal waste assumes as much importance as its containment. That said, on-site sanitation systems remain viable only as long as the entire service chain can be adequately managed, and this is where Faecal Sludge and Septage Management (FSSM) assumes importance.

FSSM represents an innovative, smart, and sustainable system that works across the value chain. Its built-in adaptability allows it to be a solution for both urban and rural areas, thereby allowing it to complement India's efforts at achieving its targets under SDG 6.2, and accelerating our performance under other SDGs relating to healthy living, inclusive cities, and accruing gender parity. In the past few years, faecal sludge management has received much awaited focus in the country and we have been able to formalize FSSM services in many Indian cities. Since the deployment of the National FSSM Policy, 2017, many states have made great strides through enactment of policies, legislative frameworks, issuance of guidelines, and by leveraging funding from multiple sources like SBM, AMRUT and 14th FC. As a result, about 499 ULBs have already achieved the ODF++ status.

The success of FSSM lies in ensuring uniform access to quality service delivery, which is driven by local governance systems like municipalities, municipal corporations, etc. Complementing synergies produced from partnerships with other stakeholders, such as private sectors players, domain experts and development practitioners; are also key to the success of FSSM. Such partnerships infuse technological innovations and help bridge funding gaps—which remain critical to achieving outcome driven results. To continue progress in this sector, it is imperative that we develop robust business models, promote private sector participation, leverage latest technological advancements, and bring extensive mechanization in operations.

Lastly and perhaps most importantly, it is also crucial to create a strong repository of FSSM best practices that can be observed, adapted, and replicated appropriately across the country. I take this opportunity to compliment the efforts of the NFSSM Alliance in development of this publication and for working alongside numerous state and regional actors, helping them adopt FSSM best practices. I am sure that the collective efforts for streamlining the FSSM sector would enable India to reach the top of the Sanitation ladder with “Safely Managed Sanitation” systems across the country. And this would genuinely be the Watershed Moment for Urban Sanitation sector of India.

My special appreciation goes to the Managing Urbanisation (MU) vertical at NITI Aayog led by Additional Secretary, Dr. K. Rajeswara Rao, who provided commendable leadership in bringing out this document, and his team involving Deputy Advisor (MU), Dr. Biswanath Bishoi, and Young Professional, Mr Dhiraj Santdasani. As we continue to make progress and leapfrog in the sanitation sector, I hope this publication would serve as a comprehensive resource for cities and states seeking to make their mark in sustainable and inclusive sanitation.

Mr Amitabh Kant
CEO, NITI Aayog



Foreword

Additional Secretary, NITI Aayog

On the lines of the Sanskrit term **(A-P-A-N-A)**, we strived to make Sanitation; A-Accessible, P-Private, A-Affordable, N-Nature friendly and A-Achievable under the government's flagship scheme of Swachh Bharat Mission. All stakeholders, including all tiers of government, private sector players, NGOs, philanthropies and most importantly, the citizens supported the movement in a spirit like never seen before for this sector. Over the last six years, the Swachh Bharat Mission has been able to build over 72 lakh toilets in urban India, and nearly 8.4 crore toilets in rural India. With this, the mission became the world's biggest sanitation drive and enabled us to become an ODF country last year.

While access to sanitation has been addressed in the right manner, it is now time to leverage the momentum and target safe management of the entire value chain of sanitation. To truly achieve this goal, one must move toward the next step of building the right processes and systems to treat and dispose the refuse from these toilets. Fortunately for our nation, many enterprising cities and states have been doing commendable work in this regard. While establishing sewer network remains long-term goal for cities, they are recognizing the urgent need to adopt the Faecal Sludge and Septage Management (FSSM) philosophy, as a fundamental pathway of providing quality of life to urban citizens, and are leading the way ahead for the country in safe sanitation. FSSM is a methodology that encourages the holistic development of systems across the sanitation value chain, from the secure containment of faecal sludge, to the scientific and environment-friendly disposal of the processed sludge.

In process of developing this document that aims to bridge the knowledge gaps in the FSSM planning space for States/UTs and ULBs, about eight major consultations have been held in the past 6 months with organisations like NFSSM Alliance, ASCI, CWAS CEPT University, Centre for Policy Research, India Sanitation Coalition, etc. Cumulatively, these consultations were attended by more than 150 people, including sector experts and urban planners, which has enriched the knowledge of the Managing Urbanization team at NITI Aayog leading to the formulation of this document.

This compilation is a combined effort of NITI Aayog and the National Faecal Sludge and Septage Management Alliance (NFSSM-A) to examine, analyze, and extrapolate some of the best FSSM practices from across our pioneering cities and states. This book is an informative guide and may not be treated as government instruction or government decision. The experiences of senior practitioners and reputed organisations working in the field of FSSM have been compiled here. It can act as a ready guide for the field practitioners who are often not fully aware of sources of information. Each organisation or ULB have to work as per the relevant rules/guidelines in place for taking appropriate decisions regarding FSSM planning. Local area practices and cultures can always be kept in view while finalising city level strategies. It is our intent that the urgent challenge of sanitation in an ever-expanding urban India be met with initiative guided by the knowledge that some cities and states with successful FSSM models can provide to municipals across the country.

Finally, a deep sense of gratitude to the teams in FSSM and MU Vertical in NITI Aayog – Dy Advisor, Dr Biswanath Bishoi, and YP Mr Dhiraj Santdasani who have persistently put in all efforts in finalisation of this document.

Dr. K. Rajeswara Rao, IAS
Additional Secretary, NITI Aayog

Preface

NFSSM Alliance

The Faecal Sludge and Septage Management: Service Business Models shares leading practices and innovations to improve how faecal sludge is managed, and how to expand services to the millions of people living in thousands of cities in urban India, lacking access to safely managed sanitation.

Urban India has made significant strides towards safe sanitation under the government's flagship Swachh Bharat Mission–Urban. However, delivering access to toilets or sewer connections is only a part of the solution. Without adequate and timely desludging of septic tanks and treatment of faecal sludge and septage it is dumped untreated in open fields and water bodies, exposing citizens to serious health and environmental hazards.

Cognizant of the implications, conversations in urban sanitation have expanded beyond toilet infrastructure to safe desludging, treatment, and reuse of human waste. The National Faecal Sludge and Septage Management Alliance (NFSSMA) has actively supported the sanitation movement in India, by catalyzing action towards safe and sustainable human waste management at the national, state, and city levels. Working in close partnership with the Government of India, the Alliance helped in accelerating the launch of the National Faecal Sludge and Septage Management (FSSM) policy in 2017. Since then, the Alliance has continued to work with the national, state and city governments to strengthen the foundation of urban India's faecal sludge management in urban India, especially championing inclusive, safe, and equitable sanitation approaches.

FSSM, when prioritized and regulated, provides us with a unique opportunity to address several existing gaps in sanitation service delivery. It not only helps address inequities in sanitation service provisions within a city but also focuses attention on historically under-funded, small and medium sized urban local bodies with inadequate sanitation infrastructure. At present, there is an inequitable burden placed on low-income communities and disadvantaged populations. Redoubling efforts towards inclusion and equity, FSSM gives us a chance to address these issues through practices like women-led sanitation enterprises, pushing individual household toilets, sanitation worker protection schemes, community-based livelihood schemes, etc. Currently, the NFSSM Alliance is supporting over ~10 state governments in India to promote the discourse on FSSM through policy regulation, infrastructure development, and prioritizing gender parity and inclusion in the sanitation value chain.

As we cope with growing migration to urban centers, it is even more important that FSSM is implemented across the country. The current pandemic has only served to heighten the need to bolster our efforts in this area, since FSSM stands strongly as a reinforcement against public health outbreaks, mitigates environmental damage and builds equitable and resilient sanitation infrastructure for the under-served. However, states and cities must be cognizant of quality control and assurance while scaling the technology. Quality assurance provides confidence that public health and environmental risks will be mitigated consistently over the intended lifetime of an FSSM system. The NFSSM Alliance has prepared frameworks, checklists, and model tenders for states and cities to leverage in order to ensure that quality FSSM is the practiced norm across the country.

Given the far-reaching implications and multi-dimensional nature of FSSM, state, and city governments need to invest in sustained capacity-building efforts. Various training modules, designed for multiple stakeholders and curated to capture local contexts, NFSSM Alliance partners have collaboratively developed. These modules are readily available through the *Sanitation Capacity Building Platform*.

Sanitation in India has made tremendous progress. This momentum needs to be sustained with FSSM for businesses, governments, policymakers, investors, service providers, practitioners, and most importantly the community members to make our urban areas clean, healthy, and more livable. This compendium is an effort to coordinate, develop, and share learnings to provide affordable and workable sanitation solutions at scale.

NFSSM Alliance

Acknowledgements

First and foremost, NFSSM Alliance would like to extend sincere appreciation and gratitude to Vice Chairperson, Dr Rajiv Kumar; CEO, Mr Amitabh Kant; and Additional Secretary, Dr K Rajeswara Rao, NITI Aayog, for providing their valuable inputs and guidance for preparing the report. We would also like to thank the team of FSSM and Managing Urbanisation vertical at NITI Aayog - Dr. Biswanath Bishoi, Deputy Advisor, and Mr Dhiraj Santdasani, Young Professional, for their continuous support.

We would also like to acknowledge our heartfelt gratitude to the members of the NFSSM Alliance who have contributed towards developing the case studies and bringing out relevant insights. The report shall benefit the State and City functionaries by providing leading practices on Faecal Sludge and Septage Management (FSSM) and replicate the learnings in their respective contexts.

Contents

<i>Message, Vice Chairperson, NITI Aayog</i>	<i>iii</i>
<i>Foreword, CEO, NITI Aayog</i>	<i>v</i>
<i>Foreword, Additional Secretary, NITI Aayog</i>	<i>vii</i>
<i>Preface, NFSSM Alliance</i>	<i>ix</i>
<i>Acknowledgements</i>	<i>xi</i>
Section-A: Introduction	1
The case for FSSM – An Introduction	2
Human waste treatment in India	2
Current state of FSSM in India	3
Reference Guide – About the report	6
Section-B: Leading Practices in Containment	11
1. Mobilizing access to sanitation credit and addressing space issues for Individual Household Toilets in Jalna, Maharashtra	12
2. State approaches in managing public sanitation facilities through women Self-Help Groups (SHGs) in Telangana and other states	18
3. Innovative private sector model for management of Community and Public toilets by Saraplast	22
4. Common septic tanks to address issues of insanitary toilets and congested areas in Bhubaneswar, Odisha	27
5. Inclusion of standard septic tank design and inspection under building rules in Tamil Nadu	31
Section-C: Leading Practices in Emptying and Conveyance	35
6. Increasing access to mechanized desludging in Odisha	37
7. Engagement of safai karamcharis through performance-based contracts in Hyderabad–DICCI model	42
8. Scheduled desludging through PPP with a performance linked annuity model in Wai, Sinnar, Maharashtra	46
9. Adoption of standard licensing agreements for private desludging operators in Tamil Nadu	51
10. City-wide management of FSSM services: Examples on enabling environment and service delivery	55
11. Digital technology in FSSM operations in Maharashtra	62
Section-D: Treatment & operations	67
12. EPC model adopted by state governments for FSTP construction	71
13. Connecting urban sanitation and improved river health–Mainstreaming FSSM in Chunar, Uttar Pradesh	75
14. Hybrid annuity model (HAM) for FSTP construction and management in Andhra Pradesh	79
15. Faecal Sludge Management, Leh, J&K	82
16. Enabling the scale-up of co-treatment in STPs across Tamil Nadu	88
17. Engagement of women and transgender SHGs for O&M of Faecal Sludge treatment plants in Odisha	98

18. Creating an Ecosystem for Sustainable Sanitation in Madhya Pradesh	102
Section-E: Integrated Models (Across Transport and Treatment)	107
19. Faecal Sludge Management, Dhenkanal, Odisha	108
20. Cluster approach to scale Faecal Sludge Management in Tamil Nadu	112
21. 5 years of operations of Devanahalli plant in Karnataka	116
Section-F: Reuse and resource recovery	119
22. Reuse and Resource recovery at Wai and Sinnar FSTP	120
Section-G: Enablers for FSSM planning, scaling up and sustenance	125
23. A State Investment Plan for Scaling FSSM in Tamil Nadu	126
24. Capacity building for Non-Sewered Sanitation: Learnings from Sanitation Capacity Building Platform, NIUA	132
25. Statewide approach for scaling up FSTP: Maharashtra	136
26. Quality assurance support for implementation of Faecal Sludge Management plants in Tamil Nadu	144
27. Malasur–Making the invisible, visible: A citizen facing social and behavior change communication campaign on FSSM	147
Section-H: Conclusion and Way Forward	153
Section-I: Appendix	155
Contact Details for Case Studies	156
Abbreviations	157
References	162

LIST OF EXHIBITS

Exhibit 1: Women and transgender run desludging services across states	40
Exhibit 2: Making the desludging services affordable for urban poor in Bhubaneswar	50
Exhibit 3: CSR funded projects in FSSM	86
Exhibit 4: Co-location of FSTPs with SWM plants across Maharashtra, Odisha and Tamil Nadu	94
Exhibit 5: Solar Power Plants at Wai, Sinnar, Bhubaneswar FSTPs	97
Exhibit 6: Institutional arrangements and structured monitoring	130
Exhibit 7: Quality control and assurance mechanism across States	140
Exhibit 8: State level systems for FSSM monitoring	142

LIST OF TABLES

Table 1: FSSM complements existing sanitation infrastructure by rapidly addressing human waste disposal issues	3
Table 2: State level regulatory guidelines and frameworks for FSSM	4
Table 3: Comparative table for state models for emptying and conveyance including licensing, SPOs, etc.	36
Table 4: Use of digital technologies in FSSM	59
Table 5: Summary of various FSTP procurement and contracting models adopted across India	68
Table 6: Ideal risk allocation across risk categories in various contracting models	70
Table 7: Classification of STP based on assessment	89
Table 8: Snapshot of existing FSTPs of a range of capacities in 10 States	96
Table 9: Anticipated roadmap for coverage of urban population (excluding Chennai)	128

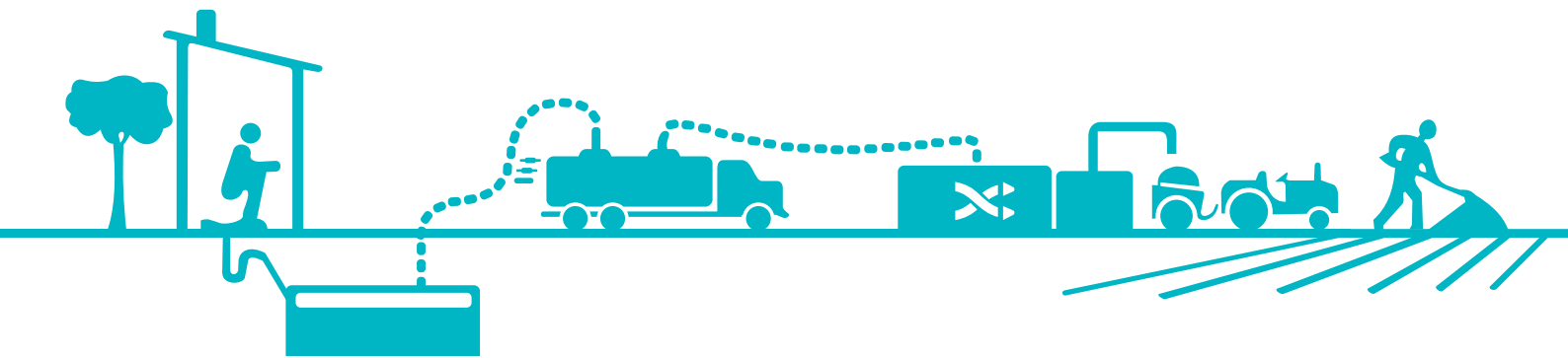
LIST OF FIGURES

Figure 1: Timeline of FSSM adoption – India is making rapid strides towards 100% safely managed sanitation	3
Figure 2: Several states have rolled out FSSM programs at scale with only modest capital outlays due to cost-effective nature of FSSM	5
Figure 3: Awareness generation sessions, loan camp by ICICI Bank, Site visit by technical expert and CWAS team	14
Figure 4: Images of HHs where in spite of lack of space women have constructed toilets	15
Figure 5: Small cesspool vehicle as a solution that can cater to 35 of the left out Indian population	38
Figure 6: Double booster pumps from Leh	39
Figure 7: Performance Linked Annuity model (PLAM) of Wai and Sinnar cities	47
Figure 8: Models of procurement and contracting used in scaling FSSM across India	68
Figure 9: A plant under construction in Odisha	71
Figure 10: EPC contracts in Maharashtra	72
Figure 11: Odisha model of implementation	73
Figure 12: Coverage through the Five Phases of the SIP	127
Figure 13 : Map of Maharashtra	136
Figure 14: The Quality Assurance Framework for FSSM will help implement quality processes across all project phases	140

Figure 15: State level FSSM monitoring dashboard Maharashtra	142
Figure 16: Construction monitoring dashboard Maharashtra	142
Figure 17: State level FSSM monitoring dashboard: Odisha	142
Figure 18: Construction monitoring dashboard: Odisha	142
Figure 19: Construction monitoring dashboard: Tamil Nadu	143
Figure 20: App based FSSM monitoring dashboard: Tamil Nadu	143

SECTION-A

INTRODUCTION



THE CASE FOR FSSM – AN INTRODUCTION

India has witnessed unprecedented momentum around sanitation since 2014. The country was declared Open Defecation Free, in 2019, due to sustained political will, coordinated action, and public participation at all levels. Universal access to toilets was achieved in Urban India with the construction of 66 lakh household toilets and more than 6 lakh community and public toilets¹. Consequently, India has emerged as an exemplar for the rest of the world.

Providing universal access to toilets is a key milestone in India's sanitation journey. However, with only 40% of urban India connected to sewer networks and about 1,200² operational/under construction Sewage Treatment Plants (STPs), a majority of the toilets (60%)³ rely on on-site sanitation systems (OSS).

Faecal Sludge & Septage Management (FSSM) prioritizes human excreta management, a waste stream with the highest potential for spreading diseases. It is a low-cost and easily scalable sanitation solution that focuses on safe collection, transportation, treatment, and reuse of human waste. As a result, FSSM promises a means to achieve the SDG target 6.2 of adequate and inclusive sanitation for all in a timebound manner.

The impact of inadequate sanitation

A 5m³ truck of faecal sludge dumped into the open is the equivalent of 5,000 people defecating in the open.

Source: Mills and Shah. Development Impact Bonds for Faecal Sludge Management: Opportunities for Innovation and Scale? Presentation by Social Finance and USAID (2017).

HUMAN WASTE TREATMENT IN INDIA

Urban centers in India have seen rapid expansion over the years. However, the infrastructure development being capital intensive and involving complex engineering takes considerable time that often cannot match the pace of urbanisation. As a result, in most metros, sewerage networks extend only to the core area while peripheral areas remain unserved. In smaller cities and towns, the coverage is even lower. Based on the large costs and long time periods associated with building out sewerage systems, coverage has grown only incrementally over the last few decades, and that has focused mainly on cities with populations over a million.

Lack of sanitation affects women and the poor disproportionately due to fragile health, livelihoods, and support systems. Further, there is an inequitable burden placed on households dependent on OSS systems as compared to those connected to sewerage systems. Those with sewerage services receive subsidized services in most cities as the cost recovery for formal water and sewerage systems is very low. However, the urban poor pay in full for FSSM which is an inequitable burden on them.

FSSM focuses on human waste management at INR 200 – INR 250 per capita as a way to provide rapid sanitation coverage to all, while the more comprehensive sewerage system costs INR 7,000 – INR 11,000 per capita⁴. FSSM therefore, presents an opportunity to rapidly deliver safely managed sanitation to all at relatively lower cost.

Key insights

- ♦ Almost 60% of urban India relies upon On-site Sanitation Systems (OSS)
- ♦ Despite universal toilet access, a large part of wastewater generated is discharged untreated in water bodies or on land
- ♦ FSSM enables rapid and cost-effective provision of safely managed sanitation to 100% of the population especially in small and medium cities with no provision for treatment of faecal sludge and in areas not covered by sewerage systems, even in larger cities

Table 1: FSSM complements existing sanitation infrastructure by rapidly addressing human waste disposal issues

Sanitation System in city/town	Applicability of FSSM
Complete sewer coverage with adequate STP capacity	FSSM required only in growth areas
Partial sewer coverage with adequate STP capacity	FSSM to complement sewerage with co-treatment and FSTPs
No sewer coverage	FSSM with stand-alone or clustered FSTPs

Table 1 outlines how FSSM can complement different sanitation scenarios across the country.

CURRENT STATE OF FSSM IN INDIA

The government of India has recognized the gaps in sanitation coverage and embarked purposefully to address them, becoming one of the first countries to announce a national policy on FSSM in 2017. As shown in Figure 1, the Government has continued to show its commitment towards FSSM through the launch of ODF+ and ODF++ protocols, an emphasis on FSSM in Swachh Survekshan, as well as financial allocations for FSSM across AMRUT and NMCG missions.

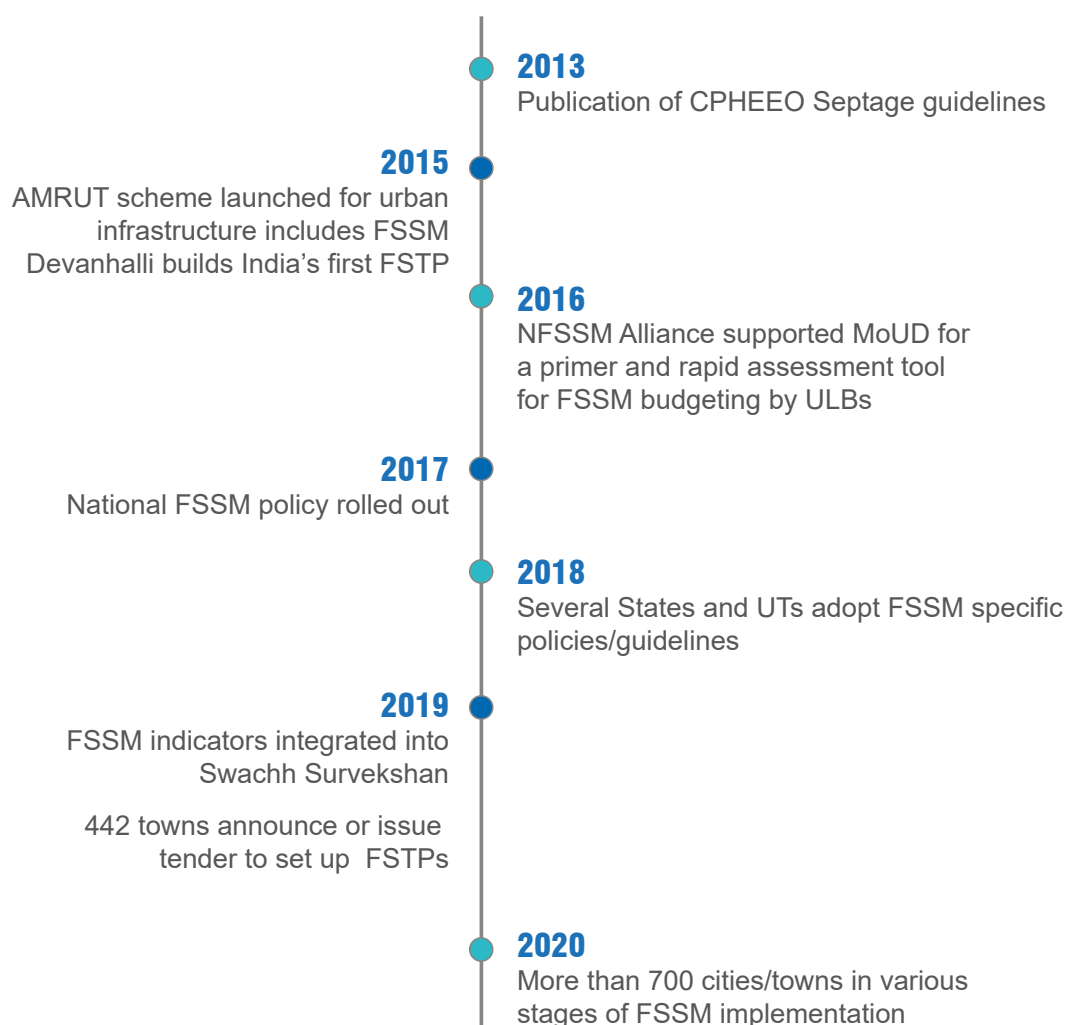


Figure 1: Timeline of FSSM adoption – India is making rapid strides towards 100% safely managed sanitation

With the concerted efforts of the Ministry of Housing and Urban Affairs (MoHUA), State Governments, Urban Local Bodies (ULBs), Central Public Health and Environmental Engineering Organization (CPHEEO), Non-Governmental Organizations (NGOs), academia and philanthropic organizations like Bill and Melinda Gates Foundation (BMGF), FSSM is being strengthened.

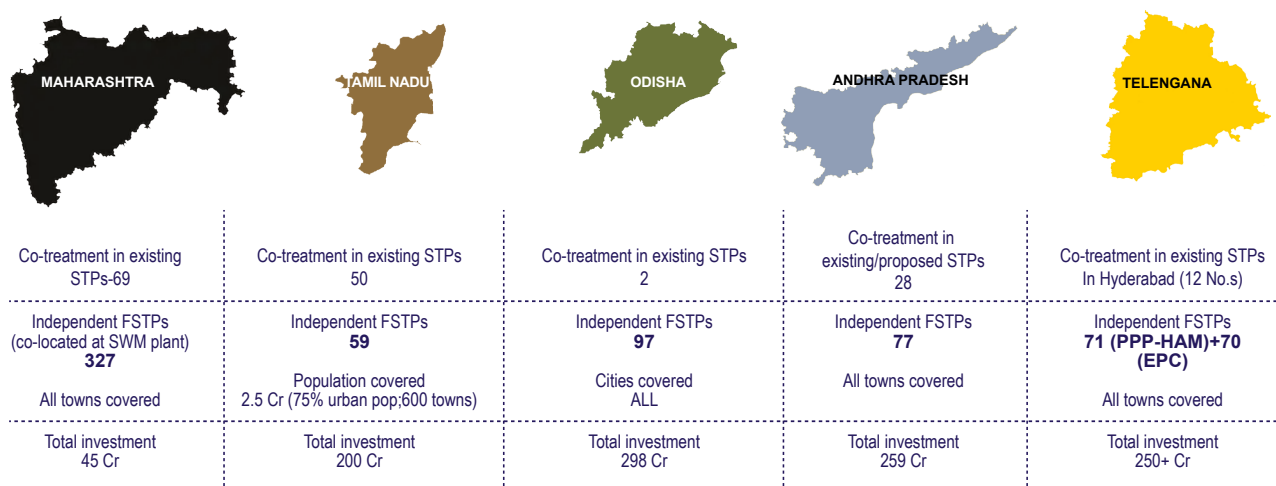
The States have sustained this momentum with over 20 states and UTs having adopted FSSM policies⁵ and 700+ Faecal Sludge Treatment Plants (FSTPs) being committed, of which 220 are under construction⁶ (with 150 operational plants). With 19 out of 36 states and union territories drafting state specific FSSM guidelines, FSSM is further being mainstreamed. The regulatory frameworks demarcate responsibilities between various bodies at the state and the local level, support synergies between different schemes for FSSM, and ensure affordable, appropriate, and sustainable FSSM across the state.

Table 2: State level regulatory guidelines and frameworks for FSSM

State	FSSM frameworks
Andhra Pradesh	♦ Faecal Sludge and Septage Management: Policy and Operative Guidelines for Urban Local Bodies in Andhra Pradesh ♦ Andhra Pradesh Government Order 134, March 2017
Maharashtra	♦ Guidelines for Septage Management, 2016 ♦ Government resolution to move beyond ODF to ODF+ / + +, 2017 ♦ Maharashtra state FSSM strategy ♦ Government resolution on co-treatment of faecal waste at STPs, 2018 ♦ Government resolution on setting up independent FSTPs at scale, 2019
Odisha	♦ Odisha Urban Sanitation Strategy ♦ Odisha Urban Sanitation Policy (2016) & ULB's regulation (2018)
Rajasthan	♦ Draft Policy on FSSM, 2017 ♦ State FSSM Guidelines for urban Rajasthan, 2018
Tamil Nadu	♦ Tamil Nadu Septage Management Operative Guidelines, 2014
Telangana	♦ The 2018 State Faecal Sludge and Septage Management (FSSM) Policy
Uttar Pradesh	♦ Guidelines for FSSM in Uttar Pradesh, 2018 ♦ Draft State FSSM Policy, 2019

Apart from the regulatory push, coordinated action on behavior change, through the *Malasur* campaign, has been rolled out by the MoHUA and several States. States have shown that with minimal planned investment, effective FSSM solutions can be delivered and positive impact can be achieved.

While a lot remains to be done to achieve 100% safely managed sanitation as per SDG target 6.2, FSSM is a viable option for sanitation. This document presents many leading practices to be drawn upon as FSSM is scaled up.



Co-treatment is the disposal of Faecal Sludge at existing Sewage Treatment Plants with some excess capacity for treatment along with the incoming sewage. It utilizes existing capacity and is hence cost effective and fast.

UP also has undertaken Co-treatment* and FSTP implementation in 50+ towns

Source: NFSSM Alliance analysis

Figure 2: Several states have rolled out FSSM programs at scale with only modest capital outlays due to cost-effective nature of FSSM

REFERENCE GUIDE – ABOUT THE REPORT

The document is presenting a variety of leading practices in FSSM in urban India. These service and business models are identified across the FSSM value chain to cover Containment, Emptying and Transport, Treatment and Safe Reuse and Disposal of treated faecal waste focused examples. The cases cover state and city interventions to demonstrate learning from state-wide approaches, city level initiatives, private sector-led models, community participation and share the progress made in the sector.

This report is intended for city managers, municipal functionaries, elected representatives, state decision makers, CSOs and private sector players to understand the developments in FSSM and opportunities it presents.

In total, the report has 27 detailed case studies across 6 Chapters which represent the various stages of the FSSM value chain. Some cases which cut across more than one stage of the value chain are also presented as part of Integrated Models in the report. The role that key enablers such as communication, capacity building, quality assurance and monitoring, play in the successful implementation of FSSM are presented at the end of the chain to bring attention to these crucial factors.

In addition to this, a set of 8 Exhibits spread across the report, provide innovative models and interventions across cities and states which have been successfully implemented. These provide insights and practical ways of implementing the interventions. The report further highlights examples and cases wherein gender equality, inclusive sanitation and pro-poor strategies are adopted across the value chain.

For each of the case study, a brief abstract provides a window into the intervention and its impact, followed by the detail of the context, implementation approach, key highlights, impact, reflections, lessons, and potential for replication in other locations. The section on potential for replication highlights examples where the same intervention has been adopted in a similar way but in different context, which entails the case to be considered as scalable.

Stakeholders are encouraged to study in detail the initiatives relevant to their context for taking further action. Contact details of persons from each organization are at page 156. The respective state urban department or ULBs may also be contacted for further details.

To facilitate implementation of various initiatives knowledge products are available to benefit Municipal and other functionaries as showcased in table below.

1. Model Concession Agreement and Model RFP Documents for liquid waste management by NITI Aayog ([Link](#))
2. Standards, specifications and benchmarks for FSSM ([Link](#))
3. PPP models under HAM, DBFOT, DBOT formats ([Link](#))
4. Model tenders specific to FSSM ([Link](#))
5. Business and service delivery models for various FSSM implementations (along with cost benchmarks) ([Link](#))
6. Quality Assurance for FSSM – checklists, templates, SOPs, practitioner manuals ([Link](#))
7. Monitoring and Evaluation processes – at various levels e.g.: Database of existing FSTPs for ready reference, FSTP monitoring protocols ([Link](#))
8. Training modules for orientation to advanced training on FSSM ([Link](#))
9. BCC and IEC materials to drive positive FSSM behaviors ([Link](#))

The details of the case and their positioning across the value chain is depicted on the following pages.



CONTAINMENT

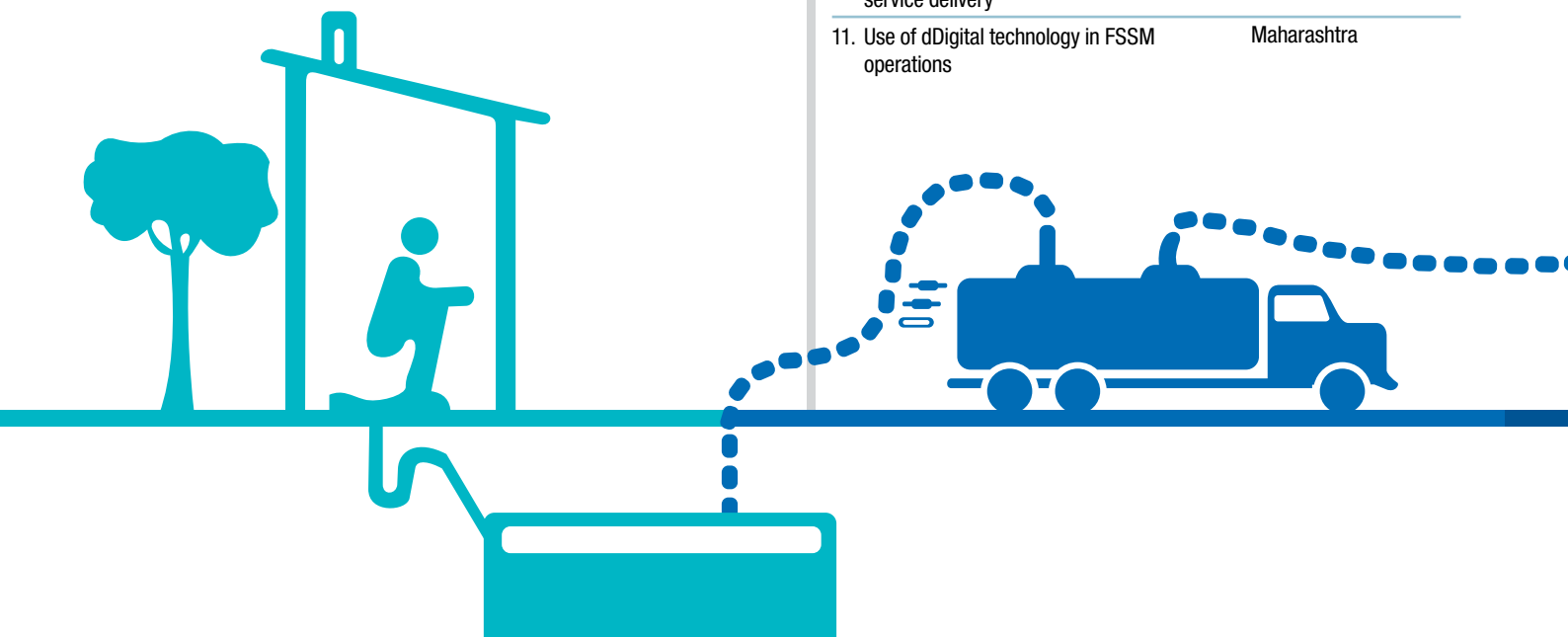
Leading practices on containment

- | | |
|--|--------------------------|
| 1. Mobilizing access to sanitation credit and addressing space issues for Individual Household Toilets | Jalna, Maharashtra |
| 2. State approaches in managing public sanitation facilities through women Self-Help Groups (SHGs) | Telangana & other states |

EMPTYING & TRANSPORT

Emptying and conveyance

- | | |
|---|--------------------------|
| 6. Increasing access to mechanized desludging | Odisha |
| 7. Engagement of safai karamcharis through performance based contracts | Hyderabad |
| 8. Scheduled desludging through PPP with a performance linked annuity model | Wai, Sinnar, Maharashtra |
| 9. Adoption of standard licensing agreements for private desludging operators | Tamil Nadu |
| 10. City-wide management of FSM services: Examples on enabling environment and service delivery | |
| 11. Use of dDigital technology in FSSM operations | Maharashtra |



- | | |
|--|---------------------|
| 3. Innovative private sector model for management of Community and Public toilets by Saraplast | Pune, Maharashtra |
| 4. Common septic tanks to address issues of insanitary toilets and congested areas | Bhubaneswar, Odisha |
| 5. Inclusion of standard septic tank design and inspection under building rules | Tamil Nadu |

Integrated model

- | | |
|---|-------------------|
| 19. Faecal Sludge Management | Dhenkanal, Odisha |
| 20. Cluster approach to scale Fecal Sludge Management | Tamil Nadu |
| 21. 5 years of operations of Devanahalli plant | Karnataka |

PILLARS OF FSSM

Gender equity and empowerment | Pro-poor and inclusion

TREATMENT

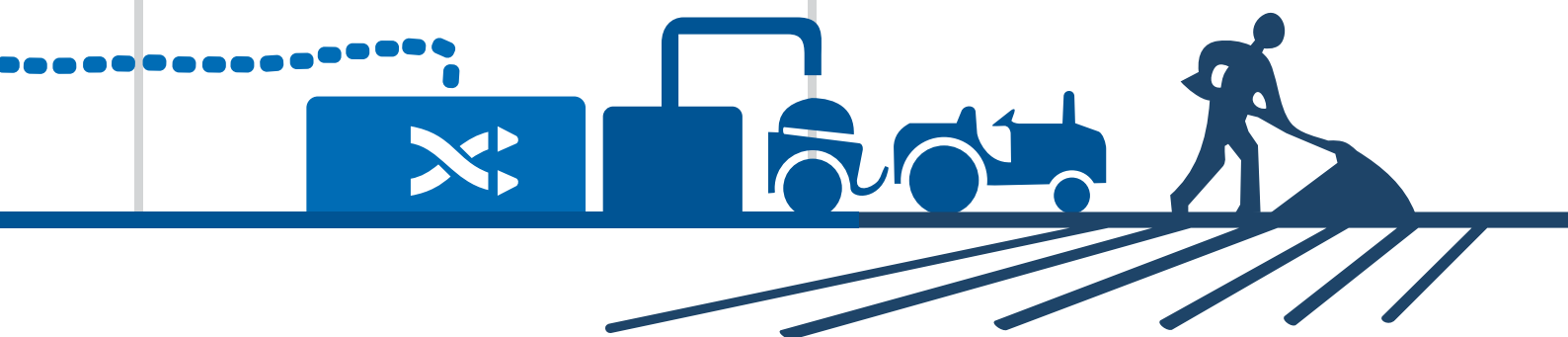
Treatment and operations

12. EPC model adopted by state governments for FSTP construction	Maharashtra, Odisha & Tamil Nadu
13. Connecting urban sanitation and improved river health - Mainstreaming FSSM	Chunar, Uttar Pradesh
14. Hybrid annuity model (HAM) for FSTP construction and management	Andhra Pradesh
15. Faecal Sludge Management	Leh, J&K
16. Enabling the scale-up of co-treatment in STPs	Tamil Nadu
17. Engagement of women and transgender SHGs for O&M of Faecal Sludge treatment plants	Odisha
18. Creating an ecosystem for sustainable sanitation	Madhya Pradesh

SAFE REUSE OR DISPOSAL

Reuse and resource recovery

22. Reuse and Resource recovery	Wai and Sinnar, Maharashtra
---------------------------------	-----------------------------



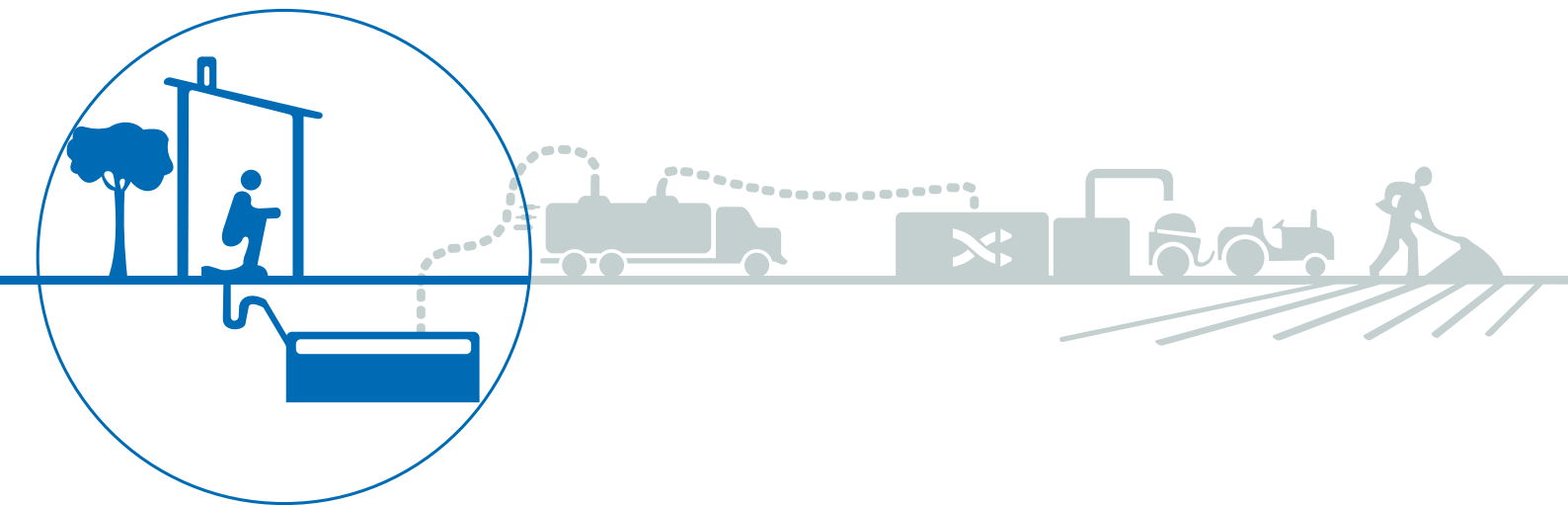
Enablers for FSSM planning, scaling up and sustenance

23. A State Investment Plan for Scaling FSSM	Tamil Nadu
24. Capacity building for Non-Sewered Sanitation: Learnings from Sanitation Capacity Building Platform	NIUA
25. Statewide approach for scaling up FSTP	Maharashtra
26. Quality assurance support for implementation of Faecal Sludge Management plants	Tamil Nadu
27. Malasur - Making the invisible, visible: A citizen facing social and behaviour change communication campaign on FSSM	

| Behaviour change and communication | Finance | Monitoring

SECTION-B

LEADING PRACTICES IN CONTAINMENT



1. MOBILIZING ACCESS TO SANITATION CREDIT AND ADDRESSING SPACE ISSUES FOR INDIVIDUAL HOUSEHOLD TOILETS IN JALNA, MAHARASHTRA

In Jalna, sanitation loans were mobilized for 300 women by linking SHGs to scheduled commercial banks, through Mahila Arthik Vikas Mahamandal (MAVIM) and its Community Management Resource Centre (CMRC). An active participation from local aggregators and trainers, such as MAVIM, was crucial to linking households, SHGs and commercial banks. The construction of an individual toilet in a limited space was also demonstrated.

The SHG members from MAVIM's CMRC were linked to banks for sanitation credit. The loans were disbursed through SHGs and demonstrated that considerably high repayment rates could be achieved for sanitation loans. The women took leadership and built good quality individual household toilets, often along with bathrooms. The project has successfully demonstrated that with the provision of affordable sanitation credit, households could get access to safe sanitation. The model for sanitation credit is sustainable and can be scaled-up in other States where, institutions like MAVIM have been working, such as MEPMA in Telangana and Andhra Pradesh, Kudumbashree in Kerala among many others.

I. Context

Since the launch of the Swachh Bharat Mission (SBM), in 2014 in India, emphasis has been laid on sanitation and cleanliness in urban areas. The focus of SBM on Individual Household Toilets (IHHT) requires further attention in the light of the current COVID-19 pandemic. Various studies have demonstrated that the urban poor, who depend on shared toilets are at a greater risk. The Joint Monitoring Program (JMP) of WHO-UNICEF also considers 'shared toilets' as unsafe sanitation. Public agencies often cite lack of space, finance and sewerage access as reasons for not being able to make individual household toilets available for the urban poor. Lack of finance is often unavailability of bridge finance for urban poor to complete toilet construction. Since only 50% of the INR 12,000 incentive subsidy is available as an advance; there is a need for credit. In 2018, a survey was conducted by CWAS that found lack of funds and lack of space were key constraints for building individual household toilets.

This case demonstrates that perceived barriers of lack of finance and space can be overcome if there is a provision of affordable sanitation credit. It also highlights the radical role played by women in deciding to own a toilet and lead its construction.

II. Intervention⁷

The demonstration case aimed to showcase how provision of sanitation credit through SHGs can lead to successfully achieving increased access to good quality IHHT. It also aims to help banks, policy makers, microfinance institutions and women empowerment organizations to better understand demand for sanitation credit through SHGs and take steps to minimize the risks for commercial bank lenders. The focus of the exercise was to undertake a pilot demonstration of household sanitation credit for toilet construction, especially in HHs with limited space.

III. Implementation approach

CWAS partnered with MAVIM to demonstrate household sanitation credit using the SHG-Bank linkage program for constructing IHHT. MAVIM is the State Women's Development Corporation of the Government

of Maharashtra, registered under Section 25 of the Companies' Act, 1956, by the Department of Women & Child Development, Government of Maharashtra. The objectives of MAVIM constitute mobilizing and building an organization for women, enhancing their capacities by providing trainings to increase self-confidence, and strengthening entrepreneurship among them, and making credit and markets accessible to them. MAVIM has created people's institutions—Community Management Resource Centers (CMRC). These CMRCs generate revenue from services that they provide to SHGs, consequently. 80% of CMRCs have become self-sufficient. MAVIM's key role in the demonstration case was to support the CMRC in implementing and monitoring the project.



Given the presence of a strong CMRC, Jalna was selected as the location for the pilot. This was developed based on the field experience of MAVIM for similar projects. There are 265 active SHGs in Jalna district, which work with this CMRC. In order to generate adequate demand and awareness for IHHT and sanitation credit, multiple sessions were carried-out by an IEC expert. The demand generated through these efforts among the beneficiaries was met by facilitating access to sanitation credit for building their own toilets. The sahayoginis and Community Resource Persons (CRPs) were assigned specific clusters based on the target areas from where they were asked to help mobilize toilet loans. ICICI Bank specifically provided toilet loans which were routed through the SHGs. Under this arrangement, women borrowers also benefitted from interest subvention of 7% under NULM, and an additional 3% for SHGs under NULM. The loan through the ICICI bank was facilitated by conducting loan camps, where bank officials and potential borrowers were brought on a common platform by the MAVIM-CMRC team. The SHG members were asked to carry required documents to facilitate quick loan disbursement. This was followed by effective monitoring to avoid defaults and late repayments. The loan repayment rates are expected to be high, as the SHGs have been well trained by the CMRC in bookkeeping, monitoring, and maintaining savings.



Figure 3: Awareness generation sessions, loan camp by ICICI Bank, Site visit by technical expert and CWAS team

The Sahayoginis and CRPs were trained before loans were disbursed. The training was for toilet design and proper quality of toilets based on user needs. A special toilet training program was conducted by CWAS where a technical expert trained the CRPs and Sahayoginis regarding the types of toilets, basic dimensions of septic tanks, and basic cost of toilet construction vis-a-vis the households using them.

After initiation of toilet construction, monitoring for completion of toilets and repayment of loans was carried out by the Sahayoginis and CRPs. A format was designed to monitor the progress which included: SHG name, number and name of members, and details of internal loans borrowed and repayment profile. Apart from MAVIM-CMRC, ICICI Bank also played a vital role in ensuring that installments were paid on time and there were minimum delays.

By November 2018, more than 270 loans had been mobilized, which was more than the 250 loans that was targeted under the project. The average cost of an IHHT and a bathroom was INR 45,000. The loans were mainly borrowed from ICICI Bank with an average loan amount of INR 10,040 and an average tenure of 9.5 months. The average time of toilet construction was 3.6 months and the monthly installment was INR 1,150. Most women have preferred to construct good quality 'durable' toilets using in-situ construction. Many have managed to overcome the space constraints and have added toilets, despite their small houses. Those who were able to afford and had space, have also added bathrooms.

IV. Highlights

The case of MAVIM-SHG in Jalna demonstrates that women are capable of taking on leadership roles through collective action. It also demonstrates the importance of agencies such as MAVIM, which can play a crucial facilitating role to help transform women's lives. With the creation of such partnerships, banks also respond by providing sanitation credit to the SHG women. The SHG women in Jalna, with support from MAVIM, were able to overcome the barriers of lack of finance. These women, with support from MAVIM and their families were able to repay the loans.

Most of these women stay in slums and belong to the economically weaker sections. But despite their financial background, all of them have been able to construct toilets and bathrooms.



Figure 4: Images of HHs where in spite of lack of space women have constructed toilets

V. Impact

One of the major impacts of this demonstration case for 270 SHG women and their families is that an IHHT provides them with safety, privacy and above all dignity. During COVID-19 pandemic a telephonic survey was conducted among the SHG women who had borrowed sanitation loans. Some of the major impacts of owning an IHHT as reported by the SHG women were:

- Less fear of COVID due to access to IHHT,
- Better privacy and improved safety for women,
- Better comfort and efficient menstrual hygiene management for women and adolescent girls,
- Easy access for elderly and differently abled.



Images of HHs where women have constructed good quality toilet and bathrooms

VI. Reflections and lessons

The success of any project depends on the degree of positive impact it creates for all the stakeholders. The provision of sanitation credit to HHs has been advantageous to all the stakeholders- toilet loan borrowers, SHGs, MAVIM-CMRC, and the ICICI Bank.

The sanitation credit project has turned aspirations of owning a ‘good quality’ toilet for the borrowers into reality. The success of the demonstration case can be attributed to:

- Presence of demand for sanitation credit,
- Involvement of MAVIM-CMRC, which has a strong grip on its area of operation,
- Trained and active SHGs,
- Linkage of SHGs with Banks,
- Sanitation credit available at affordable rate of interest

VII. Potential for replication

Given the need for sanitation credit in future, there is an opportunity to scale-up this model across the state, aligning to local conditions and requirements. The role of financial institutions and SHG facilitators would be the key factors for the model to succeed. MAVIM has a strong presence in Maharashtra with over 50 CMRC in urban areas. These provide an excellent opportunity to scale-up sanitation credit for SHGs in urban areas. Most states have a ‘resource organization,’ such as MAVIM in Maharashtra, which are capable of mobilizing women groups and making credit and markets accessible to them. There are examples of other states such as Andhra Pradesh, Telangana, Odisha, among others, where such resource organizations are active. There is a potential for replication through such organizations. Such credit will help households to gain access to good quality individual toilets and help move towards universal access to improved household sanitation.

As observed in the case of Jalna, many cities across Maharashtra have witnessed a similar movement, where empowered women and their families were able to construct IHHT in small houses by employing architectural and civil innovation and adaptive reuse of the limited space.

IHHT constructed in limited space in slums in Pune⁸

Individual household toilets can be constructed in homes that have space constraints when there is a strong intent from the owners. To understand how toilets have been constructed by such households, CWAS supported a study of survey of households in the slums of Pune.



- ◉ Average sizes of houses surveyed was 16 sqm and average toilet size was 1.5 sqm. Houses of sizes less than 9 sqm were also able to construct a toilet in their homes.
- ◉ In most cases, the new toilet was an enclosed space, generally, built at the location of the former bathroom and combining a bath area and a toilet. However, the bathroom space and the toilet could also be located in separate spaces depending upon the disposal system.

Some of these HHs that were surveyed were constructed under the 'One Home One Toilet' project by Pune Municipal Corporation in partnership with Shelter Associates (SA).

Lead case study contributor: *Center for Water and Sanitation, CRDF, CEPT University*

2. STATE APPROACHES IN MANAGING PUBLIC SANITATION FACILITIES THROUGH WOMEN SELF-HELP GROUPS (SHGs) IN TELANGANA AND OTHER STATES

Abstract

The State Government of Telangana (GoT) has prioritized sanitation and the health of its citizens through the provision of toilets in households and in public places. With the belief that women can play a key role in promoting and sustaining sanitation movements, GoT has taken systematic steps to encourage their formal participation in sanitation decision-making and service delivery. One such initiative is the state directive to engage SHGs for operations and maintenance of public sanitation facilities. Consultations, training programs, model contracts, and monitoring systems have been concluded, and as on date 150 contracts to SHGs have been operationalized.

I. Context

Telangana, the youngest state in the country, is rapidly urbanizing with close to 40% of its population living in urban areas. The State has taken several path-breaking initiatives towards enhancing sanitation service delivery, and it is committed to providing high quality public sanitation facilities and services in all its 142 towns. In line with this, every Urban Local Body (ULB) is striving to construct public toilets, community toilets, exclusive toilets for women (SHE toilets) and mobile toilets, in adequate numbers to meet the demand and sustain the ODF status. While well-designed infrastructure is being constructed, it is equally important to focus on the Operation and Maintenance (O&M) of these facilities through establishing Service Level Standards, implementing regular monitoring systems, and contracting trained operators to maintain the facilities.

As in all its other activities, the Government of Telangana (GoT) is applying a pro-poor and gender-inclusive lens to sanitation by providing opportunities for women to participate in sanitation livelihoods and entrepreneurship. Through its social development arm, the Mission for Elimination of Poverty in Municipal Areas (MEPMA), the state is mainstreaming gender in sanitation to empower women and ensure their financial inclusion. The state developed a strong community outreach structure of women under the aegis of MEPMA, wherein 10-12 urban women form into a Self Help Group (SHG), around 20 SHGs congregate into a Slum Level Federation (SLF), and 20-25 SLFs form a Town Level Federation (TLF). Currently, there are about 12.6 lakh women formed into 1.20 lakh registered SHGs. MEPMA encourages internal savings and lending among members. It also provides training and financial support to promote entrepreneurship, livelihoods, and mainstreaming gender in several sectors, including sanitation.

II. Intervention

With the intent to sustain public sanitation facilities in the state, and to provide livelihood opportunities to women, the GoT decided to engage SLFs/TLFs for operating and regularly maintaining these facilities. This brought several benefits to the ULB and the community, such as increased ownership and accountability by the community members who the SLFs represent. The engagement of women in sanitation livelihoods directly contributed to gender integration, empowerment, and financial independence, as they were directly involved in decision-making and service delivery. It also contributed to improving their dignity and acceptance in the society. Further, formal engagement of SLFs in sanitation delivery was encouraged in national ranking programs such as Swachh Survekshan, Swachhata excellence awards, etc.

III. Implementation approach

The state government had issued directions and guidelines to all the ULBs to implement an effective O&M plan by engaging the SLFs and by following the standard operating practices detailed in the guidelines. Further, model contract was developed, and formal contracts were required to be issued between the ULB and the SLF. The state government also took an approach to standardize the payment for O&M. Following discussions with the SHG members & ULB officials, and based on learnings from the other state models, it was decided that the ULB will pay an amount of INR 2500/- (excluding GST) per toilet seat/per month to the selected SHG member and the payment will be made before the 10th day of every month. The rate per seat was based on local situation and the nature of the toilet block. Every town had a Town Mission Coordinator (TMC) employed by MEPMA, selected as the key functionary to drive this process. The TMCs acted as catalysts between the ULB and the SHG groups for smooth implementation. The Administrative Staff College of India (ASCI) was engaged as technical and knowledge partner to extend support in this endeavor.



A guidance document, with step-by-step process details for ULBs to engage the SLFs for effective O&M of public/community toilets, was drafted. This document delineated the detailed roles and responsibilities of all stakeholders, besides the payment structure. To encourage and sensitize the SHG members, MEPMA conducted online training programs for the TMCs and TLFs of all the towns, with technical support from ASCI. A certificate-based training was also conducted for all the SLFs who were awarded the contracts. A total of 1500 women were trained on the importance of safe sanitation, gender integration in sanitation, contract terms, service standards, O&M procedures, usage of personal protective equipment, record-keeping, monitoring mechanisms, business skills, and other technical aspects.

After the training session, telephonic interviews were conducted with the individual SLF members, asking them a set of questions to evaluate their understanding of the whole process. After the evaluation, the selected members were given certificates and confirmed as eligible to undertake the O&M procedures. For the members who did not qualify in the evaluation, a second round of training was conducted. The state had also issued a notification to the ULB to engage only the trained/certified SHG members for the O&M of PTs/CTs.

IV. Highlights

Telangana became one of the first states in India to develop a systematic approach towards gender integration in sanitation. To date, over 150 contracts have been issued to the SLF members for the O&M of public and community toilets for a period of one year. A per seat price of INR 2500 (excluding taxes) has also been finalized. Moreover, in order to financially benefit the SHG members, the contract indicated that all major expenses such as monthly water and electricity bills, desludging septic tank, repair/installations in the toilet would be borne by the ULB. To monitor the performance of the SHG, monthly

review meetings were conducted. Apart from this, the state also launched a real-time monitoring system for public sanitation facilities called Pattana Pragathi Toilet Monitoring system (PPTMS). Using the PPTMS app the sanitary inspector can evaluate the toilet block weekly twice on the well-defined parameters.

V. Impact

This initiative by the Telangana Government is in the initial stages of promoting women empowerment and is progressing well. SHGs are finding it profitable, and each contract is earning a monthly average of INR 10,000 or more, based on the average seat size of four, for maintenance. Since they are managed by women caretakers, the usage of public sanitation facilities by women increased in the toilet blocks contracted to SHG members. The state has commissioned detailed impact studies on the livelihoods of the SHG members, along with a study to identify areas of improvement and any unintended consequences of the intervention.

VI. Reflections and lessons

SHG members are more acceptable as sanitation messengers among community members. They, therefore, contribute to the adoption of safe hygiene practices by toilet users and by members of the community in general thus contributing to sustaining safe sanitation. Further, their participation as PT/CT operators has led to enhanced usage of toilets particularly by women.

VII. Potential for replication

The GoT had laid a systematic approach to involve women groups with handholding support and laid a clear roadmap for this transformational change. The financial support of INR 2500 per toilet seat per month was well accepted by the SHG groups and showcased a potential for replication in other states. As a result, a similar initiative has already been adapted in Andhra Pradesh.

Similar kind of initiative has been taken in Andhra Pradesh, Maharashtra, Uttar Pradesh, Odisha and Tamil Nadu states. Details are mentioned below:

In Maharashtra, it was implemented in Hingoli city. A resolution was passed in June 2017 to involve SHGs in O&M of all CTs/PTs in the city. An arrangement was made that each Area Level Federation (ALF) would be given the responsibility of maintaining the CT/PT in designated areas. The work orders were signed by the ALF and the ULB, with an engagement period of 3 years. A total of 21 toilet blocks were contracted to 5 ALF members and the monthly payment of INR 13,200 was made to each ALF. Under the supervision of ALFs, the SHG members successfully managed the operations of CT/PT, and the users of the CT/PT gained a satisfactory experience of the toilets. In comparison, the contract in Hingoli was signed by the ALF member, whereas, in Telangana, the contract was made with the SHG member.

In Uttar Pradesh, Siddharthnagar district had taken a similar initiative but within a rural context. To make villages ODF+, the District Administration of Siddharthnagar took the initiative to construct Community Sanitary Complexes (CSCs) to cater to the needs of the floating/migrant population, as well as of those households, which do not have individual household toilets owing to a lack of space. As per the directive of the State, it was decided to construct at least one CSC per gram panchayat. Accordingly, the district set a target of constructing 1139 CSCs in various villages. The detailed guidelines were issued by the Department regarding proper operation and maintenance of the CSCs. In a Government order, it was suggested that good SHGs could be assigned for operation and

maintenance of the CSCs. As per the order, an amount of INR 6000/- was to be paid to the agency for cleaning the CSC twice a day and INR 3000/- to be paid monthly for procuring sanitizing agents and other petty expenses. 11 SHGs were handed over the responsibility of care and maintenance of the CSCs. Gradually, the number increased to 353 SHGs, which signed the MoU for proper care and maintenance of the CSCs.

In Odisha, operation and maintenance of CTs/PTs in 8 cities was been handed over to women and transgender SHGs to ensure community engagement and empower vulnerable communities for a sustained livelihood. Similar to the Telangana model, Odisha followed the process of Identification of interested SHG members from wards in the cities; Selection of SHG members and training them. A memorandum of understanding (MoU) was also signed between the SHG and the ULB, with a continuous handholding support provided by the ULB and the State. To help the SHGs purchase additional cleaning supplies and take on other need-based activities, the State also provided access to seed financing.

In Tamil Nadu, Trichy city has adopted a similar approach to the management of its CT/PTs. Two decades ago, with support from Water Aid, Non-Governmental Organisation, Gramalaya, organised volunteers from SHGs as Sanitation, Hygiene, Education (SHE) teams to manage some toilets facilities. However, further support was needed towards efficient service provision along with sustainability and accountability. To address this, CT/PTs run by SHE team were strengthened through the City-Wide Inclusive Sanitation (CWIS) programme. The objectives were to improve O&M and increase the financial sustainability of CT/PTs, in order to increase their usage and ensure reduction in the incidence of open defecation. Starting the initiative with support to 40 SHE teams, the programme has grown to bring new teams in other neighborhoods. SHE teams are now responsible for the operation and maintenance of around 150 public conveniences in the city. The initiative involved mobilising and capacitating women to operate CT/PTs along with broader outreach work. Towards this they were trained on various aspects including team building, record keeping and reporting, CT O&M and financial sustainability. SHE teams were federated as Women's Action in Village Empowerment (WAVE) Federation with one member from each SHE team joining the WAVE Federation. The federated approach allows for cross-subsidisation, with toilets with higher footfall and hence higher revenue contributing towards the upkeep of other toilets in lower footfall areas. Regular supervisory meetings and mechanisms have been instituted through the Federation. With 150 She teams, nearly 400 women have received training. In addition, vulnerable members of communities are provided employment, as those who are physically challenged, destitute, widowed or old are typically appointed as caretakers at the facilities. The teams simultaneously work to increase awareness on sanitation and hygiene within their communities, including ill-effects of open defecation, importance of well-maintained toilets and depute a person for solid waste management.

Lead case study contributor: *Administrative Staff College of India (ASCI)*

Other contributors: *Center for Water and Sanitation (CWAS), CRDF, CEPT University; CSE; IIHS and EY*

3. INNOVATIVE PRIVATE SECTOR MODEL FOR MANAGEMENT OF COMMUNITY AND PUBLIC TOILETS BY SARAPLAST

Abstract

Swachh Bharat Mission was established in 2014 to eradicate lack of sanitation facilities and spread awareness about health and hygiene amongst the common people in India. More than 10 crore toilet units have been built in India from 2014 to current year which includes individual and public toilets in rural and urban areas. Although the lack of sanitation facilities is being addressed through the building of toilets, but the maintenance and cleaning services remain in despair especially in public spaces. Unhygienic and unsafe public toilet facilities keep the women away from using these places and even if they use them due to lack of alternatives, it results in them contracting various infections and poor gynecological health.

Women from low income communities, daily wage laborers, municipality workers cleaning the city, police workforce on patrol, middle class women and teens on the move for work and education are all a part of vulnerable group who do not have access to any public toilet facilities in urban areas.

Saraplast Pvt Ltd., a Pune based organization has been a pioneer in the portable sanitation solutions industry in India since 1999 and in 2016 decided to intervene and participate in the sanitation facilities exclusively for women in the public spaces. Saraplast is actively contributing towards the achievement of SDG (Sustainable Development Goals) 6.2 to achieve access to adequate and equitable sanitation and hygiene for all and underserved.

In collaboration with Pune Municipal Corporation and Pune Smart City, Saraplast has launched Ti Centers (TiC) as public toilets for women. The organization renovates old buses as public toilets and positions them above existing infrastructure, such as water and sewerage lines beneath the ground. The idea of using toilets made from buses has allowed the organization to start operations faster by building and placing infrastructure on the ground, and in turn given them access to prime locations. Such prime locations are more convenient for women to access since they are not placed in secluded areas.

I. Context

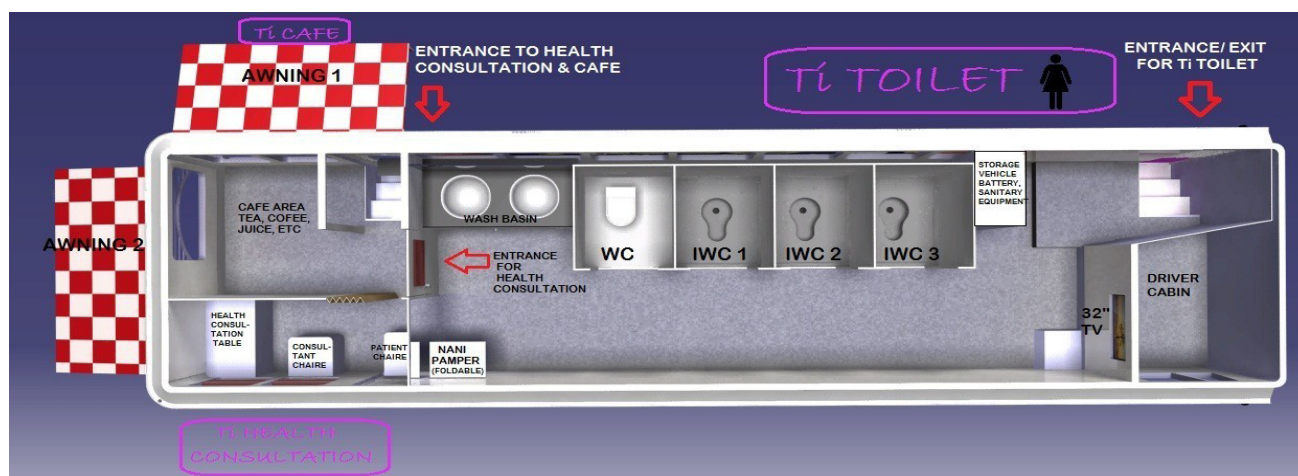
Pune is the second largest city in the Indian state of Maharashtra, and the eighth most populous city in India, with an estimated population of 7.4 million, as of 2020. It has been ranked as “the most livable city in India” several times. In Pune city, poor sanitation services pose a serious risk of infectious diseases to all, but especially to women, who are more exposed to human excreta. It threatens the following development parameters.

Health: According to the WHO in 2019, of India’s 827 000 people in low- and middle-income group die as a result of inadequate water, sanitation, and hygiene each year, representing 60% of total diarrheal deaths. Poor sanitation is believed to be the main cause in some 432 000 of these deaths.

Education: In 2019, 12% of decline in admission of girls in schools in India was recorded due to lacked separate toilets for boys and girls. In India, about 23 million girls drop out of school every year due to lack of awareness of menstrual health and lack of clean toilets.

Productivity: Illnesses caused by a lack of safe sanitation result in a loss of productive potential for not only those afflicted, but also other family members, especially women, who are compelled to take care of the unwell.

II. Intervention



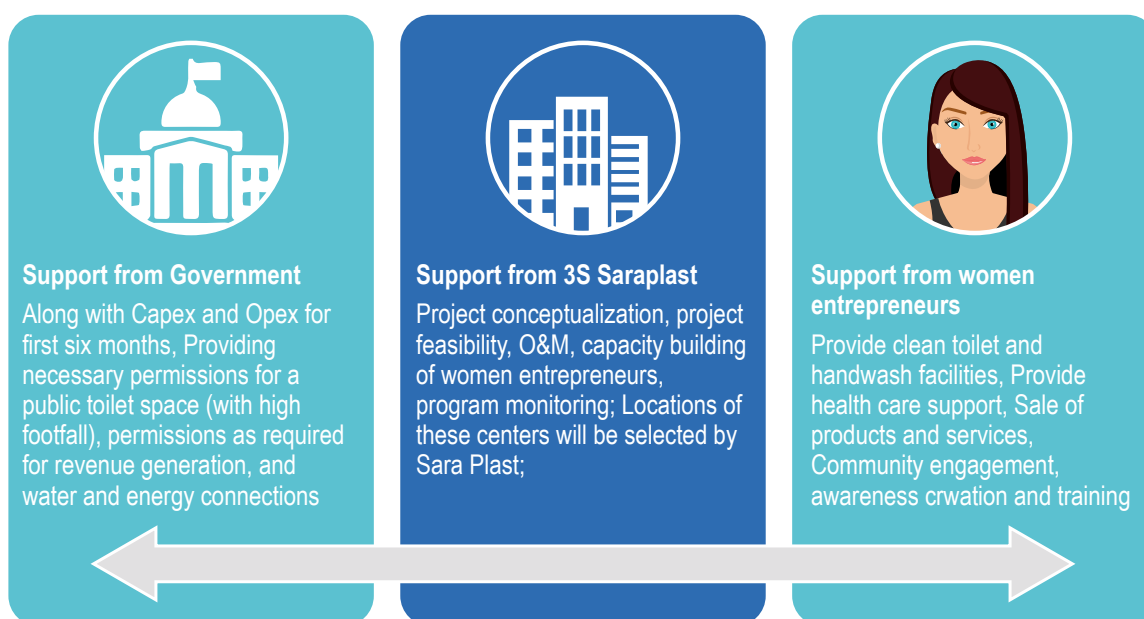
- Toilet Integration Centres (TiCs) are integrated sanitation hubs created by refurbishing old buses and are operated by trained female attendants. They operate entirely on solar energy and can be connected to a drainage system, eliminating the need for sewage evacuation. The facilities also provide clean water supply for flushing and handwashing. They carry a variety of features like western and Indian toilets, water-efficient taps, panic buttons, digital feedback systems, solar-operated lights. Besides these features, these hubs run on revenue models featuring points for the sale and disposal of female hygiene products, breastfeeding spas, shopping kiosk, café, consulting rooms, health center, apps to locate toilets, google mapping, and toilet rating for other toilets, too.
- **The key objective** of TiCs is to *increase access to quality & affordable safe sanitation and hygiene services*. Use of hygienic and safe sanitation services will influence behaviors of women towards healthy sanitation practices, contributing to positive health outcomes.
- **Business objectives:** Currently, Saraplast has strategically placed 12 TiCs in Pune, **across locations that target women from low income group**. In terms of operationalizing the model, **Saraplast has an ongoing MoU signed with the Pune Municipal Corporation allowing operation of the service at feasible and high-impact locations**. Saraplast is exploring revenue models like providing space for advertising, selling sanitary napkins and bottled water, in order to break even to reach economic sustainability.
- **Social Objectives:** TiCs, as a safe sanitation solution, complements the efforts under the Swachh Bharat Abhiyan of the **Government of India, towards** sustaining the status of open defecation free (ODF) cities. It supports coverage across three target segments: women in slum clusters, women among floating populations, women vendors/workers in public places like market yards and small informal business **centers**. The solution also proposes a series of value-added elements such as provision of a dedicated monitoring and evaluation team to capture intended impact in a consistent manner; development of a relevant M&E framework and data collection plan to capture key data elements like number of users, user profile, and behavior change factors like handwashing, use of sanitary pads; and timely assessments to strengthen service effectiveness. Moreover, based on the usage data and efficacy-testing, a substantial amount of capital shall be raised to invest in replicating the model across more towns and cities in the next 5 years.

III. Implementation approach

In 2016, Saraplast Pvt Ltd collaborated with Pune Municipal Corporation for operating these centers with a vision to make these centers self-sustainable and to provide safe sanitation solution to the low-income group in India. Consequently, Saraplast provided the following support:

- Undertake daily operations and maintenance based on applicable revenue models
- Modify and revamp an existing public bus to TiC WASH facilities
- Train local women entrepreneurs and build their capacity to operate the facility

There is a tripartite agreement in setting up this facility among: 1. ULB, which provides capex, relevant permissions, water and energy connections etc., 2. Women Entrepreneurs responsible for operating the infrastructure, and, 3. 3S Saraplast, who provides program support



IV. Highlights

The Program aimed to provide WASH access to women

- Around 355 million women in India lack access to adequate safe sanitation facilities
- Improved safe sanitation would result in less exposure to infectious diseases for women, relief from the fear of assault, and loss of dignity from relieving in the open

The Program focused on women empowerment

- There has been a growing conversation towards economic empowerment of women and the growth in dual-income households

- With this shift, an increasing number of women, even in a low-income bracket, are now experiencing and exercising greater mobility than ever before

The Program is environment-friendly



V. Impact

The buses in Pune and Hyderabad are been used over 2,00,000 times by women and girls. These toilets are a private, safe, women-only space, which can be used for women to learn about potentially sensitive women's health issues. The women will be given access to health information in the form of leaflets, videos, and talks on women's health issues, as well as to sessions on nutrition advice and yoga.

The project directly addresses SDG 6.2 relating to the eradication of open defecation alongside SDG 9 (target 9c) relating to providing access to the internet. The project also contributes to meeting SDG3 (Health), SDG4 (Education) and SDG5 (Gender Equality), which, over the long-term, leads to the achievement of SDG1 (Poverty). This project will benefit women both as potential sanipreneurs and operators of these toilets and also as consumers of the toilets, café, and health services.



VI. Reflections and lessons

Till date, the project has served over 2,00,000 women, in cities like Pune, Hyderabad, and Andaman Islands. This project has received remarkable attention on different media like social media channels and on various news channels. The expansion of the project depends on creating the right kind of partnerships with local government bodies and women entrepreneurs to feature relevant government advertisements on TiCs facilities, and to create online/retails hub for local women and women entrepreneurs to shop different products and to sell their home made products and retail hygiene products like hand wash/hand sanitizers/

sanitary products. This would help in building a hygiene care center at one of the TiCs facilities to sell hygiene products for women.

VII. Potential for replication

- The project has been replicated in the low-income communities of Narayanpet and Jalpally, near Hyderabad, Andhra Pradesh
- Old shipping containers have been converted into TiCs Health Centers, to innovatively address the shortage of availability of suitable location space
- The project has partnered with health providers to operate, run and provide health services to the citizens of these towns



Lead case study contributor: Saraplast Pvt Ltd

4. COMMON SEPTIC TANKS TO ADDRESS ISSUES OF INSANITARY TOILETS AND CONGESTED AREAS IN BHUBANESWAR, ODISHA

Abstract

In 2019, 114 urban local bodies in Odisha had self-declared themselves as 100% Open Defecation Free (ODF) cities/towns. However, rapid assessment conducted for nine AMRUT Mission towns in June 2017, observed that out of the sample size of 780 households in Bhubaneswar, 28% toilets were insanitary. Similarly, in other cities, almost 15%-20% toilets were insanitary.

I. Context

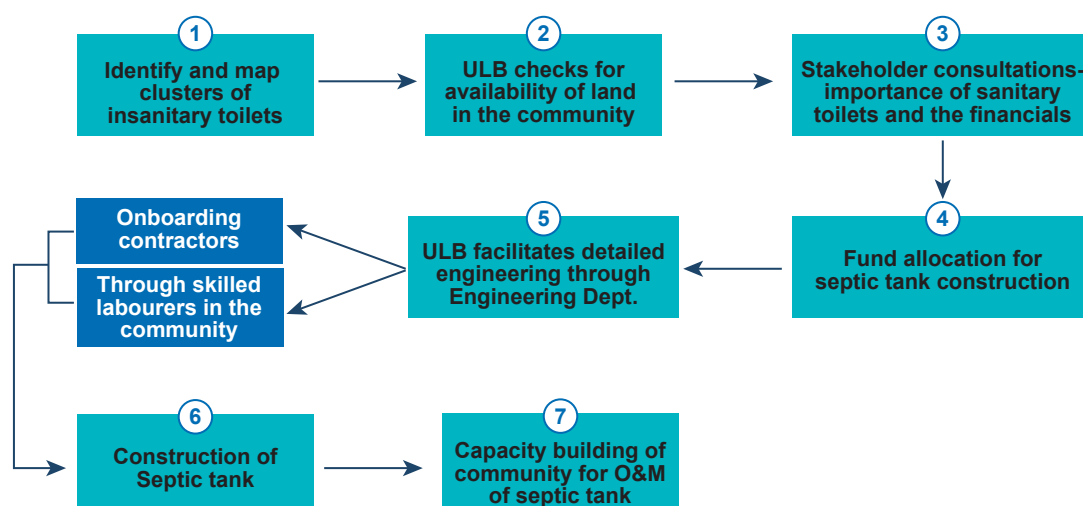
While Odisha has declared all cities as ODF and is a front runner in the country in achieving ODF++, the government is taking steps to convert insanitary toilets to sanitary toilets. Under Swachh Bharat Mission (SBM), there is a provision for converting insanitary latrines to sanitary latrines. A total amount of INR 8,000 is provided under SBM to a marginalized community *i.e.*, INR 4,000 from Government of India (GoI) and INR 4,000 from Government of Odisha (GoO). In case of non-marginalized communities, a total amount of INR 6,667 (INR 4,000-GoI and INR 2,667-GoO) is provided. However, in slums non-availability of land for each household to have a containment unit is an issue. This leads to the need for a community septic tank. A community septic tank is a cost-effective model as compared to the individual containment unit.

This can be demonstrated by the following example: An individual latrine along with containment unit costs approximately INR 25,000-30,000 for a household with five members, while a community septic tank costs approximately INR 17,000 per household.

II. Intervention

A community septic tank has been constructed in Maa Mangala slum of Bhubaneswar within the SBM-Urban scheme. The scheme was technically supported by Tata Trust who provided detailed engineering support while the funding was from SBM-U and the households. Along the same lines, Berhampur Municipal Corporation is piloting the construction of community septic tank in a ward with 27 households, owned by masons.

III. Implementation approach



1. To initiate this intervention, the ULB must **list out the number of households that have insanitary toilets**. Typically, the sanitary inspector of each ward is aware of this scenario and data can be collated at ULB level. This data can then be mapped to identify clusters wherein a community septic tank could be built.
2. Post mapping, a **ground level assessment** is required to locate land for construction of a community septic tank. The land should be at a lower elevation from households to enable gravity flow of septage from toilets to the septic tank
3. Once the cluster has been identified and land availability has been ensured, the next step would be to **convince the community to construct a safe onsite system**. This can be done through **focused group discussions** iterating the importance of sanitary toilets and impact of unsafe practices.
4. Post this, **sources of funding must be identified** for construction. Potential sources of funds include SBM, CSR, community funds, loans from Micro Finance Institutions and so on.
5. While the funds are being sourced, the parallel activity to be taken up should be the **finalization of design of the community septic tank**. In Berhampur, the design has been provided by technical support unit along with support from engineering section of the ULB. Plumbing design will vary based on the location
6. A **stakeholder consultation on O&M of the community septic tank must be organized by the ULB/technical support unit post the construction**. The training will focus on the typical plumbing maintenance required and on desludging the same within in 2-3 years. During the consultation, the communities should agree to pay for the same.

IV. Highlights

- The initiative demonstrated the potential to solve the menace of insanitary latrines
- Community septic tanks were constructed without any requirement of funds from external agencies. It was constructed purely through personal funds from the community members and incentives received under SBM.
- The probability of success is high as there is only one responsibility of the community post construction, viz. desludging once the septic tank is full.

V. Impact

- **Creation of database for insanitary toilets at ULB level and State level:** Currently, the latest data available on insanitary toilets is of Census 2011. Since census is updated every decade, it is difficult to monitor the situation of sanitary toilets. Therefore, a database of the same can be maintained at ULB level. This can be collated and updated in the SBM dashboard.
- Post construction of community septic tanks, the **desludging of the same can also be recorded**.
- **Policy interventions to provide financial support:** Subsidized rates for construction of community septic tanks can be introduced as a policy intervention. This can enable scaling this initiative in other towns.
- **Creating awareness on importance of sanitary toilets:** Onboarding the community is one of the important steps to initiate the construction of the community septic tank. In Berhampur, the Corporation initiated the conversation for construction of septic tank followed by stakeholder

consultations. Overall, to scale up the intervention, it is essential to generate demand from the communities and to do so, frequent IEC should be considered.

VI. Reflections and lessons

- The community requires technical and handholding support for design and construction
- The design of the septic tank has to be prepared for each site individually. A “one size fits all” kind of solution will not do.

VII. Potential for replication

- This intervention is replicable in across India for any city or town with low income communities, insanitary latrines and dearth of available land for individual latrines. It may also be replicated in areas where there is land available but due to low income, communities discharge their toilet waste directly into the open. As the cost of construction is shared among the community, the cost of construction per household reduces, making this a more viable option.
- In Odisha, to demonstrate the success of this intervention, it is envisaged to construct ten more community septic tanks in areas with prevalence of insanitary toilets and faulty design of septic tanks. In Berhampur, the capacity building for the O&M of the tanks will be taken up by the Technical Support Unit for Faecal Sludge and Septage Management with support from the Corporation. To enable the same in other cities, the same can be taken up by training the local Self-Help Groups and Community Organizers. This will help in sustaining the process within the ecosystem.

Savda Ghevra – Simplified sewers

- The Savda Ghevra colony was set up by the Government on the margins in rural northwest Delhi. In 2007, nearly 8,500 families were given housing plots at Savda Ghevra, but were not provided a sewerage system or potable water lines. There is no provisioning of these services in the master plan for the city till 2021.
- Each block has a community toilet complex which is poorly maintained and filthy. Residents are forced to defecate in the open as the complex is closed at night. For those who can afford to have built toilets in their homes, there is an absence of a sewerage system. These toilets are connected to small underground pits to collect the faecal sludge.
- The twin-pit technology adopted in rural areas, where families have more outdoor space is not suitable here because the small room is their only living space. Residents used to spend INR 600 every two months for desludging. In some houses the water from the faecal sludge seeped into their walls, and the already unstable walls were being further corroded.
- CURE did a **pilot project to provide a simplified sewerage** in one block. Simplified sewerage is an innovative and affordable option, particularly for high density settlements. It is a sanitation solution for populations that remain unserved. Simplified sewerage uses small diameter pipes to transport human waste. The pipes are laid under the street at a shallow depth. There is no need for large and expensive maintenance holes. The sewage is carried to a decentralized cluster septic tank to treat the effluents. The tank, which has a capacity of 4 lakh liters, has been built under the community park. The project has costed INR 40 lakh and it is estimated that investment costs are reduced by nearly 50% compared to conventional sewerage.

- The Delhi Urban Shelter Improvement Board has partnered the project, by allotting funds for rebuilding the road after sewer lines are laid. Residents whose toilets are connected through this system will pay INR 30 a month for maintenance costs. A management team of residents was also trained. Many of households have connected their toilets to the system.

Shared septic tanks in Khopoli and Sinnar, Maharashtra

To tackle the problems of space and funds in toilet construction, Khopoli Municipal Corporation (KMC) developed an innovative solution to construct a group septic tank for a number of individual toilets in close vicinity. Group septic tank of appropriate size was designed to cater to 25-30 household toilets. 10 septic tanks have been already constructed in one slum area. An underground pipeline connecting toilets to septic tank has been laid by the KMC. These group septic tanks are desludged once in a month by the KMC. After assuring that this approach worked well in one slum, KMC designed group septic tanks in other slums. Construction cost of a septic tank varies between Rs. 50,000 to 80,000 depending on the tank size, which is borne by the KMC. The household had to only pay for own toilets. Many households have come forward to build their individual toilets under the SBM.



Septic tank shared by two households in Sinnar

In this case, the house on the first floor was unable to construct a toilet as there was no separate and space for a septic tank. They decided to build a shared tank with the house on the ground floor and toilets from both houses were connected to it.



Lead case study contributor: Ernst & Young LLP

Other contributors: Center for Water and Sanitation (CWAS), CRDF, CEPT University

5. INCLUSION OF STANDARD SEPTIC TANK DESIGN AND INSPECTION UNDER BUILDING RULES IN TAMIL NADU

Abstract

Nearly 70% of Tamil Nadu's households depend on on-site sanitation systems (OSS) and the proper construction and maintenance of these is critical to ensure safe sanitation. However, most of the existing OSSs are constructed following non-standard or outdated practices. In Tamil Nadu, the Municipal Building Rules, 1972, which were inclusive of standards for sanitation systems were to be revised. A review of current procedures for construction, approval and monitoring of on-site sanitation systems was undertaken and suggestions were made to the Government of Tamil Nadu. Few of these suggestions have been incorporated in the Tamil Nadu Combined Development and Building Rules (TNCD&BR) issued in 2019, and have been presented here.

I. Context

The state of Tamil Nadu with an urban population of 34.9 million (~ 48% of the state population, is one of the most urbanized states in India as per Census 2011. In urban Tamil Nadu, about 70% households depend on various types of on-site sanitation systems (OSS) like septic tanks and pits (NSSO, 2017).

With a huge population dependent on OSS, there are several issues that can be identified to safe OSS:

- non-standard construction, operation and maintenance
- non-adherence to standards due to limitations of space and budget
- design standards not updated to meet current needs and
- institutional challenges.

The construction of OSS is dependent on households and establishments, which are limited by lack of adequate knowledge on standards, budgetary limitations, and /or space constraints leading to unsafe construction practices. Additionally, the standards for construction need to be updated regularly from the perspective of existing site conditions to meet safety requirements. The challenges to proper construction of OSS are not only about conforming to standards, but also include institutional gaps, lack of masonry capacity and land issues, which need to be addressed concurrently.

II. Intervention

The proper construction and maintenance of toilets and OSS is critical to ensure safe sanitation services for a large proportion of the population in urban Tamil Nadu. The compliance to standards such as minimal distance between the containment systems and any source of drinking water is particularly important as it threatens the health of water sources.

While there is a need to retrofit existing systems to comply with relevant compliance standards, there is also an opportunity to properly design and construct new toilets and containment structures. In this context, a set of new building regulations have been proposed in Tamil Nadu.

The existing process gaps can be broadly classified as:

- Information gap in the building application process for new construction and
- Implementation gap in the monitoring and issuance of completion certificate.

To address these gaps in the policy making and implementation exercises, current rules, regulations, standards, and best practices in India, including proposed model rules by the State and Central Government for toilets and containment system, were analyzed. On the basis of this, suggestions were made to the Government of Tamil Nadu (GoTN), with support from the Tamil Nadu Urban Sanitation Support Programme.

III. Implementation approach

The existing provisions of the Tamil Nadu District Municipalities Building Rules (MBR), 1972⁹ with respect to sanitation requirement *i.e.* toilets and containment systems were reviewed in detail. The gaps in terms of design standards, approval process, inspection and monitoring were systematically recorded. Further discussions were held with government officers in Tiruchirappalli City Corporation (TCC), and at Town Panchayats (TPs) of Periyanaicken-Palyam and Narsimhanaicken-Palyam, to understand the process followed at the ground level for approving building plan and building construction with respect to sanitation systems. Based on these interactions, the procedures for construction, approval and monitoring sanitation systems in the existing municipal building rules, 1972 were mapped, which facilitated identification of areas requiring streamlining.

Suggestions for streamlining information: The information provided in the application for building construction approval is usually limited to only existence of toilet(s) (in the plan) and a mention of treatment structure and capacity in words. However, to ensure properly designed OSS, it was recommended to include certain key provisions in the application during the construction of toilets and septic tanks. These include:

- Need for water-seal (e.g. S or P trap) to make the toilet sanitary in the case of pour-flush or cistern-flush toilets
- Minimum size and dimensions (L: W: D) for different numbers of users
- Water tightness of floor and sidewalls of septic tank
- Provision for access to containment structure – for inspection, cleaning and desludging
- Need to connect to soak-away and distance from nearest drinking water source
- Provision of the type of containment structure and the cross-section of the toilet and containment structure provided

Suggestions for streamlining implementation: On completion of the construction of OSS, the verification process of compliance to design standards needed to be augmented in most Urban Local Bodies (ULBs), particularly in smaller ULBs. Both lack of adequate staff, and absence of proper systems, to ensure regular inspection and monitoring were noted. In the interest of sustainability, these gaps, along with institutional gaps, found during inspection and monitoring process, following construction, needed to be addressed. In order to achieve this, simple steps were suggested, such as:

- submitting photographs and geo-tags (longitude and latitude) of the containment structure being constructed showing recommended standards
- uploading/submitting photographs during the construction stage
- submitting completed photographs to officers during final inspection.

IV. Highlights

The suggestions made to the building rule have sought to address both information and implementation gaps in construction of OSSs. Most importantly, this has sought to leverage technology and support

monitoring even while construction is on-going, which supports modifications, if required. To reduce the demands on municipal authorities, it was recommended that:

- Allow verification through photographs and mandate physical verifications strictly for defaulting households and on a small sample of the compliant households,
- Depute competent authorities from the nearest Municipalities for verification.

www.trussp.co.in

Do's and Dont's of constructing a septic tank

containment
emptying
Safe
treatment and disposal/re-use
transport

- ## 1 Keep it Water tight

Do's >

 - ✓ A septic tank is a water tight system.
 - ✓ The floor and the roof should be built using the reinforced concrete.
 - ✓ The side walls should be constructed with bricks.
 - ✓ All the sides and base should be plastered with water impermeable materials, to prevent seepage.

Don'ts -

 - ✗ A septic tank should not be constructed using porous materials including gravel that allows water to seep through.
- ## 2 Accessible

Do's >

 - ✓ A septic tank should be constructed at an accessible location that helps in easy de-sludging and repair.

Don'ts -

 - ✗ A septic tank should not be located in a none accessible, later it will be difficult to de-sludge and repair if necessary.
- ## 3 The Soak pit

Do's >

 - ✓ The outlet of the septic tank should be compulsorily connected with a soak pit.

Don'ts -

 - ✗ The liquid discharged from the septic tank is wastewater. This should never be connected to an open drain or other water bodies. It is the reason for public health issues.
- ## 4 De-sludging

Do's >

 - ✓ De-sludging is essential for to avoid unnecessary damages in the structure of septic tank, pollution and public health issues.






IIHS CHENNAI
 Floor 7A, Chaitanya Exotica, 24/51 Venkatnarayana Road, T Nagar, Chennai 600 017, India
 P: +91 44 6630 5500 / 6555 6590

V. Impact

The Tamil Nadu Combined Development and Building rules (TNCD&BR) issued in 2019 clearly stated that the location, design and construction of the septic tank shall conform to requirements of the National Building Code and follow provisions laid out in G.O.Ms. No 106, MAWS Dept., dated 01.09.2014. The revised rule issued in 2019 incorporated key features, such as:

- The dimensions of septic tanks for different number of users
- Inclusion of access requirements for desludging
- The need for minimal distance of 18 metres between the containment systems and from any source of drinking water, such as wells, to mitigate the possibility of bacterial pollution of water supply.

VI. Reflections and lessons

The TNCD&BR 2019 is applicable to all ULBs across Tamil Nadu. While the building rules issued in 2019 address gaps in information, the bigger challenge lies in monitoring and securing approval of constructed systems to function in safe conditions, which needs to be addressed.

The TNUSSP programme is providing training to masons and government officers to ensure conformity to design standards of toilet and containment systems. Further, the programme also aimed to ensure wider dissemination of standards to larger public. Consequently, recommendations for proper construction of septic tanks have been developed as a poster on “Do’s and Don’ts of septic tanks” poster and a short film. The posters and the short film have been widely disseminated amongst various stakeholders such as masons, registered professionals developing plans for containment systems, communities, households, desludging operators and government officers.

VII. Potential for replication

The recommendations for the Tamil Nadu Combined Development and Building rules (TNCD&BR), 2019 conform to the National Building Code, IS codes. Therefore, they can be easily adopted by other states into the respective building rules. The recommendations clearly delineate the technical requirements for a proper containment system supported by adequate cross-sectional drawings. The supporting audio-visual communication materials on proper construction of sanitation systems can be easily disseminated to a wide range of sanitation stakeholders as part of a behavior change campaign.

Integration of containment system in online building plan approval systems: Telangana

Telangana is the first state in India to introduce toilet containment system in the online building plan scrutiny and approval systems for construction as a mandatory requirement for building permission. This is generally not part of the building approval processes in other parts of the country. This has resulted in construction of many buildings with toilets but no containment systems or with underperforming septic tanks because of incorrect design and sizing. In Telangana, the requirements for the toilet containment system have been finalized on the basis of the guidelines for design and construction given in the CPHEEO Manual and IS 2470. The design parameters of the toilet superstructure and septic tank are assessed through a simple site verification process before the occupancy certificate is released.

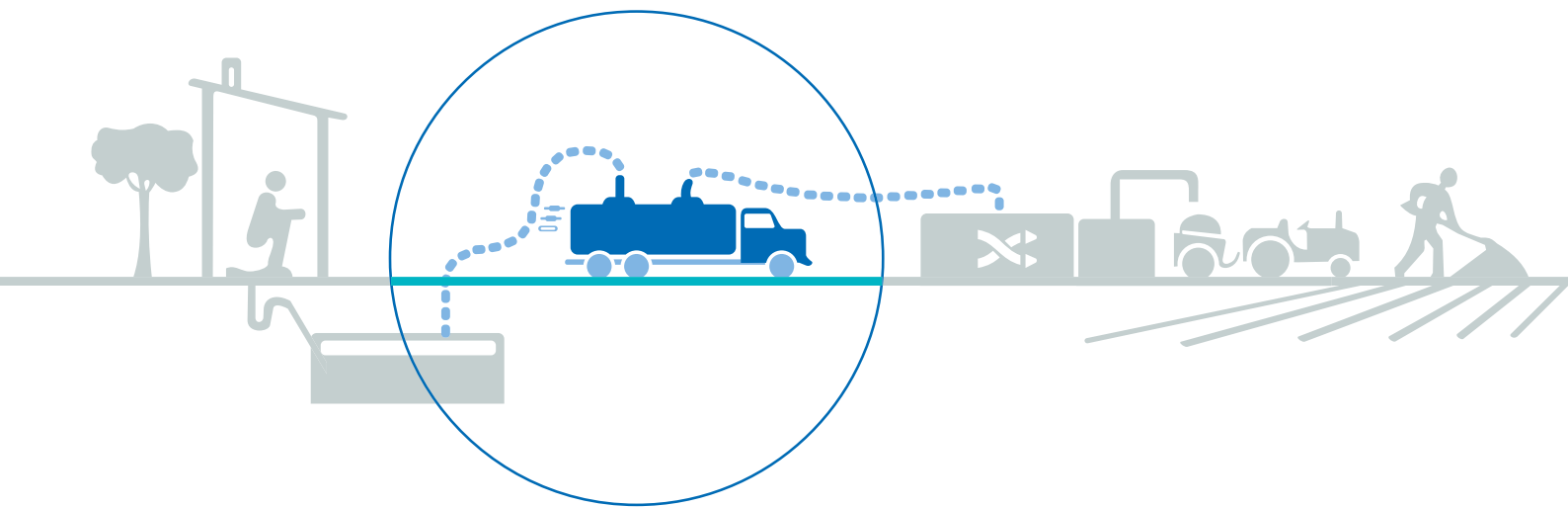
The IT enabled Auto DCR system with integrated scrutiny of containment parameters, was introduced in 2017. This system has ensured that all new buildings in the state have safe toilets, as the Development Permission Management System (DPMS) enforce the Toilet and Sanitation Regulations while the building permissions are being issued. This has also enhanced the existing Mobile App with checklists for the ease of verification by the town planning inspectors. There has been standardization of the process across the state of Telangana. A sample survey of 400 new buildings in Warangal city to test the effectiveness of the system showed a compliance rate of 98%.

Lead case study contributor: Indian Institute for Human Settlements

Other contributors: ASCI

SECTION-C

LEADING PRACTICES IN EMPTYING AND CONVEYANCE



Conveyance of faecal sludge and septage is the most critical part of the sanitation value chain. It is essential that this component of the value chain is well functioning for the entire value chain to function. This step takes the same role as a sewerage network of transporting the waste generated at a household level to the treatment facilities, but in a much more cost-effective manner. However, it is this component that requires highest amount of management as this part is most prone to pilferage.

Currently, there are several models of operation for conveyance that are prevalent in the country. All the modes of operation have their own sets of benefits. Some of the leading examples with their benefits are mentioned in the table below.

Table 3: Comparative table for state models for emptying and conveyance including licensing, SPOs, etc.

S. No	Business model prototypes	Implementing examples	Benefits
1	Full private model	Andhra Pradesh, Telangana, Tamil Nadu	Low ULB financial and implementation capacity needs
2	Full government model	Small cities in Maharashtra	No contracting and minimal monitoring arrangements needed
3	a. Government-owned vehicles and leased to private players for operations b. Government owned vehicles run by the government c. Private owned vehicles	Odisha	Low ULB implementation capacity needs Higher performance levels due to the private sector operations Market driven prices SLBs of less than three days per service Subsidized services Rurban clustering
4	PPP Annuity model	Wai and Sinnar, Maharashtra	Reduces the capex burden for local governments; result in higher service levels; Guaranteed fees result in competitive bid Prices
5	PSP Annuity model	Leh	Government capex may incentivize more and smaller private providers to participate
6	Government owned and leased to SHG	Odisha	Empowering the marginalized

6. INCREASING ACCESS TO MECHANIZED DESLUDGING IN ODISHA

Abstract

In the FSSM value chain, emptying and transportation of faecal sludge/septage is a crucial component. The government realized that more than 30% of the urban population has only narrow inaccessible lanes, which posed a hindrance for safe emptying. To cater to the extension of mechanized desludging services, the Government of Odisha (GoO) has been actively procuring mini cesspool emptier vehicles with a capacity of 1000 liters. As of now, 46 ULBs across the Odisha have procured these small vehicles. These vehicles ensure safe mechanized emptying for such populations.

Similarly, double booster pumps can also provide access to mechanized desludging. This is an award-winning intervention from Leh. These interventions have the potential to, further, strengthen the fight against manual scavenging and can cater to more than 35% of the Indian populace.

I. Context

Odisha is experiencing fast urbanization, which is accompanied by the challenges of providing people of the state with good quality basic amenities such as water and sanitation. Delivering on its commitment to the cause of creating safe, healthy and sanitized towns and cities, the Government of Odisha took initiatives four years ago to focus on safe containment, safe transportation, safe disposal, and safe treatment of faecal waste. Considering the predominance of on-site systems in urban Odisha, the government realized that sewer networks cannot be the only solution for wastewater management. The government has decided to opt for low cost, impactful non-sewer sanitation systems to make cities environmentally clean and safe for the citizens.

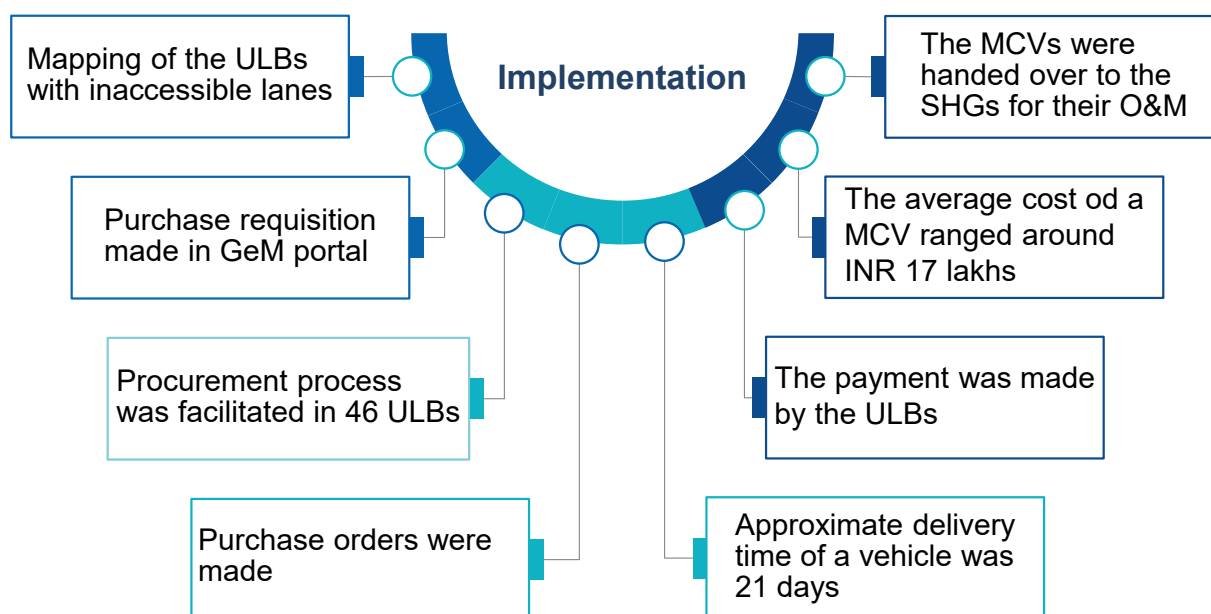
Odisha government had also brought cesspool vehicles for ULBs using state funds in 2015 and ensured availability of cesspool vehicles with all the ULBs for safe collection and transport of faecal sludge/septage. The State government has recently taken an active step in procuring Mini Cesspool Vehicles (MCVs) with an objective of accessing households in narrow lanes.

Recently held survey shows that more than 30% of the households in Berhampur have roads with less than 2 meters of width. This makes it inaccessible to a majority of the existing STVs of 3000 litre and 4500 liters capacities owned by the ULB and private operators. Therefore, the Berhampur Municipal Corporation has procured a 1000 liters vehicle and has set up a desludging charge of INR 600 for a single trip.

II. Initiative / intervention

In order to provide mechanized desludging throughout Odisha, the government took proactive steps in procuring Mini Cesspool Vehicles of 1000 litres capacity for 46 ULBs through GeM portal, along with double booster pumps.

III. Implementation approach



IV. Highlights/ Key differentiators

- The implementation had the potential to provide access and improved sanitation to the invisible slum population
- As per the Prohibition of Employment as Manual Scavengers and their Rehabilitation Act, 2013, there should be an absolute absence of manual scavengers and the first step towards this was to demolish insanitary latrines. But on practical grounds it was observed desludging of sanitation facilities in the inaccessible parts was being undertaken manually. Hence, this solution brought 100% compliance to the law.

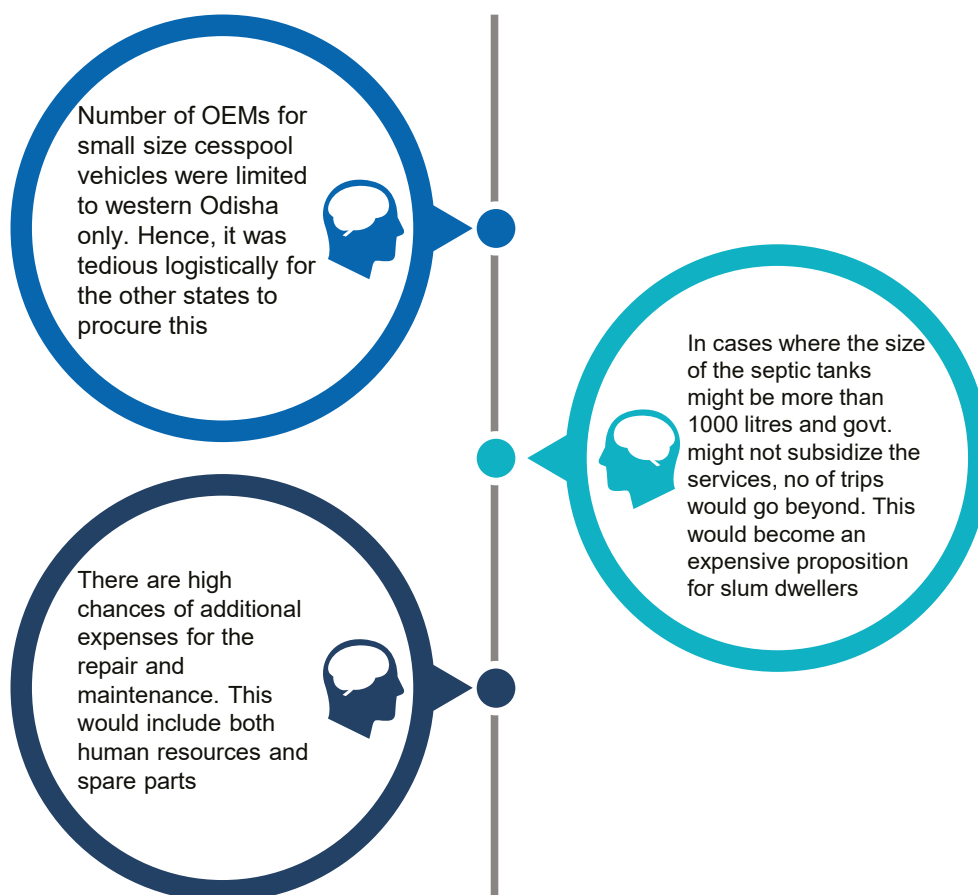
V. Impact

The use of MCVs throughout the state has ensured safe sanitation for slums constitute around 30% of the population of urban Odisha population. Additionally, as the O&M of the vehicles were handed over to the SHGs, it created additional revenue streams for the vulnerable sections of the society.



Figure 5: Small cesspool vehicle as a solution that can cater to 35 of the left out Indian population

VI. Reflections and lessons



VII. Potential for replication

As the market demand increases for cesspool services, the concept would gain momentum and spread out across India. In that case, OEMs would also be able to expand and cater to the urban settlements across India.

In Leh, a unique intervention of double booster pumps was used for desludging. This award-winning solution allows a booster pump to be attached to the existing pump mounted on the cesspool emptier vehicle. This helps to increase the reach of the vehicle by two times. With the increased reach, this solution is especially useful in hilly terrains and is suitable for inaccessible areas with narrow lanes.

This is a different solution case as it requires less investment, only involving the procurement of the pump and the fittings. However, the operation time increases, as the process to mount and dismount the pump is manual.

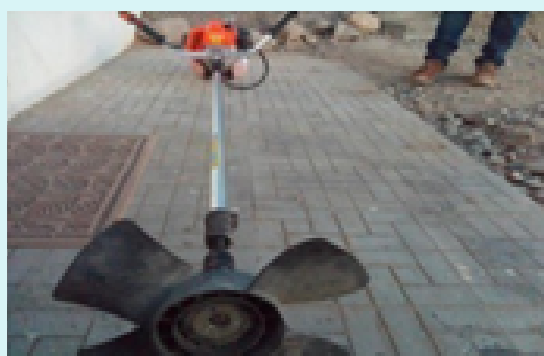


Figure 6: Double booster pumps from Leh¹⁰

Lead case study contributor: Ernst & Young LLP

EXHIBIT 1

WOMEN AND TRANSGENDER RUN DESLUDGING SERVICES ACROSS STATES

Background

- The launch of Swachh Bharat Mission increased the thrust on sustainable sanitation solutions which led the government to improve the sanitation reach, and to do away with offensive practices like manual scavenging.
- Large parts of India, particularly peri-urban areas and urban slums, see heavy reliance on onsite sanitation systems, which necessitates regular desludging as part of its maintenance.
- While public and private sanitation services are dominant players in the market, there are areas beyond their operational reach, as well as gaps in awareness creation and knowledge building that they are unable to bridge which impact access to such services.
- These gaps greatly impact vulnerable sections of the society such as women, transgender and others who are socially and economically disenfranchised, depriving them of inclusive sanitation solutions. The intersection of gender with age, class, caste and other social markers deeply impacts the position of these vulnerable groups in the society.

Intervention

- Many states like Andhra Pradesh, Telangana and Odisha have thus begun to handover mechanized desludging services to local SHGs spearheaded by women and transgender members. The engagement of CBOs representing such vulnerable groups offers a cost-effective way to improve the coverage of sanitation solutions, and also helps the SHGs generate livelihood opportunities for its members.



- There have been concerted efforts to encourage women's participation across the sanitation value chain through livelihoods and entrepreneurship. Specifically, vis-à-vis desludging, the following practices stand out:
 - In both Narsapur (Andhra Pradesh) and Warangal (Telangana), there are female desludging operators who have established themselves in the male-dominated sector despite the stigma attached to women taking up such a profession and receiving backlash from the community. There has been immense support from both the local and state governments to empower these individuals. Further, the initiative of licensing the desludging operators has helped to increase their business and added dignity to the profession.

- ◉ In Berhampur (Odisha), the BeMC has roped-in local SHGs to create demand in households for desludging services, with each household referral earning the SHGs INR 20 per request. Today, around 67 of the 94 ALFs in BeMC are engaged in this activity, and this operation has helped reach out to serve 60% of the residents. In yet another instance, in Bhadrak (Odisha), an SHG of sanitary workers from a vulnerable community is engaged in the O&M of cesspool emptier vehicles in the municipal corporation.

Impact

- Brought about greater community ownership of sanitation, along with increased gender inclusivity.
- Has created a channel of microentrepreneurs who have a steady income stream.
- Has resulted in formalizing sanitation as a dignified service
- Women, transgender and those hailing from manual scavenging communities have been afforded greater dignity, respect, and mobility and have better ability to influence and make decisions and transform existing institutions and power relations.

7. ENGAGEMENT OF SAFAI KARAMCHARIS THROUGH PERFORMANCE-BASED CONTRACTS IN HYDERABAD-DICCI MODEL

Abstract

Hyderabad Metro Water Supply & Sewerage Board (HMWSSB) took an initiative to adopt the Mini Sewer Jetting Vehicles (MSJV) for cleaning sewers to eliminate human contact with faecal matter in the process of sewer cleaning. In doing so it could extend sewer maintenance to even non-maneuverable narrow lanes. 68 such machines were hired through micro-entrepreneur model of rehabilitating manual scavengers with funding support integrated with government loan and subsidy schemes. This model has successfully demonstrated mechanization and professionalizing of sanitation work, bringing about dignity and safety to the sanitation workers life. The model is also replicated in other cities in India.

I. Context

Over the last few years, considerable emphasis had been placed on increasing access to sanitation infrastructure in India. However, the existing infrastructure in India often relies on informal sector workers for cleaning and maintenance. These laborers are generally underpaid, undertrained, mistreated, and denied access to the resources. The sewerage management mechanism in the cities of India involves workers operating in dangerous and inhuman conditions endangering their lives and compromising their health.

The city of Hyderabad has an underground sewage system connected to sewage treatment plants for treatment and disposal of sewage. About 95% of the main city is connected to sewer lines with 173 km of trunk lines and 6083 km of internal lines. The internal lines collect sewage from residential and commercial institutions and join the trunk line. There are several issues with the existing sewer system resulting in frequent blockages. Though sewer jetting machines are already used by Hyderabad Metropolitan Water Supply and Sewerage Board (HMWSSB), the system necessitates regular and frequent manual intervention, especially when blockages are caused by heavy objects. Besides, these machines cannot find their way into the narrow by-lanes of the city. Sanitation workers are exposed to various occupational hazards by way of entering the sewer, handling faecal, biomedical, and municipal waste, and being exposed to toxic chemicals and disease carrying pathogens. Additionally, many of these workers are hired on a contractual basis with low pay, no benefits, and no insurance.

Incidents of death of sanitation workers during septic tank or sewer cleaning compelled the Government of Telangana and HMWSSB to take a conclusive decision to completely eliminate manual intervention in sewerage operations of Hyderabad city.

II. Intervention

To address this issue of manual scavenging, HMWSSB deployed 70 mini-jetting machines through a micro-entrepreneur model of rehabilitating manual scavengers to eliminate human contact with faecal matter in the process of sewer cleaning. The use of these new machines eliminated the need for any human being to enter the sewers/manholes. The machines were tailor-made with Jetting, Rodding, and Grabbing machines (all) mounted on a small chassis, enabling the sewer cleaning machine to operate in the narrowest lanes/streets which were earlier inaccessible to large sewer cleaning machines.

The machines were tailor-made with a current capital investment of approximately Rs.36.16 Lakh and a working capital of 4 lakh. The funding was integrated with government loan and subsidy schemes. A total of 70 manual scavengers were rehabilitated by issue of work contracts. The members belonging to

the SC/ST community could avail of a loan for 75% of investment under the “Stand-up-India” scheme, wherein SC/ST or women entrepreneurs could avail bank loans between INR 10 lakhs to INR 100 lakhs. The Vehicle owners, being MSME from SC/ST sections, were eligible to obtain support from Telangana Government under the “T-Pride – Promoting Entrepreneurship among SC/ST Scheme”, wherein they could claim subsidy (35% for men and 45% for women) on the cost of the vehicle and up to 9% subsidy on the loan interest charges. As per the scheme, with the commencement of the job, vehicle owners could apply for the subsidy, granted by the Government within a span of 3-4 months. By implementing this model, HMWSSB created 70 entrepreneurs. A management service was provided to coordinate the activities and present a single voice/point of contact between HMWSSB and the entrepreneurs.

III. Implementation approach

The Hyderabad Metropolitan Water Supply and Sewerage Board adopted a four-pronged approach to improve service delivery and worker safety.

Awareness and Behavior Change: The Board conducted planning and awareness workshops with sanitation workers, officials, and resident welfare associations to eliminate manual scavenging. A series of short films and advertisements were developed to sensitize the end users about minimizing blockages. For the permanent and contractual employees, operational health and safety training workshops were also conducted.

Tech-Based Interventions: To effectively extend sewer maintenance to small lanes, HMWSSB deployed 70 mini-jetting machines through a micro-entrepreneur model. In this model, HMWSSB floated a tender for sewer cleaning services, which was awarded to the green field contractors from SC/ST communities and linked with the Government of India’s flagship Stand-Up India Scheme (SUIS) for financial support. The Telangana chapter of the Dalit Indian Chamber of Commerce and Industry (DICCI) played a key role in helping the Safai Karamcharis to transition to safe mechanized practices. They provided handholding support to these workers to prepare project proposals, apply for loans that led them to procure the Mini Sewer Jetting Vehicles. This facilitation by DICCI helped the workers to be involved in the tendering process that led them to get the contract from Hyderabad Metropolitan Water Supply and Sewerage Board (HMWSSB) for cleaning of septic tanks and sewer networks.

The micro-entrepreneurship offered by the HMWSSB enabled the socio-economic development of families from marginalized communities, by integrating them into the mainstream economy of the country. The owners of the vehicles were both male (25) and female (6) members, from SC/ST communities. They were the successful bidders for 69 vehicles. 142 members were given employment as drivers and cleaners of the vehicles, of which most were from manual scavenging background.

Infrastructure Upgradation: The existing sewer truck lines, which need replacement were identified and upgraded/replaced. Also, 1200 slit chambers were constructed on site to trap material that is likely to cause a blockage. There were mechanisms set in place to monitor complaints to identify hotspots of frequent blockage in the city.

Standard Operating procedure: With support from the Administrative Staff College of India (ASCI), Standard Operating Procedures (SOPs) were developed for sewer cleaning to train the sanitation workers. The SOPs included safety gear, such as chemical cartridge masks, gloves, safety belts, etc., in accordance to the Manual Scavenging Act, 2013.

IV. Highlights

There has been a 6% drop in the average daily complaints, while the monthly complaints have dropped by 24% (between June 2016 – August 2016 and 2017). There has been an improved status of worker

safety, and HMWSSB claims that there has been no manual entry into manholes following the intervention. Further, there have been no reported deaths or accidents. The preference to workers with prior experience in sanitation work has enabled the sustained rehabilitation of workers and their families. The model has been designed keeping in mind its sustainability, which is reflected in favorable economics for machine owners and the establishment of a financially sustainable services company to support owners. There is guaranteed revenue from government, financial subsidies from existing government schemes (T-Pride, Stand-Up India), and support for entrepreneurs through a services company that de-risks the model for new entrepreneurs.

V. Impact

Before the introduction of the Mini Sewer Jetting Vehicles, only reactive measures were taken-up through the process of manual cleaning and usage of bigger sewer cleaning vehicles. It has been observed that there is enhanced ease as sewer cleaning can be done in narrow lanes and congested localities with the use of these Mini Sewer Jetting Vehicles. This is due to the ease of mobility and flexibility of the vehicle. There has been an increase in customer satisfaction as this machine has reduced the time of grievance redressal and has also addressed the issue within the Service Level Agreement period. Most importantly, there is a considerable decrease in dependency on conventional sewer cleaning techniques and manual labor. This can eventually help achieve the goal of eliminating the practice of manual scavenging completely.

VI. Reflections and lessons

The following are the key achievements of the initiative:

- Elimination of manual operation in sewerage system
- Increased efficiency of sewerage operations
- Provision of dignity of labor to the Safai Karamcharis
- Reduction of sewerage problems, especially in small lanes & streets which are generally neglected due to constrained approachability
- Improvement in quality of life in Poor/Lower middle class/Middle class localities
- Use of proactive measures instead of reactive measures

VII. Potential for replication

This model has been instrumental in bringing about mechanization, professionalization and much needed dignity and safety to the life of sanitation workers. The Mini Sewer Jetting vehicles can be considered as a prototype that can help any ULB to achieve its goal of Swachh Bharat. The success story of SC/ST entrepreneurs at HMWSSB in Hyderabad caught the national attention for 100% eradication of manual scavenging and developing them into entrepreneurs providing complete mechanized services. The similar model is replicated in New Delhi for mechanization of sewerage activities under Delhi Jal Board.

Odisha's experience with engaging safai karamcharis for O&M of cesspool vehicles

In its efforts to achieve sustainable sanitation, the state of Odisha has been engaging CBOs like SHGs in various aspects of the FSSM value chain, including desludging activities, the latter of which is currently being carried out in 9 ULBs with SHG support. This has helped the government improve operational efficiency while lowering costs and has resulted in livelihood generation for SHG members. In Baripada and Cuttack this activity has been handed over to SHGs composing of sanitation workers, some of whom were earlier involved in manual scavenging, thereby dignifying and destigmatizing the work undertaken by sanitation workers.

Sanitation workers are subject to deep social stigma and indignity, in addition to being exposed to health hazards and vagaries resulting from a lack of stable income. Therefore, in an effort to empower them and help them achieve job security, the municipalities of Cuttack and Bhadrak identified and trained groups composing of such sanitation workers in the use of cesspool vehicles.

The training process included regular sensitization and capacity building activities aimed at empowering the members. Post-selection, the groups were encouraged to officially register as SGHs under NULM and open a bank account. An agreement was also signed between the ULB and the group, as part of the formalization process. The agreement took due note of the vulnerabilities of the marginalized group members, and accordingly, the ULB assumed responsibility for a number of things such as major vehicle repairs, insurance charges etc. Given how many of the members were previously unskilled workers, accommodations were also made to smoothen the process for them. In Cuttack for instance, the ULB provided the SHG (named Sai Swacchata Bahini) with a driver to man the 3000-liter cesspool vehicle which was provided to them from OWSSB in October 2019. Similarly, in Bhadrak, the SHGs were discharged from paying any user charges the first year, in an effort to help them reach an economically viable situation.

Though the SHGs in both areas have suffered from teething problems and challenges such as opening bank accounts, adhering to meeting schedules, in bookkeeping and data recording, continuous handholding support and capacity building has resulted in their improved performance and pro-activeness. The members of such SHGs, in particular those belonging to the 'Shyam Sundar Jew' SHG of Bhadrak, have learnt managerial skills, and have begun to work as a cohesive unit. Their improved performance has lessened their economic insecurity, and their formal employment has resulted in their better social standing.

Lead case study contributor: *Administrative Staff College of India*

Other contributors: *EY*

8. SCHEDULED DESLUDGING THROUGH PPP WITH A PERFORMANCE LINKED ANNUITY MODEL IN WAI, SINNAR, MAHARASHTRA

Abstract¹¹

The focus of Swachh Bharat Mission was to build toilets to make India open defecation free. While India has succeeded in achieving this goal, to move toward “safely managed sanitation” as per the target 6.2 of the Sustainable Development Goals, it is necessary to ensure that all faecal waste is safely collected and treated. The common practice for desludging of septic tanks is “demand-based desludging” rather than a regular service. Such practices have adverse social and environmental impacts. To overcome these shortcomings, scheduled desludging is advocated.

Two towns- Wai and Sinnar in Maharashtra achieved ODF++ status with the implementation of Faecal sludge and septage management (FSSM) plan. An innovative aspect of the plan is scheduled desludging on a three-year cycle. This is linked to output based annuity payment for private desludging service provider. It is for the first time in India that an effort to desludge septic tanks regularly, is being provided as a municipal service. The approach is inclusive as it covers all properties- including those in slums and low-income communities. The payment is linked to sanitation tax which is a part of property tax and thus equitable, with poor households paying much less.

I. Context

In India only 400 cities have sewerage networks that are connected to treatment plants. The small cities, with populations of <100,000, are fully dependent on onsite sanitation systems. In these cities, toilets are usually connected to septic tanks. The design, construction, and maintenance of septic tanks are, typically, the responsibility of households. There are two problems in having safely managed sanitation with this system. First, the septic tanks are not desludged regularly. Irregular and delayed desludging affects the effective functioning of septic tanks. Secondly, emptying charges are high and the poor and low-income households avoid using toilets so that their tanks are not filled up. Further, when the tanks overflow, the septage seeps into the ground and mixes with drinking water sources. This has negative environmental impacts on groundwater and surface water, and eventually on the health of the local populations.

Wai and Sinnar are two cities in Maharashtra, where for the first time in India, scheduled desludging of septic tank is being practiced. Wai has a population of 43,000 and Sinnar has a population of 72,000. In Wai, scheduled desludging operations have been going on since June 2018 and in Sinnar since March 2019. It is for the first time in India that an effort to desludge septic tanks regularly, as a public service, has been initiated.

II. Intervention

Scheduled desludging represents a planned effort to ensure regular desludging. In this regard, every property is covered along a defined route and the occupants are informed in advance about desludging. The local governments of Wai and Sinnar in Maharashtra decided to introduce scheduled desludging through a public private partnership (PPP) arrangement, and have the collected waste treated at a faecal sludge treatment plant.

The scheduled desludging contracts in these cities used a performance-linked annuity model with a pay-for-results contract between the desludging company and local government. Payment was based on the number of septic tanks desludged, with an annual target specified in the contract. For financing, both the

cities levied a sanitation tax to ensure that adequate funds were available for sustaining these services. Property owners pay an annual sanitation tax as part of the property tax, as against the traditional system of paying a charge/fee at the time of desludging. From these funds, the local government makes payments to the private operators. Payment risks are averted through an escrow mechanism.

III. Implementation approach

Before the cities implemented scheduled desludging, most of the septic tanks were desludged only once in 8 years – 10 years, or when they became completely full and overflowed. Since households did not bear the environmental cost of infrequent cleaning until the tanks overflowed, they treated cleaning of septic tanks more as an emergency service, rather than as a regular maintenance service. In addition to this, septic tank cleaning service was provided by the municipal council vehicle against a fee. Also, there were no septage treatment facilities in Wai and Sinnar and septage was being dumped at a solid waste disposal site.

To resolve this, both the councils implemented FSSM plan in the city with the support of Center for Water and Sanitation (CWAS), CRDF, CEPT University. As per the plan, desludging (emptying) service was provided more as a scheduled service through a private contractor via a performance-linked annuity payment model (refer figure 7). The desludging service was provided as per a planned schedule to cover all residential and non-residential properties over a three-year cycle and the collected septage was treated at a dedicated septage treatment facility. Even the low-income households and those living in slums also received this service. In order to carry out scheduled emptying, both councils signed an exclusive contract for three years through a transparent tendering process with a private operator. Payments were done on annuity basis and based on performance of the operator. In Sinnar, the desludging operator engaged with SHGs to undertake awareness and create a database of septic tanks for scheduled desludging, while in Wai these activities were carried-out by the city council staff. A mobile based application called SaniTab / SaniTrack was set-up to capture information of on-site sanitation systems and to monitor the performance of private sector operator, while the scheduled services were being provided.

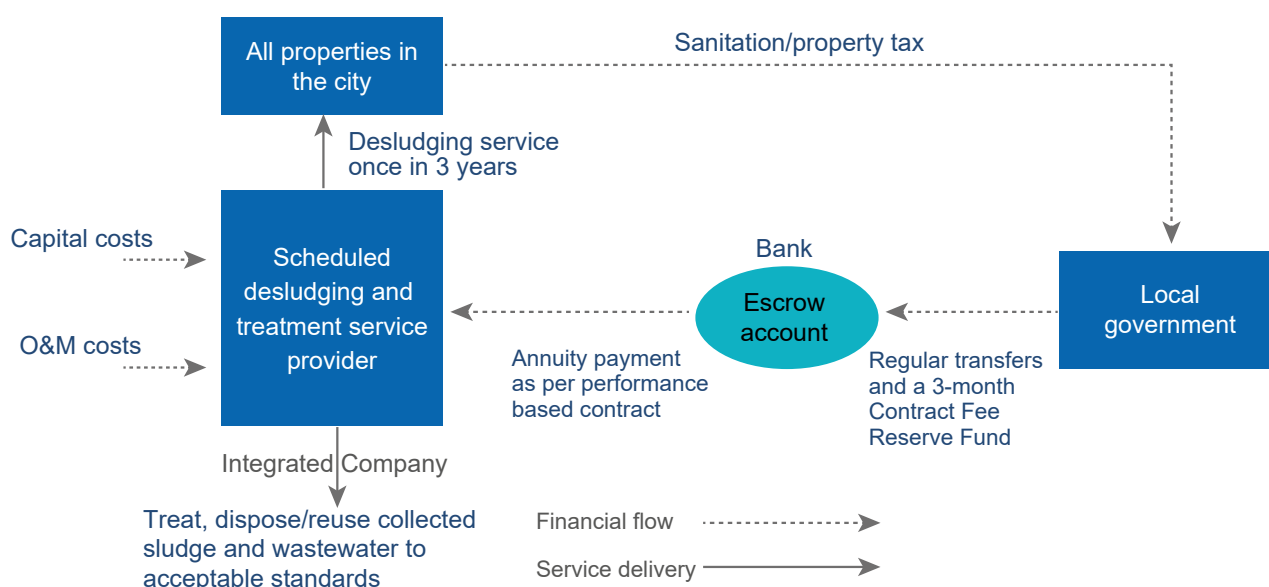


Figure 7: Performance Linked Annuity model (PLAM) of Wai and Sinnar cities

For financing the O&M cost of scheduled desludging services, these cities levied a sanitation tax as a part of property tax. This tax, as well as transfer from property tax, was used to finance the payment to the private contractor. Also, to ensure regular payments to the private sector for the FSSM services, an escrow

account was created, to hold a Contract Fees Reserve Fund (CFRF) and maintained a minimum balance of three months payment to the Contractor. This ensured regular payment to the private operator.

The monitoring of these scheduled services was done by the council officials through a mobile based monitoring application called SaniTab/ Sanitrack. The council would access the app dashboard to review progress and performance of private operator, in line with the provisions of the services.

In Sinnar, Septage was treated at a treatment facility that was funded by the council and was constructed and operated by a private service provider, under a Design Build Operate (DBO) contract with the council. In Wai, the FSTP was constructed and operated by a private operator funded by BMGF.

IV. Highlights

- Scheduled desludging in the two cities was provided as a municipal service to all properties. This made it inclusive and pro-poor as all properties in the city received the service
- The processes that were followed for implementation of these services were as per the norms prescribed by the state government. Hence, this can be replicated across many cities
- Property owners pay a small sanitation tax as a part of the property tax, which is much less than what was paid for demand-based desludging
- Innovative online monitoring tools like SaniTab/SaniTrack were used to monitor the scheduled services

V. Impact

The sanitation tax is structured to be progressive and payments are made incrementally. As a result, smaller properties pay less. The incremental payments and scheduled desludging have made the service more affordable to households (with few households paying approximately one-fifth of what they had previously paid).

A vital aspect which the scheduled desludging caters to is the equitable and inclusive approach for provision of sanitation services. The services are welcomed by the households as it is considered as regular and “free service” provided by local government as they don’t have to pay any money at the time of actual desludging.

In Wai, over the two and half years, 4000+ properties received desludging services with 95% of the property owners welcoming the scheduled desludging service. In Sinnar, in 1.5 years of operation, 2600+ properties received desludging services with the acceptance rate of 93%.

VI. Reflections and lessons

The emerging experience of scheduled desludging in these two Indian cities suggests several benefits including safe, inclusive, and affordable sanitation systems.

- **Inclusive and regular desludging service helps to achieve safely managed sanitation:** All the properties, whether residential or non-residential, avail the scheduled desludging service. This even includes slums and low-income communities. Since regular desludging takes place, the sludge does not get hard and prevents the need for manual scavenging.
- **Reduces high prices of desludging:** With introduction of scheduled desludging, backed by sanitation tax, the user charges do not exist in these cities. Households have to pay much less, annually, as compared to what they were paying for demand-based services.

- **Improves environmental and public health impact:** The scheduled emptying service, along with the treatment facility, reduces contamination of ground water and surface water. The effluents from septic tanks have lesser BOD and faecal coliform after scheduled desludging.

VII. Potential for replication

Given the multiple benefits of scheduled desludging services, and the positive experience from the initiative in two cities, it is now being considered by other cities in the state of Maharashtra. The State Government of Maharashtra is considering a draft policy to mandate scheduled desludging services in all ULBs of Maharashtra.

The Government of India has recognized the importance of scheduled desludging and has recommended three-year interval of desludging in the national FSSM policy (2017), in the advisory on on-site and off-site sewage management (2020) by CPHEEO and also in the ODF++ verification process.

Lead case study contributor: *Center for Water and Sanitation, CRDF, CEPT University*

EXHIBIT 2

MAKING THE DESLUDGING SERVICES AFFORDABLE FOR URBAN POOR IN BHUBANESWAR

Background

Bhubaneswar, the capital city of Odisha is growing at a fast pace, which is accompanied by challenges of providing people of the city with good quality basic amenities such as water and sanitation. The city has 436 slums, constituting 3,01,611 people, which is approximately one-third of the city population (source: 2011 census). The Bhubaneswar Municipal Corporation (BMC) realized that lack of sanitation affects marginalized communities. Hence, the infrastructure mechanisms must address the needs of the under-served populations—women in particular—to ensure safe, equitable, and sustainable sanitation for all. People living in these slum areas have either connected their toilets to the drains or constructed single pits. Only a handful of households have constructed proper septic tanks. The problem of having a single pit is that it fills up quickly, requiring attention quite frequently. Consequently, this puts the family under severe financial constraints.

Intervention

The Bhubaneswar Municipal Corporation in its endeavor to provide access to affordable FSSM services to urban poor, decided not to charge the current rate *i.e.*, INR 900/- per trip. Instead, it decided that only operating cost shall be recovered from the beneficiary. Hence, an amount of INR 492/- + taxes, per trip, was approved. The subsidized services were launched for 22 wards out of 67, as a pilot.

With the help of community mobilizers working in the slums, the ULB aggregated the demand, which was generated in the slums, making it financially viable to provide these services, instead of making losses. Further, to make it more convenient for the slum dwellers, the community mobilizers chalked-out a schedule for desludging of the containment units, in consultation with the community members. This would not allow the containment unit to overflow and sustain the demand aggregation.

Impact

- The subsidized model has been scaled to all the slums of the town.
- The subsidized model has made the services affordable to the urban poor.
- Since, it's an aggregated model, the slum dwellers in the city will now be able to access de-sludging services at a subsidized price of INR 290.

9. ADOPTION OF STANDARD LICENSING AGREEMENTS FOR PRIVATE DESLUDGING OPERATORS IN TAMIL NADU

Abstract

Tamil Nadu relies on an established market of over 9,000 private desludging operators to service the septic tanks prevalent in its urban areas. While these operators offer competitive on-demand desludging services, they are only partly regulated, and often resort to unsafe disposal of faecal sludge. To streamline the desludging process, the Government of Tamil Nadu has focused on the provision of adequate treatment facilities within reasonable distance from customer locations, and has adopted a Standard License Agreement (SLA) system. The SLA mandates desludging operators to adopt proper desludging and disposal practices, promotes use of treatment facilities, and ensures worker health and safety.

I. Context

As per 2011 Census, 48.4% of Tamil Nadu's population live in urban areas, making it one of most urbanized states in India. The urban areas in the State are categorized into a three-tier hierarchy consisting of Municipal Corporations, Municipalities and Town Panchayats. Within these urban areas, on-site sanitation systems (OSS) remain the dominant household sanitation arrangement across the state, with nearly 70% households¹² connected to septic tanks and pits. These households rely on services provided by an established market of private de-sludging operators. The key characteristics of this privately delivered service provision are:

1. On-demand service provided by private desludging operators, who are only partly regulated, and often resort to unsafe disposal of faecal sludge and septage
2. Over 9,000 private de-sludging operators across the State, offering sufficient competition in the market
3. Prevalence of significantly varying containment sizes that hinder implementation of standard desludging frequency
4. Low frequency / no de-sludging as a result of factors such as large size of septic tanks among others, with the exception of hilly areas
5. Reasonable de-sludging charges, except in hilly areas and areas where inadequate number of de-sludging trucks operate

Several studies undertaken as part of the Tamil Nadu Urban Sanitation Support Programme (TNUSSP) involved discussions with desludging operators across the State on the challenges of their desludging business and operations. The crucial challenges identified were:

1. Lack of adequate treatment facilities or safe disposal facilities within reasonable distance from customer locations leading to the operators travelling long distances to dispose septage or resorting to open-dumping
2. Lack of awareness, training and inadequate Personal Protective Equipment (PPE) that results in operators being exposed to dangerous environments and health hazards

II. Intervention

The main objectives of the model adopted by Tamil Nadu were:

1. To ensure and enable proper desludging practices by improving access to treatment facilities and removing barriers to safe disposal
2. To ensure minimal disruption to existing desludging businesses and protection of livelihoods
3. To ensure worker health, safety and welfare
4. To ensure affordable desludging services to the urban poor

This was achieved through the provision of adequate treatment facilities within a reasonable distance of customer sites, and a Standard License Agreement that streamlines the collection and conveyance process, and aligns desludging operations with the cluster approach. With minimal disruption to the existing market that services a majority of the population, the model incorporates approaches to service the urban poor at affordable rates and is supplemented by efforts to ensure safety of service providers.

III. Implementation approach

The key steps involved in the implementation of the regulation model included:

1. **Provisioning treatment facilities through the State Investment Plan:** To address the need for appropriately located disposal facilities, the Government of Tamil Nadu (GoTN) developed and adopted a State¹³ Investment Plan in 2018 to scale treatment across the State. The plan was based on clustering Urban Local Bodies (ULBs) around treatment plants that optimized distance travelled by operators as well as the utilization of the treatment facilities. The plan leveraged the cluster approach proposed in the GoTN's Operative Guidelines (OG)¹⁴, and the information gathered through baseline studies, wherein ULBs were clustered around both existing and potential treatment facilities within a 10 km radius (average travel distance of desludging operators).
2. **Adoption of a Standard License Agreement (SLA):** The GoTN issued Government Order (G.O (2D) 35)¹⁵ in early 2020 to operationalize the cluster approach and to activate a state-wide Standard License Agreement for private de-sludging operators. This would help in regulating the disposal process and promoting the continued usage of treatment facilities. The SLA also aligned the desludging operations with the cluster approach.

Through the Standard License Agreement, the GoTN has mandated:

1. 'Host ULBs' (i.e. ULBs where treatment facilities are located) to license private de-sludging operators serving within the cluster. Desludging operators operating across ULBs will need to register vehicles with other ULBs including the Host ULB
2. Desludging operators to apply for a license on a yearly basis
3. Desludging operators to provide documents on vehicles and workers, while applying for licenses, and to equip their vehicles with approved GPS devices that can be accessed by ULBs
4. Desludging operators to undertake periodic health and safety training for employees, while maintaining a log book on usage of safety gears
5. ULBs to charge desludging operators a nominal License Fee of INR 1,000 per year and a tipping fee of INR 100 per load (at the disposal facility)
6. ULBs to periodically publish a list of licensed operators to ensure households and establishments engage only such licensed operators
7. ULBs to share information on filing complaints / grievance redressal, as well

The SLA is currently being operationalized across Tamil Nadu through capacity building webinars and digital-blended learning modules. Additionally, bye-laws for Septage Management framed as a part of the OG have been updated to align with the provisions of the SLA. The bye-laws once enacted by the ULBs will be essential to enforce the licensing of desludging operators at the cluster level and enable ULBs within clusters to direct desludging operators to Host ULBs to apply for a license.

While the GoTN has opted to regulate and enable existing on-demand desludging services provided by private operators, certain ULBs continue to run subsidized services. ULB-run or contracted desludging services may be introduced in ULBs without sufficient private players, to ensure residents can access competitively priced services.

Additional service models for equitable service provision are also being explored. These includes:

1. Informal settlements: ULB-run/contracted or private on-demand service at affordable rates.
2. Bulk Generators (Community/Public Toilets): ULB-run/contracted on-demand/scheduled service at subsidized rates.

IV. Highlights

Tamil Nadu's model for desludging service provision both regulates the desludging process and promotes the on-demand service provided by the private sector without price interventions. The key differentiators of the model include:

1. Streamlining of desludging process, by providing access to adequate treatment facilities through the cluster approach
2. Providing desludging operators with access to larger markets through the cluster approach
3. Promoting the use of disposal facilities and removing disincentives by reducing financial burden through minimal license and tipping fees
4. Minimizing disruption to a functional market with no price intervention
5. Addressing the safety and welfare requirements of the sanitation workers

In addition, the SLA complies with the provisions of the GoTN's Operative Guidelines, guidelines of the Ministry of Housing and Urban Affairs, and the parameters mentioned in the Swachh Survekshan 2020. Primarily aimed at preventing open disposal of FS and septage, the SLA also reinforces the cluster approach.

V. Impact

While the GoTN is in the process of operationalizing the standard regulated on-demand desludging model across the State, it is envisaged that this model of desludging service provision will contribute significantly towards reducing the amount of untreated FS and septage being let out into the environment. The model will protect the livelihoods of private desludging operators, who are often small, family-run enterprises, by removing barriers and reducing disincentives, while promoting the health and safety of sanitation service providers.

VI. Reflections and lessons

The desludging model adopted by the State of Tamil Nadu provides a light-touch regulation to a thriving on-demand desludging market. It promotes usage of treatment facilities by reducing the financial burden on private operators and limits rent-seeking opportunities. Nonetheless, there are challenges anticipated

as a part of the operationalization process. The different licensing systems existing in certain ULBs would need to be standardized, along with license and tipping fees. Also, the key to the sustainability of most governance mechanisms is enforcement, and a will to make concerted efforts to create awareness and build capacity.

VII. Potential for replication

This model for desludging service provision can be replicated in contexts where sizeable private desludging markets, with sufficient numbers of operators are available to offer competitive services. In places without a large presence of private desludging operators, a similar model can be adopted with government support for desludging enterprise development. With the model complementing the cluster approach with provision of treatment facilities, it can be adopted across both urban and rural areas.

REGULATED DESLUDGING IN ANDHRA PRADESH

In Andhra Pradesh (AP), Swachh Andhra Corporation (SAC) has been established to monitor FSSM-related activities across the state. Earlier AP had issued FSSM regulations and septage management guidelines and one of the key aspects of the regulations mandated licensing of private desludging operators and tracking of FS disposal. The goal of licensing private desludging operators and tracking FS disposal was to ensure safe Emptying & Transportation of FS to protect public health and the environment. As an essential step to operationalize the regulations, SAC initiated licensing of private operators in all the ULBs where FSTPs were being initiated. To obtain the license, private operators were required to ensure that the vehicles matched the approved standards, workers were equipped with uniforms and required PPE, and vehicles were installed with appropriate GPS devices.

The ULB with functional FSTP in the state was equipped with a real-time monitoring system to make sure desludged FS was disposed-off at the FSTP. The ULB maintained a list of licensed operators on its website to provide customers the ease of access to information and had a toll-free number for sanitation queries. Any desludging request submitted to the ULB was passed on to licensed operators. The ASCI also provided training to desludging operators on desludging standards and procedures, including the correct usage of PPE.

Lead case study contributor: *Indian Institute for Human Settlements (IIHS)*

Other contributors: *ASCI*

10. CITY-WIDE MANAGEMENT OF FSSM SERVICES: EXAMPLES ON ENABLING ENVIRONMENT AND SERVICE DELIVERY

Abstract

This case study discusses the approach and specific interventions taken in Warangal, Telangana towards achieving universal access to safe toilets in all its urban areas, particularly about the introduction of S-Line, a sanitation helpline. It underlines the importance of establishing a single point of contact for providing information about various aspects of FSSM services which can help enhance service delivery by municipalities, specially to serve the poor and vulnerable.

I. Context

Warangal, the second largest city in Telangana, having a population of around 10.88 lakh (as per the provisional reports of Census of India, the city had a population of 8,18,974 in 2011) and is spread about 407 sq.km. Warangal, as many other emerging cities in India, had been experiencing significant service delivery gaps, particularly in the area of sanitation. The city has over 180 low-income settlements, housing 30% of the city population. Open defecation was prevalent due to gaps in access to toilets and due to cultural and behavior issues. Public toilets and community toilets were in short supply and existing ones were dysfunctional without any service delivery standards. On-site toilets were being built without any design standards leading to pollution of drainage network, surface and groundwater. Faecal waste management was unregulated (vis-à-vis, quality and price) and septage continued to be illegally disposed on land and in water bodies. All this significantly contributed to the pollution of the water bodies due to wastewater flows. A lack of credible information on sanitation also hampered the planning process.



II. Intervention

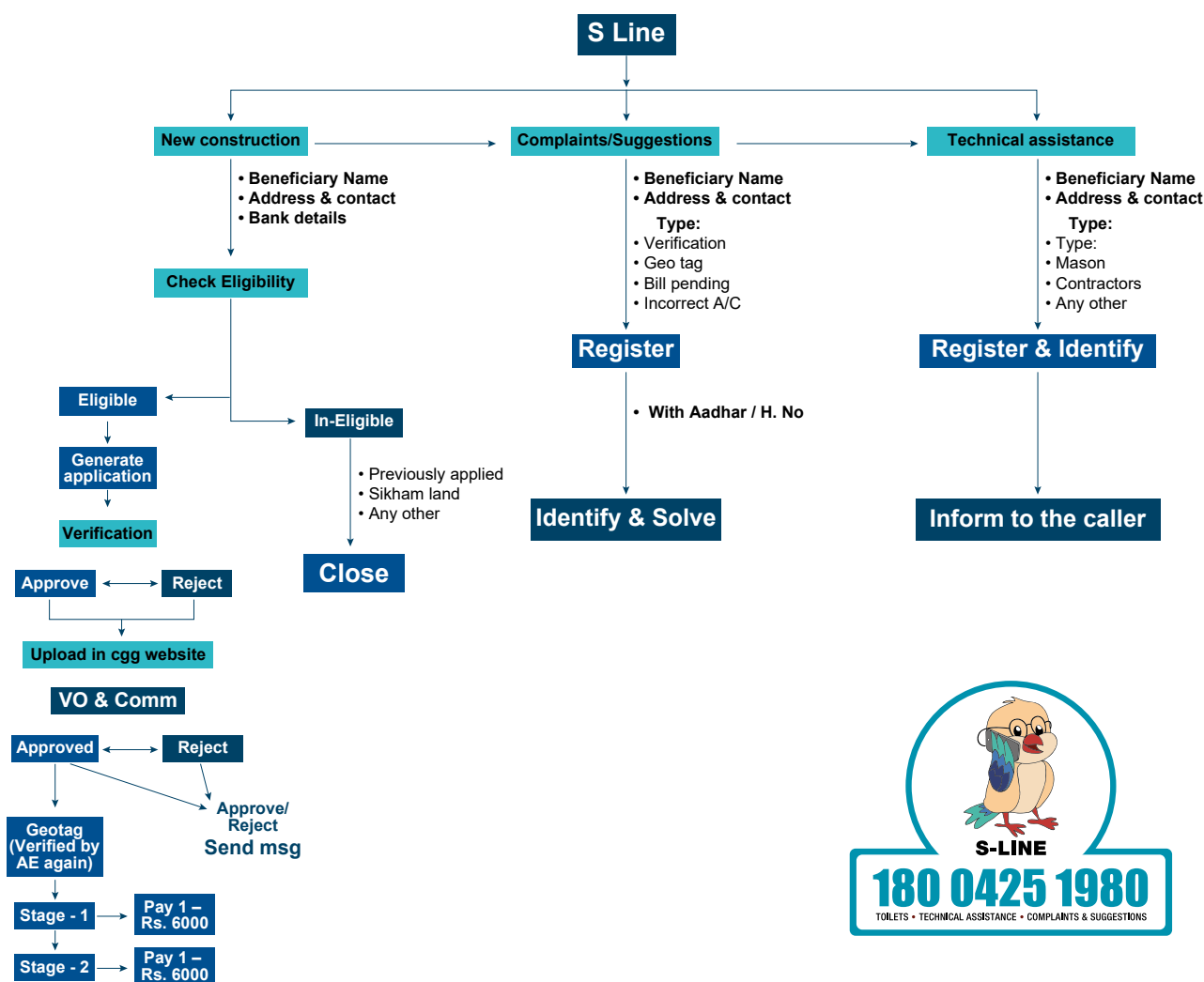
In order to enhance access to toilets, a single point contact for providing necessary information, technical assistance and receiving complaints & suggestions, the S-Line—a sanitation helpline—was launched by the Honorable Mayor of Warangal and Commissioner, Greater Warangal Municipal Corporation (GWMC) on 26th May 2016. A Project Implementation Unit (PIU) was constituted for speedy implementation of sanitation improvements in GWMC. The PIU, headed by Additional Commissioner and comprising members from the related departments of sanitation, town planning, etc., met once in a week to review and ensure progress of work.

III. Implementation approach

The Greater Warangal Municipal Corporation (GWMC) was committed to change this situation as there was a deep sense of awareness that provision of high-quality sanitation services produced enhanced economic productivity through public health improvements. However, raising resources to finance large scale sewerage infrastructure (flush and forget model) projects was not an easy option and was not sustainable. ASCI had been extending technical support to the Greater Warangal Municipal Corporation (GWMC) to improve sanitation across the value chain.

With the introduction of the Swachh Bharat Mission, the Government of Telangana also prepared an action plan for achieving ODF through construction of IHHL and public sanitation facilities under the Swachh Bharat- Swachh Telangana Mission. The Commissioner and Director of Municipal Administration (CDMA) issued guidelines in 2015 (G.O. Rt.No. 155) that directed the urban local bodies (ULBs) to work towards achievement of the action plan using a combination of infrastructure, process and behavior change interventions. The State earmarked budgets, clarified the subsidy flow process and established an Information Communications Technology (ICT) based system for supporting implementation and for real time monitoring of the construction progress. The subsidy for the construction of a new IHHL as finalized stood at INR 12,000 per beneficiary and the process for availing it was also established. All concerned municipal functionaries were trained to facilitate this process and on quality of containment systems. Training was also undertaken for masons on different toilet typologies, containment systems, cost estimations, etc. ULBs were encouraged to undertake IEC campaigns to create awareness and demand for construction of new IHHLs particularly by engaging slum sanitation committees, resident welfare associations, and self-help groups through the Mission for Elimination of Poverty in Municipal Areas (MEPMA) and to set up helplines to fast track the process.

Warangal established a Sanitation helpline (S-line) in May 2016 as a single point of information, service, and complaint redressal center for citizens. The S-line number was promoted extensively across the city on public toilets, government-owned properties, desludging vehicles and other avenues. The city also started an “I Want a Toilet” campaign using different physical and digital media to promote S-line number and IHHL construction. The solutions to support the poor, such as decision to allow construction of IHHL on non-tenured land, provision of finance through self-help groups to initiate construction, fast disbursement of subsidies, technology solutions to address constraints arising from space and terrain were finalized during the weekly PIU meetings.



IV. Highlights

It was observed that there was a significant increase in the number of phone calls and walk-in enquiries by women over the last few years which indicated that the system was convenient for women to raise their concerns as it was met with quick redressal of their concerns. The new application process that was established also reduced the processing time from 3 months to 1 week, which not only fast-tracked the process but also helped to reach out to the larger sections of the population.

V. Impact

S-Line has been instrumental in helping the city to achieve its ODF status and has also evolved itself to form an active interface with the citizens. As of August 2020, 3762 complaints were registered and redressed through S-line. Of these, 231 were to provide technical assistance such as design of septic tanks and toilets, contact details of masons trained to build safe toilets, etc. Further, 47417 new applications were received for construction of new IHHLs and 6394 applications were received for conversion of insanitary toilets to safe ones.

VI. Reflections and lessons

The introduction of S-Line in Warangal has been beneficial as the citizens have access to trained staff to support them on all aspects of septage management, including septic tank design, approval process of IHHL subsidiary, methods of construction, and contact details of masons and desludging operators, among

others. There has been increased demand for construction of new IHHLs and conversion of insanitary toilets to safe ones due to increased awareness among the citizens about safe sanitation and FSSM services. Most of the grievances are redressed within a time window of 36 hours, and there is ease of monitoring the process as well. To sustain this intervention, GWMC has integrated the S-Line into the municipality that not only helps the citizens with toilet related issues but also septic tank related issues (mainly cleaning of the tanks). Therefore, the S-line has made it easy for the GWMC to address various issues on toilets and septic tanks. The S-Line and PIU has helped the citizens of Warangal to raise their issues and challenges right from the application for an IHHL, through its design, construction, availability of subsidy and maintenance of the toilets. It has also helped to increase awareness about owning and using a toilet.

VII. Potential for replication

This intervention has been able to fast track the achievement of the ODF status in Warangal, and is a clear example of how a single point of contact for providing information about various aspects of FSSM services can facilitate the enhancement of service delivery by municipalities, especially to provide value to the under-served. The same initiative has been adapted in Narsapur of Andhra Pradesh and has achieved similar success. This indicates the positive replicability of the model.

Similar kind of initiative has been taken in Ahmedabad, Gujarat and the details are mentioned below.

No objection certificate (NOC) for water and drainage connection – Ahmedabad

The “500 NOC scheme” provides slum residents with a ‘No Objection Certificate’ to have a legal access to individual sewerage, water and electrical connection on payment of a fee of INR 500. The objective of the city government was to ensure universal coverage of water and sanitation services in slums. The eligibility criteria were that an applicant should have a dwelling unit of not more than 40 Sqm in a slum and should submit a residence proof. The fee is much higher for bigger houses.

In order to facilitate individual household toilets, the individual applies to the zonal office for an NOC with the requisite information. The Estate department conducts site visit to the applicant’s residence to measure and prepare building plan sketch to ensure the dwelling unit is less than 40 Sqm and if the dwelling is eligible for the NOC, a “resolution” certificate to the City Civic Center (CCC) is issued. The beneficiary pays INR 500 to the tax department and gets the NOC receipt. Thereafter, a photographer is sent to take the photo of the beneficiary. Once the NOC is issued to the beneficiary, the charges for individual sewerage and water connections can be applied as INR 300 and INR 200, respectively. A sewerage connection is a prerequisite for an individual water connection. Investment in the provision of basic infrastructure has led to shelter upgrading and transformation of slums.¹⁶

Lead case study contributor: Administrative Staff College of India

Other contributors: Center for Water and Sanitation (CWAS), CRDF, CEPT University

Role of digital technologies in FSSM

Technology is a strong enabler, and incorporating it into the FSSM value chain has manifold benefits, including effective monitoring, increased transparency and accountability of stakeholders, that eventually results in better service delivery at the grassroots. Understandably, Central and State FSSM frameworks, therefore, place great thrust on the use of SMART solutions to help optimize and improve the FSSM value-chain.

The table below explores some of the SMART solutions that have been deployed in different states as part of the respective state's FSSM strategies:

Table 4: Use of digital technologies in FSSM

Technology	Details	State / City Practice	Impact (On-going and expected)
GPS usage, central tracking through common control centers.	To ensure efficient and accountable desludging operations, GPS based vehicle tracking and monitoring systems have been deployed. This ensures real time monitoring of operations on the ground.	All cesspool vehicles functioning across ULBs in Odisha (both the government procured and private vehicles), are installed with GPS monitoring mechanism. In Bhubaneswar, in particular this is linked to the Smart Cities command and control center and monitored through that. A similar centralized mechanism is also being considered for the remaining parts of the state.	GPS tracking has resulted in greater accountability among stakeholders, especially when coupled with incentive and penalty structures. Real-time monitoring has also improved plant utilization from an erstwhile 10-20% capacity, to over 100% in some areas. 8 hotspots where sludge is frequently illegally discharged in Bhubaneswar has been geo-tagged. Any movement of vehicles in these areas are immediately alerted to the relevant authorities.
FSSM operator applications	Apps and digital technologies like the FSSM Tracker app (Warangal), and the SANI-Track technology (Wai, Sinnar) help licensed FSSM operators with the desludging process through the dispensation of schedules, and by helping they record septage collection on a real time basis. Accurate capture of data on desludging, and validation checks through customer and operator signature capture is also made available.	Deployed in Wai and Sinnar cities of Maharashtra and in Warangal Municipal Corporation area, Telangana	By effectively recording and monitoring service delivery, these technologies help regulate cesspool operations and increase accountability of FSSM operators both government and private. In doing so, they also incentivize FSSM operator performance, and help with better adherence to FSSM regulations.

Technology	Details	State / City Practice	Impact (On-going and expected)
SANI Track for desludging services linked to payment	SANI-Track is a web enabled monitoring system that operates similar to an e-commerce app, and enables real-time monitoring, and records daily operations in a paperless format. Offers end-to-end monitoring of FSSM, and is capable of covering scheduled and on-demand desludging. Automatically generates reports on desludging, and allows for the linking of payments to the monitoring app.	Currently being used in cities of Wai and Sinnar, Maharashtra, which leverages private desludging contractors. These are also expected to be deployed in Kolhapur and Satara soon.	The app presents data on the properties requiring service, and enables the operator to record data on the desludging carried out, such as volume, PPE usage, customer feedback etc. The app also provides geo-location of FSTPs and warns against illegal disposal, thereby enabling officials to know if desludging has been properly carried out. The records generated through the capturing of real-time information can help process payments to service providers based on performance.
Customer requisition apps / online – S-line model of Warangal	Customer requisition apps provide customers with online assistance, including recording service requests, grievance redressal and offering technical assistance as needed. Sanitation Helpline (S-Line), deployed in Warangal is one such example.	S-Line was launched in 2016 at the Greater Warangal Municipal Corporation, Telangana.	S-Line is manned by trained staff who have been able to support citizens on all aspects of septage management. It is able to address citizen queries on eligibility of new constructions, and provide technical assistance in the form of connecting them to registered masons and other contractors. It also addresses customer queries regarding pending bills to verification requests.
Monitoring platforms – SANI-Track, SANI-Tab and San-Q and other dashboard tools	IT enabled monitoring platforms help with real-time data capture across the FSSM process chain and helps with processing the same with minimum human intervention. These prove invaluable when it comes to tracking / monitoring performance of FSSM operations. SANI-Tab – originally a survey tool captures spatial details that are plugged into a web-based dashboard allowing quick analysis. SANI-Track's usage also captures real-time data, and generates reports on desludging, conveyance and customer satisfaction. SANI-Q on the other hand monitors real-time water quality at the FSTP	Deployed at Wai and Sinnar cities in Maharashtra. Deployed in Odisha	Taken together, the monitoring platforms offer real-time across capture, containment and treatment cycles. The data recorded is easily understandable, accurate and offers potential for in-depth analysis of the cities' FSSM initiative by targeting areas requiring improvement or better enforcement. Also empowers local officials to take ownership of the process. Expected outcomes: The dashboard shall be visible at the highest level of stakeholder and any red flags in terms of FSSM implementation at any geography shall be timely and effectively addressed

Technology	Details	State / City Practice	Impact (On-going and expected)
	FSSM monitoring dashboard – A three tier dashboard for monitoring and troubleshooting all FSSM related activities including milestone and regular. The dashboard is updated by at the ground and reviewed at three levels. First at ULB, followed by district and finally by state. A notification system is enabled to make sure the relevant stakeholder is made aware at the right instance and can take any steps necessary. Other digital monitoring tools – Digital monitoring tools are used to report and evaluate three major activities by the key decision makers regularly. The three activities are construction and invoice payment progress and operational plant utilization.		Every day the utilization of the operational plants is reviewed. This has helped in increasing utilization from less than 20% to more than 60% Weekly monitoring of construction and payment against invoices has helped streamline construction activities and payments to vendors have become more timely.
Smart contracting	Smart contracting to reduce any redundancies in the current contracting due to human intervention	Odisha	Expected outcomes: Timely payment Standard Operating Procedures and checklists to enable payments Greater transparency in the payment systems Ensuring time work delivery by contractor

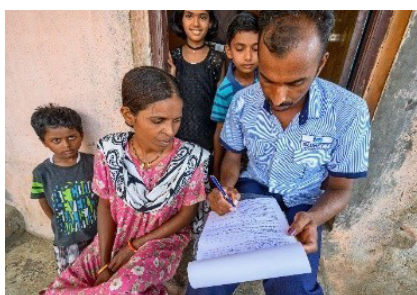
11. DIGITAL TECHNOLOGY IN FSSM OPERATIONS IN MAHARASHTRA

Abstract¹⁷

Wai and Sinnar are the first cities in India to implement scheduled desludging of septic tanks for all properties. Both city governments have entered into “performance-based” contracts with private service providers for FSSM operations. This means that payments will be subject to satisfactory performance. In order to monitor these services, the cities have deployed a range of digital applications – SaniTab, SaniTrack, SanQ—which help ensure that sludge is collected regularly and delivered to correct location and treated to standards, while following all safety protocols. The information is real-time and requires minimum human intervention for processing. These applications also help collect valuable information on on-site sanitation systems in the city, and help build a database for future use.

I. Context

To address the issue of irregular emptying of septic tanks, scheduled desludging plans were implemented in Wai and Sinnar in Maharashtra. In each of these cities, a private service provider was contracted to desludge all septic tanks on fixed schedule, spanning three years. The faecal sludge treatment plants were also set-up where the operating agencies are mandated to treat the sludge in adherence to disposal quality standards. The contracts between the city government and the private service providers are “performance-based,” which allow for payments to be made based only on satisfactory performance.



Such performance-based contracts require robust monitoring systems at each stage of service. Initially, this was done through paper-based forms, receipts, reports and logbooks. Such systems are fragmented, time-consuming, labor-intensive, and do not provide real-time information. They also do not provide insights for system improvements such as geo-spatial spread, coverage of properties, customer satisfaction, volumes and trips, coverage of vulnerable areas etc. Moreover, desludging operations were based on very basic datasets of onsite systems. All previous experiences suggested that differences in sizes, accessibility, owner perspectives, emptying history could potentially affect operations. The implementation of scheduled desludging provided the opportunity to mandatorily visit each and every septic tank and over the course of a three-year cycle, build a detailed and unique database of onsite systems in both cities. It is very rare for cities to have this kind of data, which is very useful for future planning.

To address such monitoring and database requirements, the cities needed SMART solutions. The experience in Wai and Sinnar demonstrated easy adoption of digital tools and a potential to replace paper-based monitoring systems.

II. Intervention

For monitoring service delivery for desludging, an online, web-enabled monitoring system called-SaniTrack was developed. It consists of mobile app and web modules, where the desludger schedules and records daily

operations with signatures like in an e-commerce app, allowing city managers to see real-time information on (i) geographical coverage, (ii) schedule progress, (iii) household readiness, (iv) safe conveyance from household to FSTP, (v) customer satisfaction and (vi) use of PPE, on a dashboard. The dashboard offers key performance indicators, timeline filters, map-based insights, and also allows downloadable data for more detailed analysis. On the other end, SaniTrack simplifies the process of maintaining paper forms by reducing it to clicks, signatures on a screen, and automatic location/time crosschecks. These can later also be downloaded in the form of individual reports containing addresses, photographs and signatures, similar to a paper-based form.



The second initiative—**SaniTab**, is a smartphone/tablet-based survey tool, which was initially developed for conducting household level surveys to generate a baseline data of a city's sanitation status. The data collected was plugged into a custom web dashboard allowing for quick analysis. It also captured spatial details, making it possible to identify and focus more on the vulnerable areas. The tool was enabled to capture details during desludging services. It also captured details on desludging operations, along with relevant information on septic tanks, such as (i) location and accessibility, (ii) access covers, (iii) size and shape (iv) build quality (v) owner perspectives.

Thirdly, **SanQ**, consists of hardware setups at the FSTPs allowing real-time monitoring of output quality of treated wastewater. Such instant readings allow for quicker system improvements compared to physical lab reports.

III. Implementation approach

SaniTab and SaniTrack were developed by CWAS in partnership with an app developer. The server space and domains were procured before deployment. Initially, local teams from CWAS operated the apps and dashboards. However, with some capacity-building, local desludgers were equipped to use the app modules, and city officials took ownership of the dashboards.

SaniTrack consists of five modules –

1. Mobile app module for desludging manager – Managers can select from a list of properties and input daily schedule
2. Mobile app module for desludging operators—Operators are presented with their daily schedule. On selecting each property, information is provided on its location, address, owner name and type of sanitation system. Operators can record information when desludging is carried out. Data

on sludge volume, PPE usage, customer satisfaction, respondent gender, timestamp, photograph etc. is captured. A completion is acknowledged by household respondent by signing on the mobile app. Upon arrival at FSTP, the app checks geolocation and warns if not near FSTP location. FSTP operator acknowledges receipt with another signature.

3. Web dashboard for city managers—An overview screen provides information on coverage and key performance indicators such as coverage of properties, rate of desludging and volume of sludge. A second screen gives spatial views on a map with filters and charts for more detailed indicators such as customer readiness, acceptance rate type of properties, trips, PPE usage, respondent gender etc. Each property can be selected to see the signatures and photographs. Downloadable results are available in the form of spreadsheets as well as individual reports.
4. CT/PT desludging app module—For municipal operators who service septic tanks at community and public toilets.
5. Admin module—This has a screen to register new households, service operators, trucks/contractors and manage system users.

SaniTab is highly customizable and allows upload of user defined questionnaires. In the past, it has been used for citywide surveys on open defecation, access to toilets, and willingness to construct toilets. Currently two questionnaires for FSSM are active –

1. Desludging services for properties– This captures information on the ongoing desludging process as well long-term information about the onsite system under the following heads -
 - ♦ Property details – identifiers, type, location, owner contact, owner perspectives
 - ♦ Service deliver and desludger performance – type of service scheduled or emergency, volume, trips, use of PPE, issues faced
 - ♦ Onsite system characteristics – type, size/shape, accessibility, emptying history
2. Desludging services for CT/PT

SanQ consists of hardware at the inflow and outflow points which provides readings every few minutes on key parameters such as (i) liquid flow (ii) PH levels (iii) BOD, (iv) COD, (v) Nitrate levels. These are visible on screens available on-site and can also be downloaded or accessed via standard mobile apps.

IV. Highlights

1. The use of digital technology for monitoring of operations leads to process improvements and optimization. Real-time monitoring means that there is no need to process data to view progress and process payments to service providers. The systems are easy to operate, reduce paperwork and minimize human error with select and click screens, automatic geo-stamping, time stamping etc. Digitized data also makes possible a wider variety of filters and analysis.
2. The modules are designed to be empowering and inclusive for desludgers, city officials as well as customers. For desludgers, the apps support vernacular languages and offer click and select mechanisms as well as graphic formats over text. Customer signatures with undertaking raise awareness about procedures while special focus is given on monitoring service provision to vulnerable areas. Local government officers have also shown support with ownership of dashboards.
3. Building a unique and rate database of onsite systems

V. Impact

These technologies help deliver better desludging services by providing constant insights on FSSM processes and ensuring safe conveyance, treatment and disposal of faecal sludge. They reduce human labor and provide simpler methods to monitor and collect data. In Wai and Sinnar, SaniTab and SaniTrack have already captured information on close to 3800+ desludging operations and generated database of as many septic tanks. The city officials have shown interest in the dashboard and now regularly check them to monitor progress.

VI. Reflections and lessons

- Capacity-building support was required for desludgers and city officials to become comfortable with the systems
- Mobile format is easy and is quickly adapted
- Using local language and terms eased the process of learning, while pictures/symbols were required to explain technical terms
- Sanitation workers may or may not own/use smartphones. They are also hesitant to carry their phones while working near septic tanks for fear of dropping them. A training session was held for them
- Mobile network may always not be available as FSTPs are located on the fringes of the cities. Consequently, apps now allow the surveyors to save data in-situ, and submit it once there is internet connectivity
- Scaling-up of apps requires adapting to vernacular languages

VII. Potential for replication

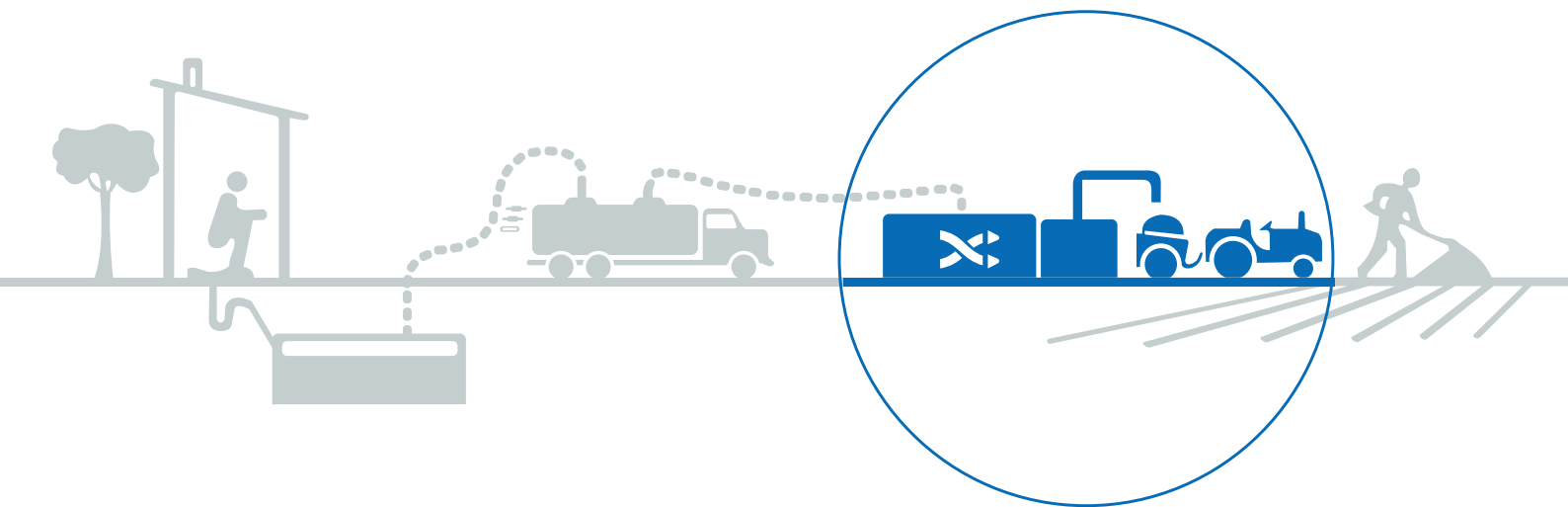
SaniTrack can accommodate various models of FSSM – scheduled or demand-based, service provided by government or the private sector, and single or multiple service providers. SaniTrack is currently being used in cities of Wai and Sinnar, where scheduled desludging has been contracted out by the government to a private contractor. With the Government of India stressing on regular desludging under Swachh Bharat protocols, it is expected that SaniTrack will be widely used. Once institutionalized within the city government, SaniTrack can be used for constant service improvisation, and monitoring tools can be linked to performance-based payments.

SaniTab questionnaires can be customized to city requirements, and like SaniTrack, are applicable to a wide range of service models. Aside from Wai and Sinnar, the tool was used in Odisha for a household survey that covered 70,000 households. Owing to its simplicity, user-friendliness, and easy adaptability, SaniTab has received inquiries from outside of India, as well.

Lead case study contributor: Center for Water and Sanitation, CRDF, CEPT University

SECTION-D

TREATMENT & OPERATIONS



FSTP procurement and contracting models

States have adopted various methods of procurement reflecting their scaling up strategy for FSSM. Figure 8 below shows the landscape of procurement and contracting models possible in FSSM across India. Examples of implementation of each model are then presented in Table 5 below.

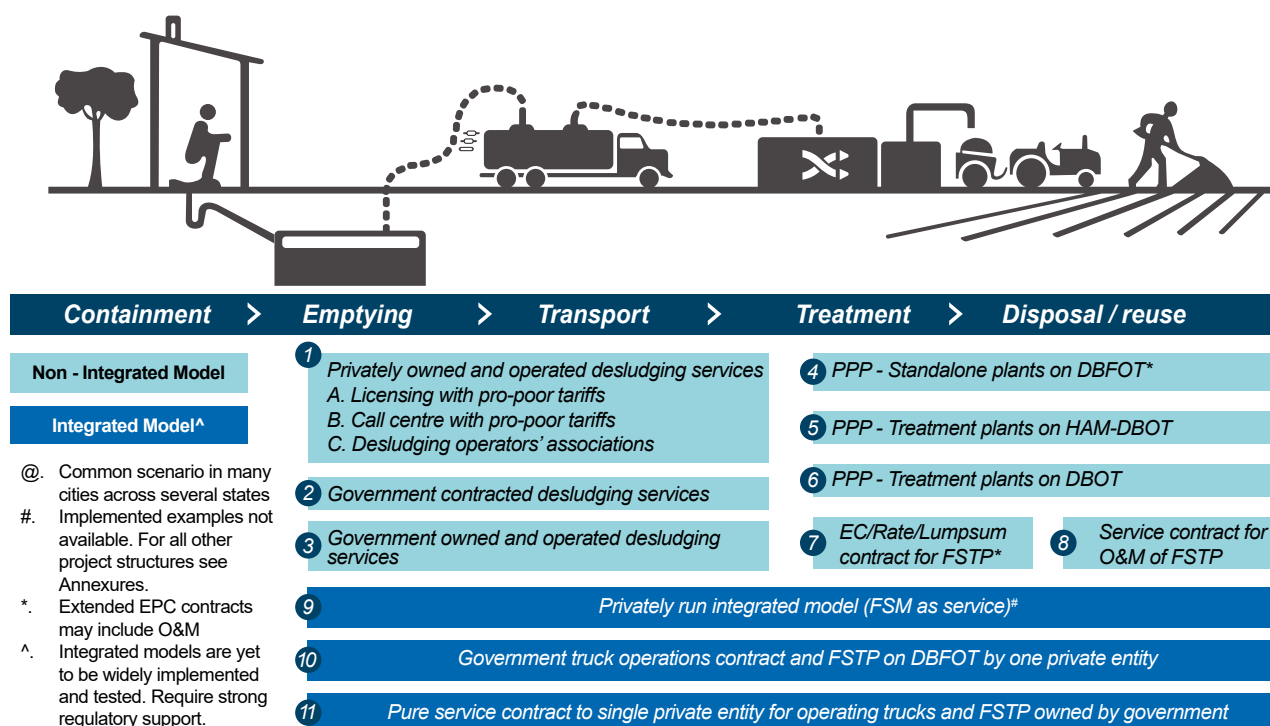


Figure 8: Models of procurement and contracting used in scaling FSSM across India

Table 5: Summary of various FSTP procurement and contracting models adopted across India

Model no.	Location	Financing mode	Unique feature of project
4. DBFOT 5. DBOT-HAM	Andhra Pradesh and Telangana	Capital cost: 50% Capex upon construction Operating cost: 50% Capex and O&M for Concession Period of 9.5 years	1. HAM pioneered for FSSM in India 2. Packages of tenders including multiple FSTPs to make project size interesting for bidders 3. Annuity payments guaranteed by GoAP
6.1 DBOT	Uttar Pradesh	Capital and operating cost: UP Jal Nigam through State funds	1. Bid parameter was a percentage of cost estimated by DJB
6.2 DBOT	Sinnar (Maharashtra)	Capital cost and operating cost: From ULB's own funds	1. Technology neutral tenders 2. Design, construct and operate for 3 years

Model no.	Location	Financing mode	Unique feature of project
7.1 Rate or lumpsum	Maharashtra	Capital cost: Finance commission grants Operating cost: Shared by municipalities	1. Single window technical and administrative sanctions for implementation of FSTPs 2. Simple, easy to implement treatment infrastructure at scale
7.2 Rate or lumpsum contract	Tamil Nadu	Capital cost: From GoTN Operating cost: Shared by municipalities	1. Clustering of municipalities for achieving economies of scale 2. Cost sharing between municipalities for FSTP O&M costs 3. Model scaled up across the State by GoTN
8. O&M service contract	Odisha	Capital cost: N/A Operating cost: Provided by municipality	1. O&M of FSTP outsourced to Self Help Groups for operations
10. Integrated DBFOT	Leh, Ladakh	Capital cost: Blue Water Company (Private entity) Operating cost: User fees & Municipal Council of Leh	1. FSTP 100% privately financed under DBFOT 2. Desludging and FSTP operations by one private entity 3. Fee linked to desludging service – pay for performance model
11. Integrated FSSM service	Lalsot, Rajasthan	Capital cost: ADB grant Operating cost: User fees and/or municipality	1. Desludging and FSTP operations by one private entity

Risk Sharing in FSTP contracts

The success of procurement models hinges critically on the risk allocation between the client and service provider. As FSSM is in a nascent stage, various risk sharing models have been attempted with different degrees of success. In general, models where the liability of regular (monthly, regardless of service provided) fee collection is placed on the service provider, are yet to establish considerable success. Burdening service providers with obtaining approvals and permits also acts as a deterrent to project success due to improper risk sharing. Finally, delayed payments pose the single most significant risk to the viability of the project for a service provider. In most cases, this risk is borne entirely by the service provider, which often makes these projects unattractive for them. Table 6 shows the ideal scenario for risk sharing across a few important risk categories typical to FSTP contracts.

Table 6: Ideal risk allocation across risk categories in various contracting models

Nature of risk	DBFOT & DBOT-HAM	DBOT	Rate or Lumpsum contract	O&M only contract
Design risk	PSP	PSP	ULB	ULB
Construction risk	PSP	PSP	ULB	Not applicable
Approvals (Electricity & water connection, pollution board clearance etc.) risk	ULB; supporting documentation to be provided by PSP	ULB; supporting documentation to be provided by PSP	ULB; supporting documentation to be provided by PSP	Not applicable
Capital financing risk	PSP & ULB	ULB	ULB	Not applicable
Operating cost financing risk	ULB	ULB	Not applicable	ULB
Delayed payment risk	ULB	ULB	ULB	ULB
Force majeure risk	ULB and PSP	ULB	ULB	ULB
O&M performance	PSP	PSP	Not applicable	PSP

Legend:

ULB – Urban Local Body

PSP – Private Service Provider

12. EPC MODEL ADOPTED BY STATE GOVERNMENTS FOR FSTP CONSTRUCTION

Abstract

Almost 500 faecal sludge treatment facilities are already sanctioned in the states of Maharashtra, Odisha and Tamil Nadu. These units shall cater to more than 600 cities and towns. A procurement route of EPC has been adopted by all the states to fast-track the works and streamline the interventions required by the different government agencies involved. Maharashtra with its EPC-rate contracts and Odisha and Tamil Nadu with the EPC- lump sum contracts are all edging towards a cleaner, greener and cost-effective approach to improving public health, reduce environmental pollution and overall well-being of the states.

I. Context

In the three states of Maharashtra, Odisha and Tamil Nadu, managing faecal sludge has gained prime importance. This is due to the excessive amount of sewage that is discharged into the water bodies and the determination of the states to manage their sewage more effectively. The states realized that conventional sewerage sanitation as it is both time and capital intensive. Therefore, adopting the non-sewer sanitation approach for Faecal Sludge and Septage Management is crucial for achieving the target of safely managed sanitation systems, especially in smaller cities.

The final leg of the approach is to set up treatment facilities that enable quality treatment and reuse or safe disposal of the output products. With almost 500 treatment facilities sanctioned, certain parallels can be drawn on the methods used by them in their approach to set up these facilities.

In 2019, the Government of Maharashtra (GoM) has adopted a systematic approach to implement city wide FSSM plans at scale. GoM decided to set up the independent FSTPs in 311 ULB across states through statewide government resolution (GR) dated of 8th November, 2019¹⁸. An administrative approval was granted to use 14th Finance Commission funds to set up FSTPs across ULBs of Maharashtra.

In 2016, Odisha decided to implement Septage Treatment Facilities under the Atal Mission for Rejuvenation and Urban Transformation (AMRUT) scheme. Currently, the state has 11 operational treatment facilities. But for overall coverage of 114 cities and towns more treatment plants are required, and the state has allocated more than INR 300 crores towards construction of these facilities in a phased manner.

In 2018, the Government of Tamil Nadu (GoTN) adopted the State Investment Plan (SIP) focused on scaling of treatment facilities across 663 Urban Local Bodies in phased manner. Along with the SIP, the GoTN made a budgetary allocation of INR 200 crores for the construction of 49 Faecal Sludge Treatment Plants (FSTPs). Subsequently, in 2019, an additional INR 31 crores were sanctioned for the creation of FSTPs in 11 Town Panchayats.

II. Intervention

The states have adopted the EPC approach to procurement of civil contracts. While Maharashtra has chosen an EPC-rate contract route, the states of Odisha and Tamil Nadu have gone ahead with an EPC-lump sum contracts route for construction of treatment facilities. These contracting mechanisms are most



Figure 9: A plant under construction in Odisha

commonly used for all types of engineering works financed by public or government bodies. This type of contract is most suitable for small and medium towns in terms of technical and management capacity of local staff to fast track implementation and ensure adequate participation from private contractors to comply with criteria for competitive bidding.

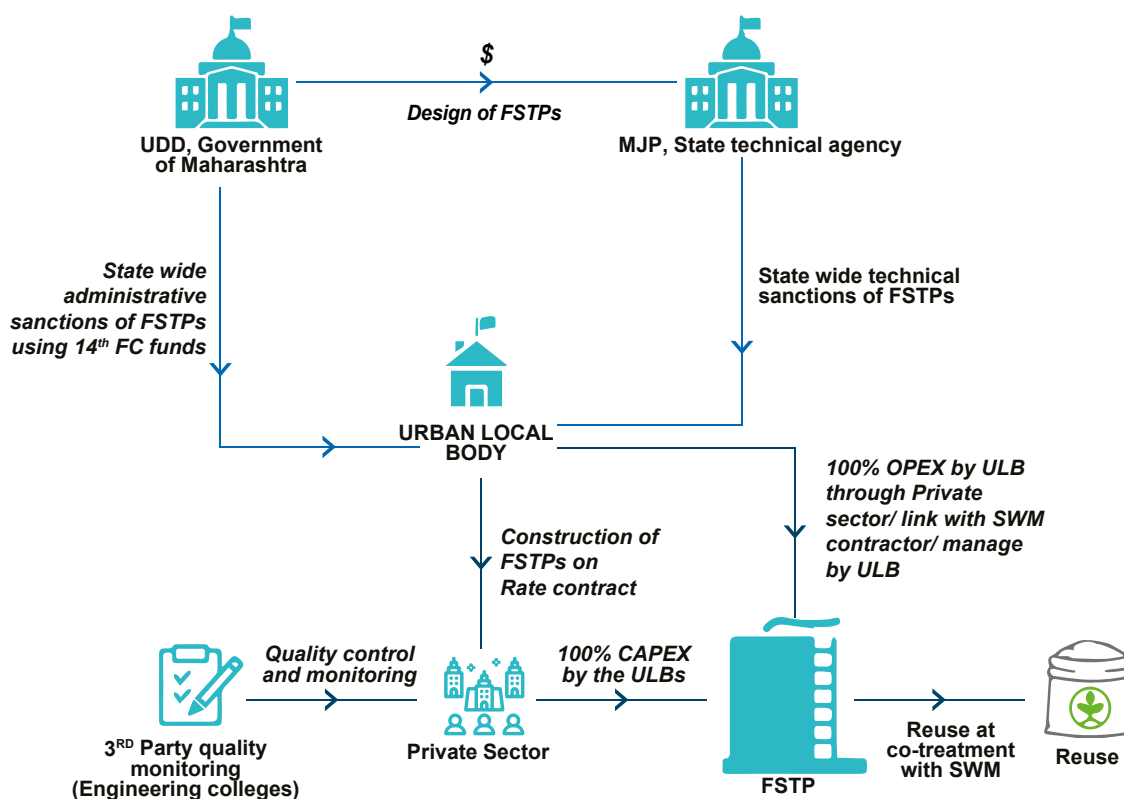


Figure 10: EPC contracts in Maharashtra

Maharashtra adopted a single-window clearance approach to implement state-wide implementation of Faecal Sludge and Septage treatment facilities in the state. All ULBs in the state were classified into 3 categories, a) ULBs with functional sewerage treatment plant (STP), b) ULBs that can treat faecal sludge at a nearby STPs and c) remaining ULBs that will need an independent faecal sludge treatment plant (FSTP). The 311 ULBs which are entirely dependent on onsite sanitation systems and where no sewerage projects are under consideration for the near future, had to construct their own FSTPs. For this, the state government adopted single window approval system for both technical and administrative approvals at state level.

Odisha, through the parastatal of Orissa Water Supply & Sewerage Board (OWSSB) floated tenders under lump sum EPC contracts. These tenders were floated by OWSSB for contracts between contractors and Public Health Engineering Organization (PHEO), Water Corporation of Odisha (WATCO) and ULBs. OWSSB has adopted a competitive tendering process for the construction works of one year and one month of trial run. Most projects have been taken by local players while some of the contracts are with players from outside the state. The single tendering entity ensured that a single entity specializing in setting up treatment facilities could utilize its experience and abilities to push Odisha forward in construction.

The complete documentation work for the EPC model of contracting was taken up by the OWSSB. The Detailed Project Reports were prepared immediately for the sites along with the tender documents. The technological specifications for the plants were specified in the Detailed Tender Call Notice (DTCN) and the facilities' construction is taken by the ULBs or Public Health Engineering Organization (PHEO).

In Tamil Nadu, the ULBs used standard civil works contracts, which were customized to suit local requirements, to avail services for the construction of the 60 sanctioned FSTPs. Adopting a competitive bidding process, ULBs awarded construction contracts, including O&M services for a trial period, to mainly local private contractors.

III. Implementation

As a part of the FSTP implementation process, the GoTN considered three technology options. These included discrete biological and mechanical systems as well as a hybrid biological and mechanical option. The GoTN opted for the biological systems given their operational simplicity and lower Operation & Maintenance (O&M) costs.

Subsequently, state-level orientation sessions on the treatment technology and type designs were organized for ULB officers, engineers and contractors. The Detailed Project Reports prepared by ULBs were submitted to the Commissionerate of Municipal Administration (CMA) for administrative and technical sanctions. The GoTN with the support of the Technical Support Unit (TSU) of the Tamil Nadu Urban Sanitation Support Programme (TNUSSP) assisted ULBs in the preparation of bid documents, Bill of Quantities, and construction and hydraulic design drawings.

The ULBs issued standard civil works contracts, through a competitive bidding process, to local private contractors for the construction of the FSTPs. This type of contract and contracting process is widely followed in the State for most types of construction works.

Odisha's implementation model is as shown below:

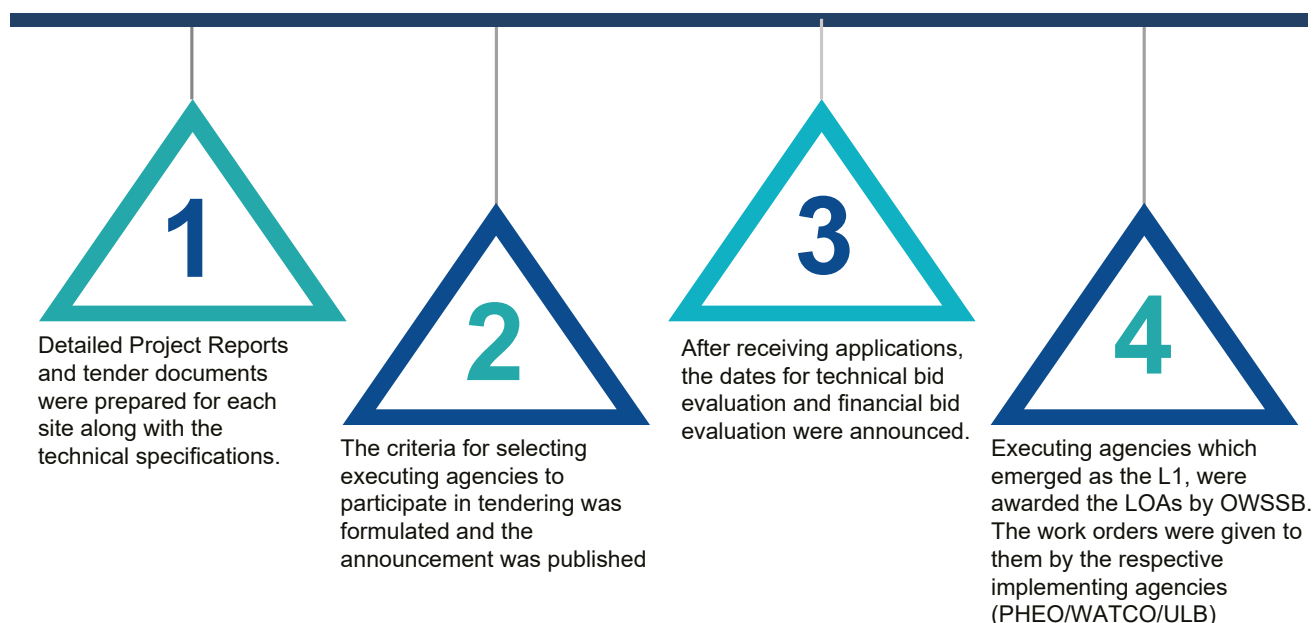


Figure 11: Odisha model of implementation

While in Maharashtra, a single window approval has been adopted for sanctioning of technical and administrative approval for 311 FSTPs. It helped ULBs to curtail the long approval process. Pre-approved technical design, structural and hydraulic design templates of FSTP helped ULBs to fast track implementation of FS treatment facilities. Mandatory compliance of third-party technical audit through the empaneled engineering/polytechnic college ensured quality assurance and quality control of implementation of FSTPs.

IV. Highlights

- They made the contractor responsible for all project activities starting from the design through the construction phase. Specifically, they make the contractor responsible for all design, engineering, procurement, construction, commissioning and handover activities of the project, leaving the owner with minimal responsibilities at the time of project delivery.
- A single window approval for implementation of FSTPs at state level helped ULBs to curtail the long approval process. Pre-approved technical design, structural and hydraulic design templates of FSTPs helped ULBs to fast track implementation of septage treatment facilities.

V. Reflections and lessons

It was observed that the executing agencies generally lacked the technical know-how for the construction of FSTPs and hence there is a delay in the approval of the design and drawings by OWSSB as they were subjected to multiple rounds of rectifications. Hence, it was realized that the capacity building of the executing agencies is imperative to ensure their sensitization on FSSM.

VI. Impact

By the end of 2021, Maharashtra, Odisha and Tamil Nadu will have more than 500 treatment units covering over 600 ULBs.

VII. Potential for replication

The models demonstrated in Maharashtra, Tamil Nadu and Odisha is representative of around 7600+ towns of India, including 3600+ statutory towns and 3800+ census towns. In addition, many small cities in South Asia and Africa are of similar size as these cities and can learn from state's experience of developing and implementing a state-wide strategy.

Lead case study contributor: Ernst & young LLP; Indian Institute for Human Settlements; and Center for Water and Sanitation (CWAS), CRDF, CEPT University

13. CONNECTING URBAN SANITATION AND IMPROVED RIVER HEALTH- MAINSTREAMING FSSM IN CHUNAR, UTTAR PRADESH

Abstract

Chunar is a small town situated on the banks of River Ganga, spread across 14 sq.km with a population of 37,185. As part of its larger mandate to support effective septage management in Uttar Pradesh, CSE has entered into a partnership with Chunar Nagar Palika Parishad (CNPP) to implement effective FSSM for improved city-wide sanitation. A detailed report on excreta flow diagram was prepared and subsequently technical assistance was provided to prepare DPR for FSTP which was accorded approval under Namami Gange Programme. As a knowledge partner, CSE is working closely with CNPP, Uttar Pradesh Jal Nigam (executing agency) and Elefo Biotech Private Limited (contractor) to oversee construction of 10 KLD FSTP plant on gravity based technology. The project once completed will showcase FSSM interventions across sanitation chain including scheduled desludging and end use /reuse of treated sludge (compost) of wastewater for cost recovery for other Ganga basin towns. The project design is outcome oriented, and the bidder/ contractor is fully responsible for ensuring compliance with the treatment and discharge norms in order to reuse treated wastewater. CSE through its technical support unit is ensuring effective stakeholder management through engaging City Sanitation Task Force members in the design, implementation and finally operations of the FSTP plant (once it is completed). Adequate IEC support is being facilitated for households along with capacity building of ULB staff to be able to overtake O&M post the contract period.

I. Context

Chunar is situated on the banks of River Ganga and River Jargo, in the state of Uttar Pradesh, India. The city lies in the Vidhyan Range, 42 km from the district headquarters, Mirzapur, and at a distance of 273 km from the state capital, Lucknow. The population of the city, as per Census 2011 is 37,185. The living conditions in the city are generally moderate with intermittent water supply and inadequate sanitation facilities. The administrative area under Nagar Palika Parishad (NPP) or municipal council of Chunar is 14 sq.km (NPP, 2016), and the city is divided into 25 municipal wards. The primary mode of earning livelihood is agriculture and agro-based business. Chunar is well known for its small and micro-scale pottery industries, especially of clay toys. Chunar has 9% coverage of sewer network¹⁹ but the field-based study revealed that there is no functional sewer network. 69% of the population of Chunar is dependent on on-site sanitation systems [OSS], either having septic tanks or lined pits. Overall, 97% of the excreta is not being managed safely and is indiscriminately discharged in the local environment. Currently, there is no treatment of the FSS being generated/collected in the city. Due to lack of awareness, motivation, regulation, infrastructure, and governance, faecal sludge and septage (FSS) desludged from OSS is disposed of in open spaces and open drains, or even in water bodies, causing severe problems of environmental pollution, ground water contamination, and adverse impact on the health of local communities, especially of women and children.

II. Intervention

Under the 'Support to towns for achieving open defecation status and for effective faecal sludge and septage management (FSSM)' Water Programme, the Centre for Science and Environment has provided support to the city in the field of sanitation, since 2016. In February 2019, a Memorandum of Understanding (MoU) was signed between the two organizations, wherein Chunar NPP sought continued technical assistance from CSE to implement effective Faecal Sludge & Septage Management (FSSM) for improved city-wide

sanitation. CSE has set-up a Technical Support Unit (TSU) in Chunar to support, facilitate, and handhold city-level agencies in planning, creating operating guidelines, and enabling frameworks, as well as, in designing and executing FSSM practices across the city of Chunar.

III. Implementation Approach

CSE is the technical support partner of the upcoming faecal sludge treatment plant at Chunar. An FSTP of 10 Kilo Litre per Day (KLD) capacity working on a gravity-based technology at Durgaji Marg in Dargah Shareef Mohalla, Chunar, is under construction over an area of 2361 square metre (sqm), of which the proposed built-up area is around 1366 sqm and the rest of the land (995 sqm) would be designated for horticulture. The project is supported under Namami Ganga Programme. The State Mission for Clean Ganga –Uttar Pradesh (SMCG) has selected Uttar Pradesh Jal Nigam (UPJN) as the executing agency for the project.

Technology and Treatment Process

This FSSTP based on Gravity-based technology is designed for 10 cum/day capacity. The faecal sludge is first made to pass through the screening chambers for the retention of coarse materials/solid waste present in the faecal sludge. The liquid sludge is conveyed to PDBs, where it is allowed to degrade naturally with the help of specific varieties of plants called as Macrophytes such as Typha, Cana Indica etc. The planted sludge drying beds are structures with sloped base for holding graded filter media. The sludge undergoes liquid-solid separation and also drying.

The dried sludge from the planted drying beds is removed once in 1 or 2 years depending on rate of feeding. The rest of the part which is the liquid percolate or effluent wastewater is conveyed to the separate treatment units. The effluent wastewater is then treated in two stages (primary and secondary stage) in DWWTs modules. The primary stages *i.e.* Settler is mainly meant for sedimentation of any solids that have entered the modules along with the percolate. The secondary stage *i.e.* anaerobic filter is for the anaerobic degradation of any dissolved and suspended organic matter. The partially treated wastewater from the secondary treatment unit would be conveyed into the horizontal planted gravel filter where partial aeration and nutrient removal takes place. The effluent from planted gravel filter is discharged to tertiary treatment units such as Dual Media Filter, Activated Carbon Filter and UV Disinfection to treat it appropriately. The treated wastewater is stored in a collection tank from where it can be reused for agriculture through pumping.

Financial Aspects

Capital expenditure (CAPEX) of the facility for technical modules	INR 94.78 Lakhs
CAPEX for non-technical modules, including office, operator's room, road, wash area, parking, landscaping, storm water drains etc.	INR 79.78 Lakhs
Additional expense (to procure one vacuum tanker, develop the plantation site and access road connecting the site)	INR 18.92 Lakhs
Total CAPEX including contingencies & labor cess	INR 193.48 lakhs
Total OPEX for five years	INR 47.86 lakhs

The total expenditure including capital and operational expenditure along with cost for creating enabling environment for implementing city-wide FSSM comes out to INR 270.32 lakh. The project also has a provision of (total INR 15.0 lakh) expenditure on the trainings of ULB and UP-SMCG officials and geo-

tagging of all the properties and for public participation. About INR 7 lakh will be spent on sanitation surveys, geo-tagging all properties along with the web-based GIS & MIS. The revenue-generation through collection of desludging fee will be around INR 6.25 lakh and through selling of compost will be around INR 2.18 lakh. The total revenue generated will be INR 8.43 lakh; hence, there will be surplus revenue of around INR 46,610 in year 1. In subsequent years the O&M cost is expected to increase and, hence, desludging fees would have to be adjusted accordingly.

After completion of construction, O & M of FSTP will be carried-out by contractor for the period of 5 years. After 5 years, O & M of the FSTP will be carried-out by Chunar Nagar Palika Parishad (CNPP). The cost towards five years O&M of the project has been included in project cost sanctioned by NMCG. Until the FSTP gets ready for the operation, Chunar Nagar Palika Parishad will maintain the temporary trenching site for safe disposal of Faecal sludge. The treatment and discharged parameters will be complied to by the contractor in order to reuse treated wastewater for horticulture/agriculture.

Proposed Business model

There can be two sources of revenue for this project; a) Emptying fees charged to the user, b) Revenue generated by selling the compost and/or treated effluent. The compost from FSS will have a good market value as compared to the sludge from sewage treatment plant. For increasing demand of compost from the local farmers, ULB can demonstrate the increase in productivity of crops and vegetables by using the compost and treated water on plantation site.

In the present pilot scale plant at Chunar, total FSS loaded will be approximately 60,480 kg. Assuming losses during filtration and handling and conservative selling price, it is estimated that the plant will recover INR 2,17,800 per year by selling the compost. Considering 1 trip/day of both smaller and bigger tanker (1,000 liters and 5,000 liters capacity respectively)²⁰, the total revenue possible from desludging is estimated to be INR 6,25,000 per year.

Total Revenue = Resource recovery from compost + Desludging revenue	INR 2,17,800 + INR 6,25,000 = INR 8,42,800
Cost of maintenance of tankers	INR 25,000 in one year
Cost of fuel for all tankers	INR 5,000 per month, <i>i.e.</i> INR 60,000 in one year
Salary of drivers and labor working in desludging operations	INR 24,000 per month, <i>i.e.</i> INR 2,88,000 in one year.
Cost of site O&M	INR 4,23,190 in first year. Total Expenditure = INR 25,000 + INR 60,000 + INR 2,88,000 + INR 4,23,190 = INR 7,96,190

Thus, it is expected to generate surplus revenue of INR 46,610 in first year. As the expenditure is going to increase due to inflation, the desludging fee and selling price of compost will be adjusted accordingly every year. Moreover, resource recovery can further be enhanced by selling the produce from plantation site. The investment required can be kept at bare minimum by utilizing the by-products derived from the FSSTP.

IV. Highlights

The Chunar FSTP project will showcase FSSM interventions across the sanitation chain, including scheduled desludging and end-use/reuse of treated sludge (compost) of wastewater to ensure cost recovery for other Ganga basin towns. The treated effluent will be reused for horticulture/agriculture on site, and the plant design will incorporate landscaping around the treatment modules. The Chunar NPP has in the meantime

also developed a temporary trenching site, which receives all the faecal sludge, emptied mechanically. This trenching site is a stop-gap arrangement till the faecal sludge treatment plant (under construction) of 10 KLD capacity is operational. The contractual arrangements under the FSTP project have ensured that the project design is outcome-oriented, and the bidder/contractor is fully responsible for ensuring compliance with the treatment and discharge norms, in order to reuse treated wastewater for horticulture/agriculture. Meanwhile, CSE, through its technical support unit, is ensuring effective stakeholder management through engaging City Sanitation Task Force members in the design, implementation, and, finally, operations of the FSTP on completion. Moreover, adequate IEC support is being facilitated for households along with capacity-building of ULB staff, to ensure undertaking O&M following the end of the contract period.

V. Impact

The project once completed will help Chunar manage faecal sludge and septage in a sustainable manner for its population. It will also assist in creating awareness for regular emptying of containment systems and safe handling of faecal sludge and septage. The capacity-building initiatives will contribute towards construction of improved septic tanks, regular desludging, and proper treatment supervision through CSTP and NPP.

VI. Potential for Replication

The project has been envisaged to showcase FSSM interventions across the sanitation chain, including scheduled desludging and end-use/reuse of treated sludge (compost) of wastewater for cost recovery. It will also act as a learning center focused on citywide sanitation, effective FSSM, improved urban sanitation, and river health for other small and medium ULBs across U.P (and India). The lessons from Chunar will be useful for other cities in the Ganga basin, and within the state, to plan and implement viable solutions for faecal sludge and septage management.

Lead case study contributor: *Center for Science and Environment (CSE)*

14. HYBRID ANNUITY MODEL (HAM) FOR FSTP CONSTRUCTION AND MANAGEMENT IN ANDHRA PRADESH

Abstract

About 99% of Indian cities have been declared ODF as of August 2020. These 4324 cities are now aspiring to achieve total sanitation through the safe management of faecal sludge. The challenge is to finance the capital and operating costs of Faecal Sludge Treatment Plants. Equally challenging is the availability of technical capacity at municipal level for sustained operations of the treatment facilities. This document provides a detailed account of an innovative Hybrid Annuity Model of PPP used to develop 147 treatment plants in two states of India – Andhra Pradesh and Telangana. The experience presents important lessons for replication at scale in India and beyond.

I. Context

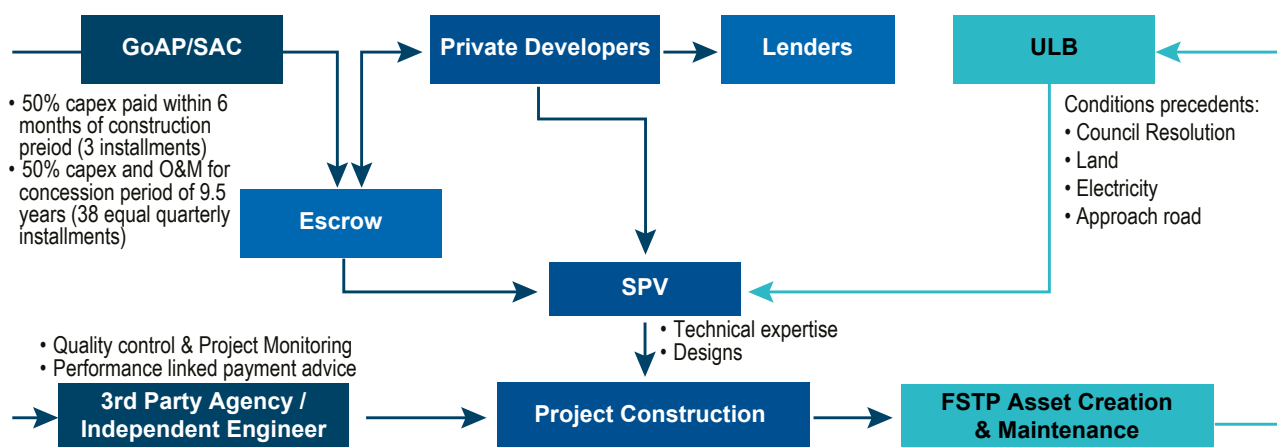
The Government of Andhra Pradesh has articulated a vision to make urban areas free from open defecation. AP is one of the first states in India to declare all its 110 Urban Local Bodies (ULB) Open Defecation Free (ODF) by universalizing access and use of toilets. The intent is to go beyond ODF and achieve total sanitation, which will include faecal sludge management, drainage, solid waste management, and facilities for safe treatment and disposal of waste. Currently, the state is facing a large burden of untreated faecal waste indiscriminately disposed-off in water bodies and open spaces, causing large public health and environmental risks extending beyond the boundaries of the city/ town.

To achieve safe sanitation, it is envisioned that all ULBs should achieve ODF++ status through safe management of faecal sludge and septage. As a result, a policy and operative guidelines for safe handling of Faecal Sludge and Septage Management (FSSM) in urban local bodies was notified by the GoAP in 2017. The policy was introduced to regulate the provision of toilets, safe collection, treatment, and disposal/reuse of faecal waste in urban areas of Andhra Pradesh. In line with the policy, the state had decided to set-up faecal sludge treatment facilities in all the towns. The state aimed to achieve this by promoting co-treatment of faecal sludge at functional Sewage Treatment Plants (STPs) and establishment of standalone Faecal Sludge Treatment Plants (FSTPs) in towns without STPs.

GoAP planned to establish 76 FSTPs in small and medium towns. The techno-economic studies (Detailed Project Reports) helped ascertain funding requirements for establishing FSTPs. However, financing the capital and operating costs was a significant roadblock for achieving the vision of safe sanitation. The technical expertise of municipalities to build and operate these plants was a concern.

II. Intervention

Against this backdrop, to bridge the financial and technical gaps in the ULBs, the state government of AP took an innovative step to introduce Public-Private Partnership (PPP) for developing FSTPs in 76 ULBs on Design, Build, Operate & Transfer (DBOT) basis. The Hybrid Annuity Model (HAM) of PPP, with a ten-year Operations and Maintenance (O&M) contract, was considered as the most appropriate mode of procurement. As O&M is a crucial component for sustaining FSTP operations, a long-term O&M support was considered. Under the HAM model, Government pays 60% of the cost of the project during the construction period and the remaining 40% is paid on an annuity basis, along with the O&M fee, during the O&M period. The Administrative Staff College of India (ASCI) provided technical assistance to GoAP to implement FSSM and decentralized sanitation improvement programs in all towns of Andhra Pradesh.



Hybrid Annuity Model – Project structure

III. Implementation approach

- The concessionaire shall be responsible for the construction, operation, and maintenance of the FSTPs at the sites being provided by the Government/Urban Local Body (ULBs), and in conformity with the specifications and standards
- 76 FSTPs are clustered into seven packages to promote economies of scale and to attract credible and established operators
- Municipalities ensure the availability of land on a lease (~0.5 to 1 acre) for establishing FSTPs. A permanent approach road for trucks to decant septage at the treatment plant is made available by the ULB. Further, ULB facilitates access to water and power for O&M of FSTP
- The technology-agnostic approach was considered during procurement and, therefore, the bidder was free to employ well-established technology options for establishing FSTPs. Technologies that are appropriate, environment friendly, and low on O&M cost were preferred. A technology evaluation committee validated the proposals and undertook necessary due diligence.
- A two-stage procurement process was adopted: EOI, followed by a detailed RFP, covering technical and financial components, was issued; A Quality and Cost Based Selection (QCBS) process of procurement was followed
- The technical and financial bids of the bidders were evaluated using Least Cost Selection (LCS) process. The bids were evaluated based on the lowest assessed Bid Price (the “Bid Price”). The Bid Price is the summation of (a) Bid Project Cost and (b) Net Present Value (NPV) of O & M Cost (the O & M Cost) during the O & M Period. The bidder quoting the lowest price considering CAPEX (capital expenditure) and OPEX (operational expenditure O&M) for ten years was considered.
- Concession period of 10 years in a design, build, operate & transfer (DBOT) model requires the construction to be completed in 6 months and the plant to be operated over the balance of 9.5 years
- Third-party technical agencies (Independent Engineers) were appointed for regular technical scrutiny
- Cost benchmarks, with key performance indicators, were defined at the outset
- The process held the bidder responsible for the effective treatment and safe disposal of faecal sludge and septage, and for complying with the environmental and other regulatory norms that are in vogue from time-to-time during the entire concession period

- Bidders could monetize resources recovered like biogas, treated wastewater, biochar, and compost; bidders were encouraged to employ a low energy usage option
- Municipalities were directed to regulate desludging operators and authorize them to deliver faecal sludge at the project site for treatment

IV. Highlights

- The HAM model enables the influx of private capital for infrastructure development and helps in mitigating risk related to capital investment through a risk-sharing approach
- Unlike typical PPP projects, HAM distributes financing risks between government and private players and, hence, is becoming the preferred choice for developers, banking institutions, and government alike, among all other PPP models
- HAM developer is incentivized to take a lifecycle view to reduce O&M costs in the future. This results in longer life of the asset
- HAM projects are less prone to delay vis-à-vis EPC projects due to the availability of capital
- HAM ensures staggered cash flows for the Government

V. Impact

- Increase in private sector investments
- More than 40 operators from MSME sector capacitated to invest in FSTP.
- Several innovative technologies promoted, tested, and readied for replication at scale

VI. Reflections and lessons

The Hybrid Annuity based PPP models in India have been adopted successfully in roads and highways development. Implementing HAM in establishing FSTPs at scale is a unique experiment by GoAP. The model is well balanced with clear commitments and risk-sharing from both parties. One of the most important features of this model is that both the Annuity and O&M payments are linked to the performance of the FSTP. This will ensure sustained usage of the assets created due to better accountability, ownership, and optimal performance.

The role of transaction advisory is important not only in developing a balanced Request for Proposal but also for market development through promoting the project with the right target group. Continued engagement with the private sector through the life of the project is essential for building trust.

VII. Potential for replication

The PPP engagement for establishing FSTPs using HAM is a first of its kind and has significant potential for replication. Several states have reviewed AP experience. The State Government of Telangana has replicated the model and is implementing FSTPs in PPP (HAM) in its 71 ULBs. As the FSTP projects are being operationalized, both the states have started developing plans for accepting sludge from rural areas within a 10 km radius, thus leading the way for another innovative model of rural-urban integration in sanitation.

Lead case study contributor: Administrative Staff College of India

15. FAECAL SLUDGE MANAGEMENT, LEH, J&K

Abstract

BORDA identified Leh municipality in Jammu & Kashmir as a city in need of an FSSM solution. Leh is a high-altitude, cold desert municipality with a high dependence on groundwater. Most of the local population uses eco-san toilets (no desludging required), whereas water flush toilets are provided for tourists who throng the town in thousands on a daily basis. Hence, the hotels and homestays were the key customer segment. BORDA along with Blue Water Company partnered with the Municipal Council of Leh (MCL) to pilot integrated Collection, Transportation and Treatment of Faecal Sludge. Design for the FSTP was undertaken by CDD Society (BORDA 2018).

I. Context

Leh, a high-altitude coldest desert at 12,000 feet in Jammu & Kashmir, India, has rapidly become a popular tourist destination with a footfall of 2 80,000 visitors, annually. The city is building a sewerage system that, in the near future, will connect about 40% of the city, but today, households, hotels, and guesthouses use a septic tank and soak pits for on-site containment of sewage. As most of the septic tanks are poorly designed, and the underground water table is high (only 30 feet in some places), in 2017, there was early evidence of water contamination, possibly due to overflowing septic tank.

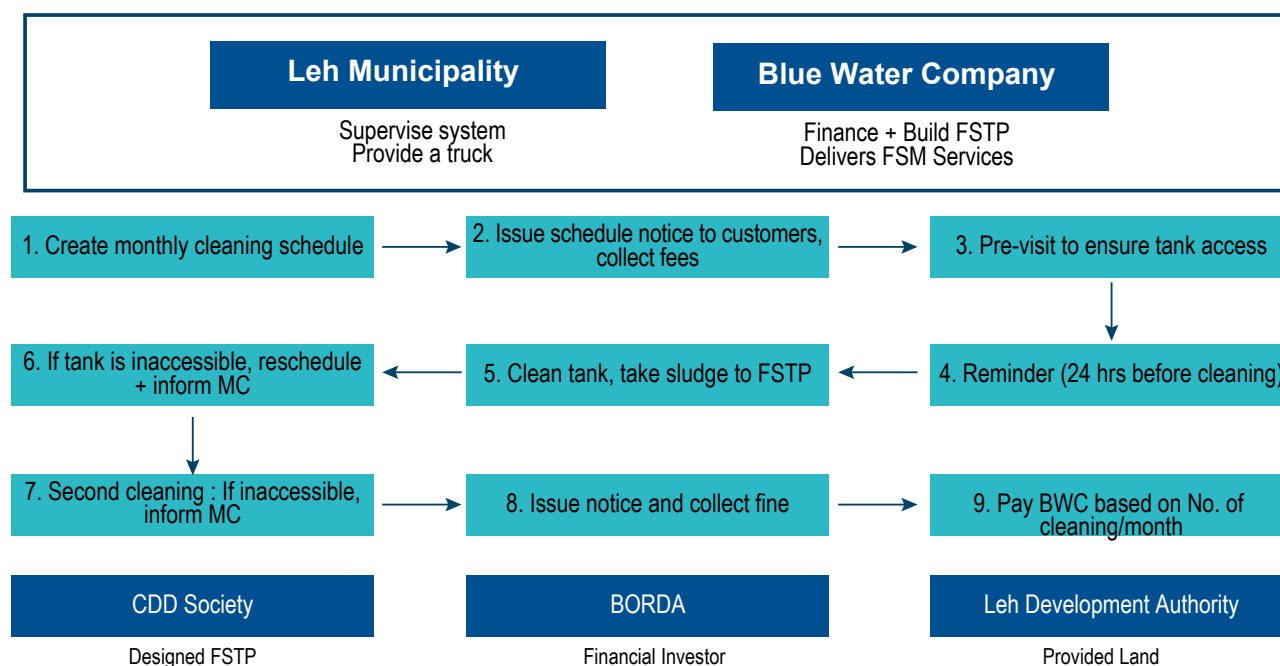
Therefore, the Municipal Committee of Leh (MCL) ordered that septic tanks be made watertight and be mandatorily desludged every year. The town needed an FSTP to treat and reuse the sludge safely.

II. Intervention

- Planning and scheduling desludging of septic tanks in an efficient manner
- Safely transport faecal sludge to a treatment plant
- Operate a faecal sludge treatment plant to meet effluent standards at high altitude
- Sell and reuse the byproducts from treatment of effluents
- FSTP implementation through PPP
- Worker Safety and dignity at the heart of sustainable operations.

III. Implementation approach

Detailed step-by-step process followed and activities undertaken



Stakeholders	Funding/ investments	Roles Played
- Leh Autonomous Hill development council - Municipal Committee - BORDA - CDD - Blue Water Company	BORDA & Blue Water Company	- Leh Autonomous Hill development council – provide land - Municipal Committee – Supervise system, provide the truck, fixing and collecting user fee - BORDA – Financial investor - CDD – designed FSTP - Blue Water Company – Finance & build FSTP and FSSM services

Monitoring and roll-out

The municipality monitors desludging and FSTP operations. According to the integrated contract, the BWC is responsible for managing FSTP operations and the provision of scheduled and demand-based desludging services. The MCL provided one existing desludging vehicle. The BWC prepares the schedule for desludging, which is shared with the MCL, who notifies customers of the desludging dates. Scheduled desludging is undertaken twice a week. The remaining days in the week are reserved for on-demand desludging. Once the desludging service has been provided, the BWC is paid 90% of the revenue (INR 3,500 for each trip) upon submission of documentary evidence of service provision.

Timeline across planning, implementation, and monitoring post-implementation

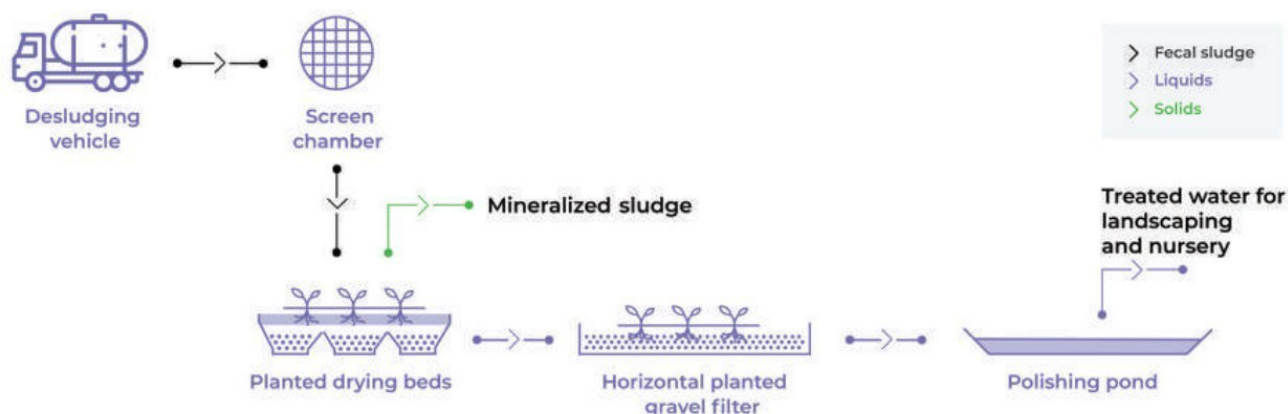
- 2017: Officials from Ladakh Autonomous Hill Development Council visited Devanahalli FSTP in February 2017.
- In April 2017, BORDA was requested to support in creating an effective system to manage faecal sludge in Leh.
- Blue Water Company was identified as the BOT contractor to finance the FSTP, with payment for return financial arrangement

- FSTP construction was undertaken in May-July 2017
- FSTP was inaugurated in August 2017

Technology used or implemented

Screen Chamber, Planted Gravel Filter (PGF), Horizontal Planted Gravel Filter (HPGF) and Polishing Pond.

Flow charts/visuals /data analytics



Treatment Process Faecal Sludge Treatment Plant, Leh, J&K

IV. Highlights

- Leh FSTP brought to fore the applicability of PPP model for FSSM
- **Professional Service** – All the personnel involved in FSSM operations from BWC are trained to provide professional service – being trained on customer etiquette apart from being provided with Uniforms and PPE. BORDA also ensured that these personnel had access to State-of-the-Art facilities in their operator room in terms of lounges, toilet facilities etc. – which further motivated the personnel.

V. Impact

- More than 6 Million Liters of FS treated, and 7,100 people served till December 2020
- The technology for high altitudes/cold climate areas has been demonstrated
- Successfully piloted the double booster pump so as to provide accessible desludging services to households/hotels in narrow lanes

VI. Reflections and lessons

Key success, lessons

- FSSM interventions can be implemented quickly if the political will is strong
- Integrated FSSM services handled by one party as in this case makes FSSM operations efficient
- A good working environment can motivate sanitation personnel to contribute more effectively.
- Innovation and experimentation are essential to improve the service quality in sanitation
- Payment for Results–Appropriate financial arrangements and sharing risk and responsibility between the government and private operator

Challenges

- Long and cold winters
- Tourist season during summer
- Low pump power
- Narrow streets and gradient
- Resistance to scheduled cleaning and political risk
- Performance of the treatment plant during peak winters
- Majority of black water problem is not solved – as a result there is plan for expansion of capacity of facility

VII. Potential for replication

Sinnar: First city in India to set up its FSTP using the DBO model financed through ULB funds

Sinnar Municipal Council (SMC) with a population of 72,000 is a model city that has set up its faecal sludge treatment plant (FSTP) through a DBO approach. With support from Center for Water and Sanitation (CWAS), CRDF, CEPT University, SMC had issued a Design- Build- Operate (DBO) tender in May 2017 for construction of its 70 KLD FSTP. Under this tender, the awardee was responsible for planning, designing, constructing as well as operation and maintenance for the first three years of operations. The Sinnar FSTP is in operations since March 2019 and has treated around 12+ Million litres of septage till date.

Salient features

- A technology neutral and performance based tender document
- A bidder selected through a transparent and competitive open bidding process
- This FSTP is fully financed by local government using its 14th Finance commission grant
- Initial three years of operation and maintenance are included
- Escrow mechanism is used for timely payment to the private operator. This helps to reduce the risk of delay in payment to contractor
- The Bidder has to obtain all the necessary approvals from the competent authority

Based on the Sinnar experience, a model tender document has been developed.²¹



Lead case study contributor: Consortium for DEWATS Dissemination Society

Other contributors: Center for Water and Sanitation (CWAS), CRDF, CEPT University

EXHIBIT 3

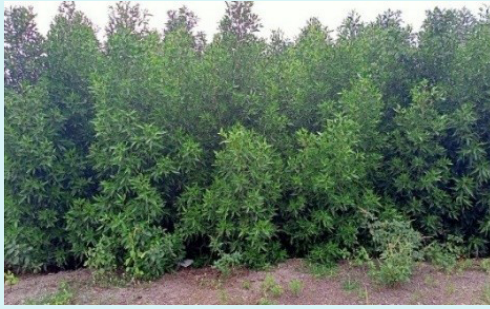
CSR FUNDED PROJECTS IN FSSM

Background

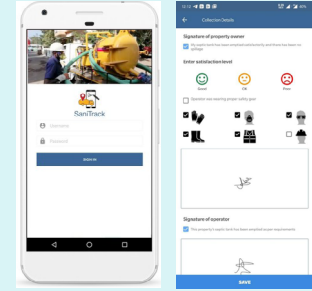
- Along with government funding, the sanitation sector has seen increased interest and funding from the corporate sector.
- Many corporates have funded projects in the sanitation sector including Faecal Sludge and Septage Management (FSSM) through the CSR route.
- Companies like HSBC, HT Parekh Foundation have been front runners and have contributed their CSR funds for various FSSM projects.

Intervention

- HSBC supported the city of Sinnar in Maharashtra to enhance the quality of existing FSSM infrastructure in partnership with Center for Water and Sanitation (CWAS). The key intervention areas were decided based on the ongoing ODF sustainability and FSSM activities by the municipal council. Major interventions for FSSM included online monitoring system for scheduled emptying of septic tanks; creating resource center at the Faecal sludge treatment plants (FSTP), landscaping and creating urban forest around FSTP to create a model FSTP facility among others.
- HT Parekh Foundation was already supporting the construction of individual household toilets in cities of Maharashtra. However, it was found that many of these toilets are connected to septic tanks which require proper desludging, treatment and reuse. Hence the support was extended to achieve safely managed sanitation systems with a focus on Faecal Sludge and Septage Management (FSSM). The HTP foundation is supporting the cities of Kolhapur and Satara in Maharashtra through a partnership with CWAS. The key activities envisaged under this CSR grant included citywide FSSM plan with special focus on slums, scheduled desludging of septic tanks, co-treatment of Faecal load at STP in Kolhapur and FSTP expansion in Satara city; setting-up the monitoring mechanisms for safe desludging and treatment operations; Support in converting the STP/FSTP into resource centers and capacity building of ULB officials, etc.
- The HT Parekh Foundation had agreed to fund one FSTP in the peripheral of Hyderabad and signed an MoU with HMWSSB, given how over 50% of households / establishments in the Greater Hyderabad Municipal Corporation (GHMC) and peripheral areas lacked sewerage network and was dependent on onsite sanitation systems namely septic tanks. The team also worked with 80-100 desludging operators as well as the Greater Hyderabad Water Board to create a platform called Dial-a-Desludger to enable households to request for desludging services whenever required.
- Macquarie bank supported a sanitation workers training program, piloted in Bhiwandi, Maharashtra. The activities included provision of safety gear and PPE to sanitation workers, on-the-job training to clean sewers and septic tanks, and access to government schemes.



Landscape and resource center at Sinnar FSTP



Online monitoring system for FSSM- SaniTrack

Impact

- These CSR investments are intended to support cities, where toilets have been provided but citywide services for safely managed sanitation are needed. The investments will help assess, plan, implement and monitor FSSM services across entire sanitation service chain, including desludging, treatment and reuse.
- There is willingness by city government to adopt and implement FSSM plans. The city officials are looking forward to partnerships with corporates to undertake innovative solutions to waste management.
- The above case examples will encourage other corporates to support projects in FSSM sector.

16. ENABLING THE SCALE-UP OF CO-TREATMENT IN STPS ACROSS TAMIL NADU

Abstract

- To address the prevalence of unsafe disposal of Faecal Sludge (FS) due to both lack of adequate treatment facilities and underutilized treatment capacity, the Government of Tamil Nadu adopted a co-treatment model in 2018 to allow co-treatment of faecal sludge at existing Sewage Treatment Plants (STPs), with spare treatment capacity, and new STPs. Following a thorough assessment of STPs across the state, co-treatment was enabled at 50 STPs, through infrastructure and operational changes, supplemented by capacity-building and governance measures.

I. Context

In Tamil Nadu, nearly 70% of urban households depend on On-site Sanitation Systems (OSSs). The Faecal Sludge (FS) and septage accumulated over time in the OSSs need to be safely treated and disposed. However, the lack of adequate treatment facilities, within reasonable distance from its origin, often leads to open disposal of faecal sludge and septage on land and in water bodies, which poses a significant threat to public health and the environment.

II. Intervention

To promote and regulate the process of collection, transportation, and treatment of FS, the Government of Tamil Nadu (GoTN) issued the 'Operative Guidelines for Septage Management for Local Bodies in Tamil Nadu' (OG) in 2014. Given that Tamil Nadu has been practicing co-treatment of faecal sludge with sewage in Sewage Treatment Plants (STPs) for nearly two decades, the OG emphasized the potential to scale-up treatment of FS through co-treatment of septage and sewage at underutilized Sewage Treatment Plants (STPs) in the state on the basis of a cluster approach.

In 2018, through the State Investment Plan (SIP), the GoTN adopted a co-treatment model for treating FS at all existing and potential STPs, with the following objectives:

- To prevent open dumping of FS and contamination of water resources by providing adequate treatment and disposal facilities; and
- To saturate the utilization of existing and proposed sewage treatment facilities

Co-treatment is the process by which faecal sludge and/ or septage collected from on-site sanitation systems is treated at STPs, along with the sewage. Since FS is a concentrated waste compared to sewage (for e.g., FS has higher values of BOD), its treatment at STPs requires understanding of its characteristics and impact on the STP performance. The FS is received at decanting stations (generally pumping stations with FS receiving facilities) connected to the STP. The decanting stations help in diluting FS with sewage and, hence, avoid shock-loading. In terms of operation and maintenance, co-treatment requires regular monitoring of FS quality, and maintenance of overall decanting infrastructure.

III. Implementation approach

Key steps involved in the implementation of co-treatment include:

1. **Adoption of a State Investment Plan:** In 2018, by GoTN was the first step towards scaling of treatment infrastructure, including the process of co-treatment across the State. The SIP was

developed based on two key principles: 1) Co-treatment of FS at existing STPs, and, 2) optimum utilization of treatment facilities through clustering of ULBs. Of the five phases proposed in the SIP, Phases I and II focused on enabling co-treatment at existing and proposed STPs, respectively. The two phases covered nearly 60% of the total urban population.

2. **Infrastructure Assessment:** To enable co-treatment, infrastructural improvements such as provision of decanting stations and suitable pumping stations at STPs, were required at certain locations. Therefore, a detailed field assessment of all STPs in Tamil Nadu was initiated to assess the feasibility of implementing co-treatment at STPs and decanting at pumping stations. The assessment included evaluation of STPs and Sub-Pumping Stations (SPS) on performance, co-treatment potential, and flows (network and pumping stations), including:
 - a. Access to infrastructure for decanting and pre-treatment
 - b. Current inflow, characteristics of sewage and plant performance
 - c. Improvements required to enhance or enable co-treatment
 - d. Assessment of network and SPS for potential leakage of sewage
 - e. Review of O&M and financing options
 - f. Assessing current desludging practices
 - g. Assessing sludge treatment and method of disposal of treated water

Based on the assessment, STPs were categorized according to the criteria set out in the table below.

Table 7: Classification of STP based on assessment

Criteria	A1 Co-treatment not practised	A2 Co-treatment practised	B	C	D
STP working status	All equipments in working condition, and has unutilised capacity		All equipments in working condition, and has unutilised capacity	working at full/ near full capacity	Equipments not functioning/ breakdown
Investment or modification required to adopt co-treatment	Requires Minimal investment (Upto 3 Lakh Rupees)		Requires moderate investment (Between 3 to 20 Lakhs)	Requires high investment (More than 20 Lakhs)	Requires high investment (More than 20 Lakhs)

3. **Implementation of co-treatment:** With the support of the Tamil Nadu Urban Sanitation Support Programme (TNUSSP), the GoTN operationalized co-treatment model at 50 STPs across the State. Along with improvements at the STPs and pumping stations (decanting facility), the following activities were carried out:
 - a. Capacity building and behavior change communication of desludging operators
 - b. Development of an App for digital tracking of desludging vehicles
 - c. Design and institutionalization of FS testing protocols, using digital tools (such as an online testing mechanism for industrial waste)
 - d. Implementation of a Memorandum of Understanding to facilitate co-treatment for clusters of ULBs using a common treatment facility

TNUSSP also worked with the ULBs to implement activities at the STPs and pumping stations (decanting facility) by providing support on:

- DPR review and integration of decanting facility at proposed STP
- Implementing and monitoring decanting facility at STPs/ pumping stations
- Capacity-building of ULB engineers and STP operators

The scale-up of co-treatment being enabled at 50 STPs across Tamil Nadu ensures over 1,000 KLD of additional treatment capacity in the State

IV. Highlights

The key differentiators of this co-treatment model include:

- Requirement of minimal modifications to enable co-treatment (like creation of a decanting facility) and those that can be easily undertaken in a short period of time at minimum cost
- Improving O&M procedures and the capacity of key personnel like DSOs and plant managers for long term sustainability
- Self-sustenance, as existing infrastructure is improved to implement co-treatment
- The cost-sharing model between cluster ULBs, which allows the host ULB to bear all expenses related to co-treatment, subject to periodic review
- provision of investment for decanting stations at STPs by the ULBs

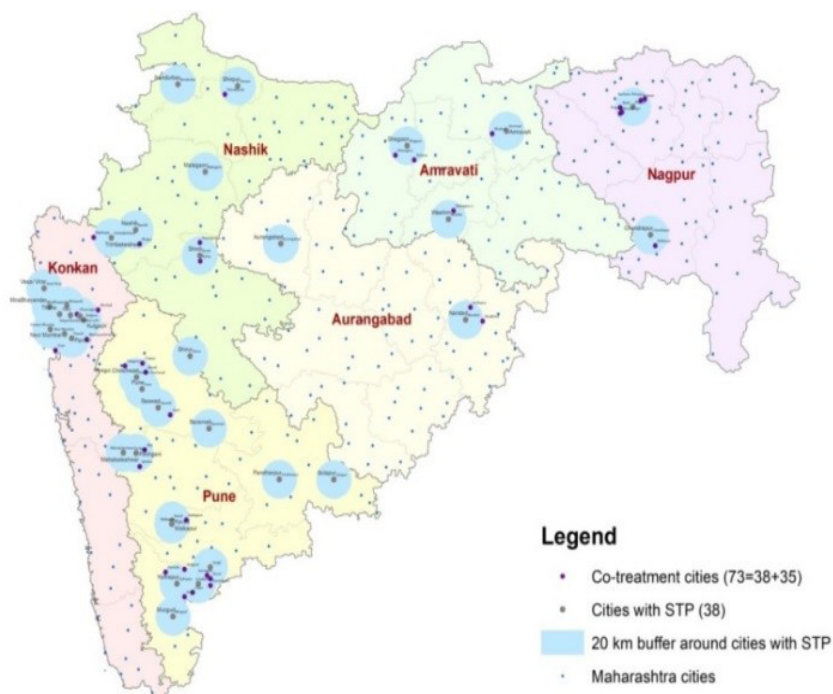
V. Similar initiatives from other states

1. Maharashtra model for scale-up of co-treatment

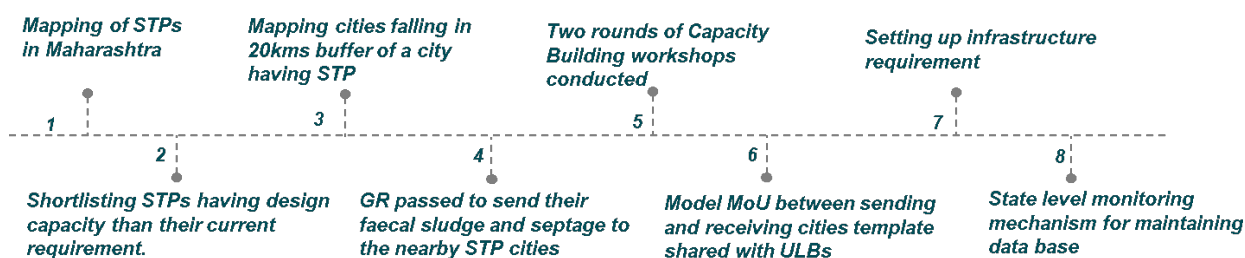
Government of Maharashtra (GoM) initiated a state-wide adoption of Faecal Sludge and Septage Treatment facility. The state took two-pronged approach towards state-wide FSSM strategy: a) co-treatment of faecal sludge at own or nearby STPs, and, b) setting-up independent FSTPs at city level for faecal sludge treatment.

State level strategy for co-treatment of faecal waste with functional STPs

Maharashtra is one of the few states in India to institutionalize co-treatment of faecal waste with functional sewerage treatment plants (STP). This was done through a resolution (GR: SMU-2018 /Cr No. 351/UD-34) in 2018 to promote ULBs to initiate co-treatment practices in ULBs. GoM identified ULBs in two categories for co-treatment; a) ULBs with functional sewerage treatment plant (STP) but without full sewerage coverage could treat septage collected from on-site systems in their own STPs, and, b) ULBs



could co-treat their septage at an STP in a nearby ULB, located within 20 km of radius from existing STPs. As per the co-treatment GR, 35 STP cities and 36 sending cities, that could co-treat their septage at respective 21 receiving cities with STP, were identified.



Institutionalization of co-treatment of faecal waste with functional STPs

GoM conducted several rounds of capacity-building workshops to initiate co-treatment practices in selected ULBs. A 'standard' MoU was also developed to facilitate the co-treatment process between sending and receiving cities. This MoU clearly defined the roles and responsibilities of sending and receiving cities. It also captured identification of designated location for discharge of faecal waste. It also provided necessary directives to receiving cities and private STP operators to accept the faecal waste load from nearby cities. A record keeping and monitoring format on receipt of quantity and quality of faecal waste was also developed and shared with the ULBs.



Memorandum of Understandings (MoUs) between receiving city (Nagpur) and sending cities



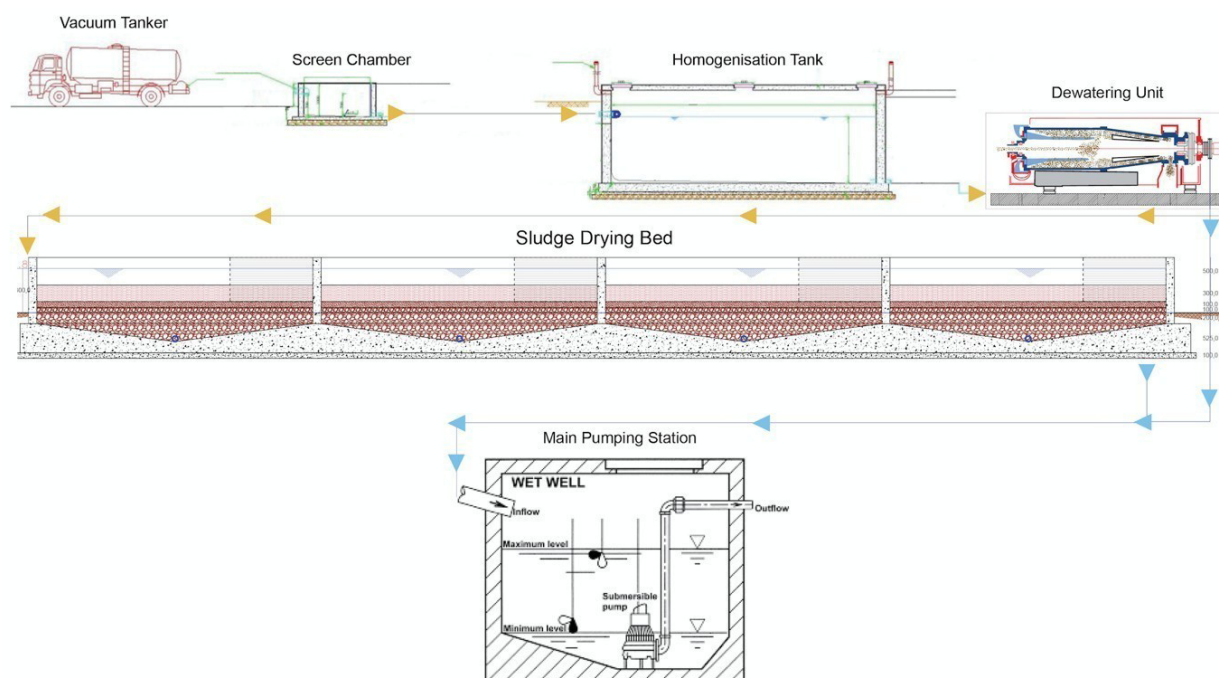
Successes and lessons learnt

About 69 ULBs have attained ODF++ status by initiating co-treatment practices with own or nearby STPs in Maharashtra. A government resolution on co-treatment enabled ULBs to implement safe sanitation practices. It is important to recognize the need for a robust monitoring system to ensure that treatment efficiency of STP is maintained as per standards.

2. Scaling-up FSSM through Co-Treatment - Uttarakhand's Approach

A City-Wide Inclusive Sanitation (CWIS) initiative is being taken up in Uttarakhand with a focus on FSSM. In a multi stakeholder collaborative initiative of the state government, the National Institute of Urban Affairs (NIUA) and the Asian Development Bank (ADB) along with state departments are improving the sanitation infrastructure in the state. A detailed study on current FSSM practices is being carried out by mapping the areas of the city and peri-urban areas that remained uncovered by the existing and proposed sewerage networks. With most of the STPs found to have spare treatment capacity, it is envisaged to use the existing treatment sites for co-treatment of FSS with sewage as an interim solution. In order to demonstrate the benefits of co-treatment, a technical feasibility study was performed to support the implementation of a co-treatment facility of 40KLD at an upcoming 18 MLD STP in Raipur, Dehradun. The proposed infrastructure will benefit 24000 HHs for 15 years.

With similar support, a 130 KLD co-treatment facility is upcoming at 68 MLD capacity Kargi STP, Dehradun. The co-treatment at Kargi Chowk STP involves utilization of space and spare mechanical equipment available at the STP; see figure below for the process flow of co-treatment method. Furthermore, it also takes into consideration the existing STP treatment capabilities to ensure seamless and maximum treatment of FSS as well as sewage.



Process flow diagram of co-treatment method

Having cognizance of the study has brought technical purview for co-treatment of septage with sewage in the state. The state is using this knowledge for scaling-up treatment of FSS by using Co-treatment method at their current STPs having the spare capacity and for upcoming sewerage plans as well. The state of Uttarakhand, India, is now mainstreaming FSSM at a city-wide scale through Co-treatment method. This is evident through various notifications and advisories on Co-treatment and FSSM being circulated by authorities.

VI. Impact

The scaling of co-treatment across existing and potential STPs will enable access to FSSM services for 60% of the urban population (excluding Chennai), and contribute towards reduced untreated FS being

let-out into the environment. By the end of 2021, the existing treatment facilities will be optimally utilized as they will be operating as co-treatment facilities.

VII. Reflections and lessons

A key advantage of the co-treatment model is the minimum cost and time required to initiate the process and provide critically needed treatment capacity by saturating underutilized capacity at existing STPs. While there are challenges anticipated in relation to the characteristics and quantity of faecal sludge received at co-treatment facilities, it is important to initiate the process and make changes based on understanding gathered from field operations. Continuous monitoring and learning is required to ensure that the plant performance and effluent quality are maintained as per standards.

VIII. Potential for replication

With STP acting as the more commonly available treatment facility across many cities and states, minimum investment and resources are required to initiate and scale co-treatment. This would significantly contribute towards the reduction of untreated faecal sludge and septage being disposed into the environment.

Lead case study contributors: *Indian Institute for Human Settlements, Center for Water and Sanitation (CWAS), CRDF, CEPT University, NIUA*

EXHIBIT 4

CO-LOCATION OF FSTPS WITH SWM PLANTS ACROSS MAHARASHTRA, ODISHA AND TAMIL NADU

Background

- Regardless of the stringent pollution control norms in place, in many cities where FSSM has not received due attention, untreated septage collected from septic tanks and pits is dumped in open drains and other areas posing an environment and health hazard.
- In comparison to the disposal of municipal solid waste, there is little exposure to or understanding of the need to set-up septage treatment plants, and the process of septage treatment and safe disposal. This is a huge deterrent to India achieving ODF+ and ODF++ status.
- Safe and sustainable sanitation requires the proper disposal of faecal waste at designated disposal sites, along with their safe treatment. The end-products from treatment can also be harnessed as useful resources such as fertilizers, compost.
- However, land availability is a pre-requisite to the setting-up and running of such treatment sites. The absence of adequate public awareness and the lack of adequate land availability in cities make the construction of FSTPs lengthy and time-consuming process.

Intervention

- ULBs across states have sought to optimize land use by leveraging unused capacity of Sewerage Treatment Plants, where available, or by setting up FSTPs within, or near solid waste management (SWM) sites
- SWM sites in particular are sought given how organic solid waste procured through SWM can be co-treated and co-composted along with faecal sludge. Examples of states leveraging this option are as follows:
 - ♦ The FSTP located in the Resource Recovery Park at Periyanaickenpalayam (PNP) Town Panchayat in Coimbatore, which has a capacity of 25 KLD, has been co-located within the solid waste treatment facility, also enabling co-compositing
 - ♦ Similarly, in Maharashtra, all 311 of the FSTPs sanctioned in November 2019, of which 120 have been set-up and 100 are in the pipeline, are co-located within the solid waste treatment plants.
 - ♦ The FSTP in Dhenkanal, Odisha, also employs co-composting technology, with the treatment system also consisting of a co-composting unit, where the dried sludge from the STP is composted with municipal solid waste.

Impact

- Co-locating allows for ULBs to not have to identify separate land for FSTPs and go through a long and time consuming land acquisition process.
- It has the added advantage of being able to leverage existing infrastructure – like roads and buildings – as well as resource costs such as labor, water and electricity, across solid waste and septage treatment facilities.
- Co-locating FSTPs within SWM plant sites also allows for easier proximity and transportation of solid waste for co-composting. The co-composting process results in a by-product of higher nutrient value which can be sold as manure for agricultural purposes, generating revenue for the ULB.
- Co-locating FSTPs within SWM sites also has the added advantage of highlighting / creating the realization that FSSM is as important as SWM, and both need to go hand-in-hand to ensure total and sustainable sanitation.

Existing FSTP technologies and capacities in select cities

The landscape for Faecal Sludge Treatment Plants (FSTPs) varies widely depending on the capacity, technology used, and ancillary infrastructure (roads, compound wall etc.) provided. Table 8 below provides a snapshot of FSTPs built in 10 different States – with contexts ranging from the extreme cold and tourism driven Leh, J&K, to the hot, small town of Lalsot, Rajasthan–using various technologies. Three technical approaches have been adopted widely – i) passive, low energy/low skill technologies, ii) mechanical systems, requiring a certain minimum scale but low land foot print, iii) Thermal technologies, that aim to combust a part of the faecal sludge to treat the rest. The capital costs provide a clear indication of the cost-effectiveness of FSTPs, though they are not strictly comparable due to different levels of infrastructure and degree of treatment. They also point to the operations costs of FSTPs being more affordable for a typical ULB, increasing the chances of FSSM infrastructure being maintained in the long run.

Table 8: Snapshot of existing FSTPs of a range of capacities in 10 States

Sr. No.	City	State	Year of Commission	Designed Capacity (KLD)	Type of Technology	Land Allocated (Acres)	Capital cost (INR crores)	Operation Cost (INR lakhs/Month)	Reuse - resource utilised**
1	Sircilla	Telangana	2019	18	Passive	0.62	1.60	0.58	None
2	Leh	Jammu & Kashmir	2017	12	Passive	0.18	0.52	1.00	Nutrients & Water
3	Devanahalli	Karnataka	2015	6	Passive	0.16	0.90	1.10	Nutrients & Water
4	Brahmapuram	Kerala	2015	100	Mechanical	0.25	4.00	1.48	Energy, Water & Nutrient
5	Nashik*	Maharashtra	2017	20	Passive	1.48	8.00	0.75	Energy & Nutrients
6	Sinnar	Maharashtra	2019	70	Mechanical	0.38	2.05	1.53	None
7	Wai	Maharashtra	2018	20	Thermal	0.50	1.75	2.00	Energy
8	Bhubaneswar	Odisha	2019	75	Passive	2.50	2.85	1.01	Nutrients & Water
9	Brahmapur	Odisha	2019	40	Passive	1.50	2.48	0.78	Nutrients & Water
10	Dhenkanal	Odisha	2018	27	Passive	1.50	2.96	0.80	None
11	Puri*	Odisha	2017	50	Passive	0.25	1.74	1.09	None
12	Narsapur	Andhra Pradesh	2018	15	Thermal	0.29	1.50	2.50	Energy & Water
13	Warangal	Telangana	2017	15	Thermal	1.00	1.50	1.50	Energy & Water
14	Unnao	Uttar Pradesh	2019	24	Passive	1.60	3.50	1.79	None
15	Lalsot	Rajasthan	2019	20	Passive	1.85	3.75	0.33	None
16	Phulera & Sambar**	Rajasthan	2019	20	Passive	1.30	2.82	0.72	None
17	Periyannayakan Palayam**	Tamil Nadu	2019	25	Mechanical	0.50	2.50	1.5	Nutrients & Water
18	Kovilpatti	Tamil Nadu	2020	40	Passive	1.80	3.94	1.5	Nutrients & Water
19	Tirumangalam	Tamil Nadu	2020	40	Passive	1.80	4.30	1.5	Nutrients & Water

Source: Rao, Krishna C.; Velidandla, S.; Scott, C. L.; Drechsel, Pay. 2020. *Business models for faecal sludge management in India and additional inputs from Indian Institute for Human Settlements (IIHS), Bengaluru*

Notes:

- + Treats both FS and organic waste simultaneously
- * Co-treatment of Faecal Sludge in an existing STP
- ** FSTP catering to cluster of towns
- ++ This is the current state, most FSTPs will be able to reuse Nutrients and Water in future

EXHIBIT 5

SOLAR POWER PLANTS AT WAI, SINNAR, BHUBANESWAR FSTPS

Background

- Wai and Sinnar are two cities in Maharashtra that are providing first of its kind scheduled septic tank emptying services and have set up a Faecal Sludge Treatment Plant (FSTP) of 70KLD capacity. These interventions have been implemented through technical support from Center for Water and Sanitation (CWAS), CRDF, CEPT University. In Bhubaneshwar, Odisha Water Supply and Sewage Board (OWSSB) has implemented 75 KLD FSTP.
- In Wai, the construction and operation of FSTP is done by a private firm while it is funded by BMGF. The Sinnar FSTP is funded by council's own funds and is being operated by a private firm through a Design Build Operate (DBO) contract. The Bhubaneshwar FSTP is operated by WATCO (Water Corporation of Odisha) which is a utility of Government of Odisha.
- Wai and Sinnar FSTPs are mechanized treatment plants The FSTP at Wai is based on thermal treatment process (Pyrolysis) and the Sinnar FSTP is based on UASB technology. Bhubaneshwar FSTP is based on nature-based system with minimal mechanization.

Intervention

- With an aim to generate renewable energy and to meet the electricity requirement of the FSTP, all the three cities have set up Solar Power Plants at the FSTPs.
- The electricity requirement of Wai FSTP is about 15Kw for 10hrs a day, while that at Sinnar is 7.5 Kw and for Bhubaneshwar its 10Kw. Based on this, the designed capacity of the on-grid solar power plant in Wai, Sinnar and Bhubaneshwar were setup at 30 Kw ,10Kw, 10Kw respectively.
- In Wai, the solar installation had been designed over sludge drying beds. Whereas in Sinnar and Bhubaneshwar, they have been provided over the resources center of the FSTP.
- The on-grid solar systems at all the three FSTPs are operational.



Solar power plant at Wai FSTP



Solar power plant at Sinnar FSTP



Solar power plant at Bhubaneshwar FSTP

Impact

- As the FSTPs are mechanical, the installed solar plant helps the municipal councils to save on electricity costs.
- After meeting the electricity requirement of the FSTP, the excess electricity is being used at SWM site.
- The solar plants also help reduce carbon footprint

17. ENGAGEMENT OF WOMEN AND TRANSGENDER SHGS FOR O&M OF FAECAL SLUDGE TREATMENT PLANTS IN ODISHA

Abstract

In the effort to generate sustainable livelihood opportunities, and drive an inclusive sanitation agenda, the State Government of Odisha has handed over the operations and maintenance of septage treatment plants to seven women and one transgender SHG in the cities of Angul, Balasore, Berhampur, Baripada, Cuttack, Dhenkanal, Rourkela and Sambalpur, respectively. A phased and participatory approach was adopted at all stages, beginning with selecting the SHGs, to creating training modules, to their capacity building to finally handing over the infrastructure by signing an agreement. The path breaking pilot has also proven to be an effective cost optimization process to the state, given how it employs an alternate strategy in plant operations and maintenance. Its success has encouraged the state to consider replicating it across all ULBs, as when septage treatment plants get set-up in the state.

I. Context

Entrepreneurship has long been recognized as an important source of poverty alleviation, economic empowerment and a means to mitigate gender inequity. However, social norms and gender specific barriers have inhibited economically and socially marginalized groups, such as women and transgender, from making their mark in entrepreneurship. Micro-entrepreneurship thus offers such vulnerable individuals with limited education and skills, a viable avenue to participate in economic activities, provided the same is accompanied by long-term technical, financial and incubation support. Cognizant of the same, the state of Odisha has been involving such marginalized members from the community in the state's sanitation endeavors through partnerships and associations with community organizations like Self Help Groups (SHGs). Accordingly, SHGs are involved in a number of sanitation initiatives from CT/PT construction to its O&M, composting, solid waste management, to mechanized desludging of toilet septic tanks/ cesspool operations, and more recently, a unique pilot in maintaining of septage treatment plants in 4 cities across the state.



II. Intervention

The deliberate engagement of women and transgender SHGs for the O&M of Septage Treatment Plants (SeTPs) in the cities of Angul, Balasore, Berhampur, Baripada, Cuttack, Dhenkanal, Rourkela and Sambalpur was undertaken as a pilot in an effort to strengthen SHG engagement in liquid waste management in Odisha and as a step towards gender parity and inclusivity. It was undertaken in a phased manner, beginning with the identification of those groups interested and invested in sanitation activities, then orienting them through a capacity building process which included trainings and exposure visits, as well as engagement with all stakeholders involved in the plant's functioning, and, finally, with the selection of those who passed the final evaluation. The handover of plant maintenance was also motivated by the need to optimize costs through alternate ways of septage management. Though the plants required external assistance in O&M, the low-technology/'no-technology' model adopted by the state relied on a natural biological process; thus, daily maintenance of plants was easily assigned to semi-skilled human resources,

particularly, given the limited availability of external operators who could manage such plants. With a total of 100+ SeTPs expected to be operational in the state by 2021 to treat all the septage generated in urban Odisha, the engagement of SHGs would yield the state gains in terms of improved efficiency. It will also improve community ownership over sanitation and facilitate the creation of sustainable livelihood opportunities in the space.

III. Implementation approach

The process flow for the physical handover of the O&M of the treatment plants to the SHGs began with the identification and role definition of various stakeholders. At the state level, OWSSB and PHEO provided technical guidance and the State Urban Development Authority (SUDA) supported with capacity building and in leveraging the SHG network under the NULM programme. The local representatives of the OWSSB, PHEO, and the city level unit (CMMU) of the NULM program also supported the ULBs. Following this, steps were taken to select the appropriate SHG, beginning with preparing a selection criterion, then inviting interested SHGs, orienting them on the process, short-listing eligible SHGs for the final evaluation, and then selecting the SHGs based on their performance through the entire process.

After selection, but prior to the capacity building of selected SHGs/ federations, a detailed Standard Operating Procedure (SOP) was prepared, with the intention of facilitating the selected SHGs to carry out routine, specific and critical tasks relating to FSTP O&M. Once the SOP was in place, capacity building was initiated, through a combination of classroom and onsite training. The key modules covered included the orientation on routine maintenance and periodic maintenance activities, crucial tasks for ensuring safety measures at the SeTP, among other procedures. The selected SHG members were also compensated for wage loss during the trainings, through a stipend.



This was followed by the signing of a service contract between the group/federation and the concerned ULB. The preparation of the contract was done taking into account the interests of SHGs. Given the nature of SHG functioning, flexibility was built-in to ensure they could work with multiple stakeholders. The documents were also made available in Odia, and the SHGs were provided draft copies for discussion and consultation with their own legal experts. All concerns raised by the SHG members were duly addressed, prior to the signing of the contract. Once the modalities were finalized, the final contract signing and smooth transfer of the FSTP to the selected SHG/Federations followed. Following the handover, a handholding

exercise was also built into the process. A performance monitoring criterion was evolved to monitor the management by SHGs, and to help them with any teething problems.

IV. Highlights

When turned into service providers, SHGs have a distinct advantage over private players, of being able to better mobilize the local community and incentivize their participation since they come from the community itself.

SHGs also represent members from vulnerable communities like women and transgender, who are deprived of benefits like safe and hygienic sanitation services, so their involvement also promotes inclusivity in sanitation.

From the perspective of the state, this process has resulted in the exploration of alternatives, and sustainable models of septage management, a thinking which can be adapted to other sanitation processes as well.

It has also allowed the state to scrutinize the process of septage treatment functioning and examine the specific roles and responsibilities of different state actors in the sanitation-value chain, from ULBs to parastatals to government departments, thereby improving their synergy and mutual coordination.

V. Impact

The process has helped generate sustainable livelihood/employment opportunities for poor urban women and vulnerable groups like transgender, who are often deprived of income and social security benefits. The involvement of CBOs/SHGs has also strengthened community ownership, pride, and dignity over infrastructure, and in turn, has created long-term, sustainable and low-cost methods to deliver essential services. Lastly, their involvement has also gone a long way towards mainstreaming sanitation work and breaking stereotypes on how only men are capable of handling physical and mechanical work at treatment plants.

VI. Reflections and lessons

From a long-term perspective, the pilot process has revealed the need for strong capacity building to deliver outcomes in a timely and meaningful manner. It has also highlighted the need to mainstream gender concerns, such as providing gender sensitivity training to those interacting with the SHG members, as well as the need to create gender appropriate PPEs that appeal to the sensibilities of the SHG groups. Other lessons learnt involved the need for SHG members to adhere to the strict work timings employed at the septage treatment plants, and for the ULBs to create processes to make timely and prompt payments to the SHGs

There is also a need to ensure timely payments against the service provided as these CBOs are from lesser means and require timely payments for working capital.

VII. Potential for replication

The pilot engagement of SHGs/federations for O&M of SeTPs has certainly encouraged Housing and Urban Development Department to extend the same to all septage treatment facilities that may come up across the state. However, the path breaking model has also motivated other states to consider initiating activities along similar lines. One such activity involves the engagement of SHGs in Sinnar, Maharashtra, to manage the landscaping of the resource center near the STP in Sinnar.

Management of landscaping at resource centers by SHGs in Sinnar²²

The Sinnar FSTP carries out scheduled desludging, resulting in huge quantities of water being generated. This had proven to be a mammoth task to manage. The city thus decided to set up a reuse plan, which included landscaping of around 8000 sq. mt. of land around the FSTP, and creating an urban forest. This area was then designated a resource center where the government could hold training sessions and other such programs for government stakeholders. The government then floated a tender, which was made open to only SHG groups, to select an agency who could help with the management of this area, through the reuse of wastewater and through composting. A 10 member SHG was eventually selected for the job recently, becoming the first SHG to be engaged by the state in FSTP-centric work. This is expected to pave way for other ULBs in Maharashtra to adopt similar models, and eventually even build up to engaging SHGs in the actual O&M of the plants themselves.

Lead case study contributor: Ernst & Young LLP

Other contributors: Center for Water and Sanitation (CWAS), CRDF, CEPT University

18. CREATING AN ECOSYSTEM FOR SUSTAINABLE SANITATION IN MADHYA PRADESH

Abstract

The State of Madhya Pradesh has made considerable strides to improve its urban sanitation landscape since the launch of Swachh Bharat Mission in year 2014. Barring 49 bigger urban Local Bodies which are covered through sewerage networks, most rely on on-site sanitation systems for their faecal sludge and liquid waste management. To particularly meet the FSSM needs of these smaller ULBs (with a population of 20,000), the Directorate of Urban Administration and Development has created a low-cost mini FSTP model which has been successfully piloted in Shahganj and is being replicated across the state.

The State's commitment towards ensuring sustainable sanitation for all has led to Madhya Pradesh winning the title of the third cleanest State in Swachh Survekshan (SS) 2020²³ with 108 towns having been declared ODF++²⁴ in comparison to only 14 towns from 2019's survey, which has, to a large extent, been made possible due to the mini FSTP innovation introduced and implemented by the State.

I. Context

Madhya Pradesh is geographically the second largest State of the country, with 378 Urban Local Bodies (ULBs). More than 45% of the total urban population of the State resides in 16 Municipal Corporations and around 31% urban population resides in 98 Municipal Councils.

After the commencement of the SBM-Urban Mission, there has been a wide prevalence of on-site sanitation system in the state. There has been an increase in the percentage of pit latrines and public toilets by 21.1% and 6.3% respectively since 2011²⁵. Out of 378 towns, 49 towns (majorly Nagar Palika Nigam and Nagar Palika) have ongoing and proposed sewerage projects, which are in various stages of implementation and are expected to be completed in the next 5 years. However, most other ULBs rely on on-site sanitation and therefore become the prime focus when it comes to holistic FSSM coverage in the State.

Besides, there is still a lack of awareness among community members and other stakeholders such as desludgers and ULB staff on the ill effects of improper faecal sludge management. There is a need to focus on capacity gap assessment and its fulfillment at the level of ULBs in terms of manpower, finance, skills, expertise and capacity building for various stakeholders at different levels in order to create an enabling environment for FSSM.

II. Intervention

While continuous efforts are being made to expand the sewerage network in the cities, considering the present limited sewerage infrastructure across urban centers in the State, faecal sludge and septage management are expected to play a pivotal role in the safe, hygienic and sustainable sanitation service delivery. Keeping the above context in mind, the State has identified the following areas of interventions based on a need assessment study:

1. Strengthening of the policy and regulatory environment for FSSM
2. Identifications of various technological options for faecal sludge treatment, especially for smaller towns

3. Capacity building and training of various stakeholders to create awareness about faecal sludge management, its importance and adverse effects in case of negligence.
4. Innovation in service delivery mechanism through Information & Communications Technology (ICT) based interventions
5. Provisions of environmental conservation in the context of sanitation service delivery to prioritize FSSM implementation in towns situated on important riverbanks of the State.

III. Implementation Approach

In order to understand the FSSM scenario in the State in terms of existing system, infrastructure availability and provisions, the Directorate of Urban Administration and Development (UADD) conducted a rapid survey with selected ULBs. Towns were selected to cover different groups of ULBs such as – Nagar Nigam, Nagar Palika and Nagar Parishad and the predominant sanitation system such as towns with existing sewerage system and those with no treatment system.

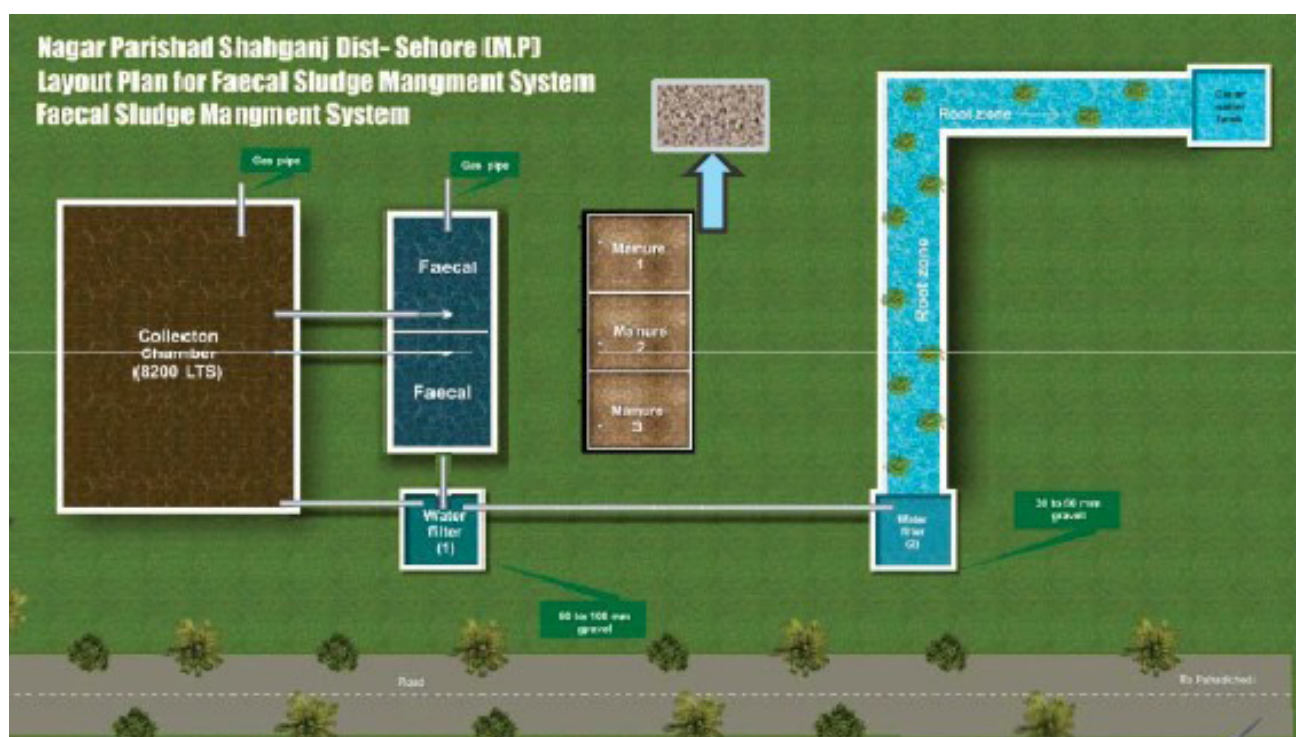
Based on the survey study:

- Directorate-UADD has drafted the State's FSSM Policy and Guidelines for effective implementation of FSSM at ULB level. The policy is presently under approval.
- UADD has disbursed INR. 8.5 crore to all ULBs for purchasing of mud pumps (for cleaning of on-site sanitation systems).
- To give a boost to the existing FSSM infrastructure and to particularly reach out to the smaller ULBs, the Directorate has proposed a mini Faecal Sludge Treatment Plant in compliance with the State's engineering cell and sanitation experts post its successful implementation by Shahganj ULB.
- Focusing on the aspect of capacity building, UADD has organized frequent divisional workshops for multiple stakeholders to make them aware about the FSSM value chain.
- A dedicated FSSM team has been formed at the Directorate level monitor the above activities and ensure its successful implementation.

IV. Highlights

The Mini FSTP developed by UADD is an FSSM innovation. This concurrent development has put Madhya Pradesh in a unique position where provisional treatment for faecal sludge and septage can be made available to almost every town. Through this development and speedy implementation in 100+ ULBs, the State has received a big push when it comes to building effective sanitation infrastructure in FSSM.

The Mini FSTP is a combination of sludge drying bed and planted drying bed with leachate collection tank and a polishing pond for treated water. The entire system is a gravity-based model and requires no mechanical and electrical interventions. This model developed will work in most of the geographical locations of Madhya Pradesh and other similar states.



V. Impact

The initiative taken by UADD encouraged bigger ULBs officials to think in the direction of providing a sustainable FSSM solution for all its citizens.

- Almost all ULBs which have existing sewerage infrastructure adopted the co-treatment mechanism to treat the faecal sludge and allowed nearby ULBs through inter ULB agreement to treat their faecal sludge in STP.
- Few ULBs such as Jabalpur, Ujjain, Vidisha, Ratlam, Singrauli etc. adopted the modular FSSM treatment systems.
- Few ULBs which fall in the river basin areas adopted in-situ bioremediation techniques to treat the wastewater before merging with river.
- Around 50 lakh people have been benefitted through these FSSM initiatives undertaken by the State in the last 3 years.

VI. Reflections and lessons

After its successful implementation at Shahganj town, UADD took this initiative as a challenge for implementing a low-cost solution for treating the faecal sludge and septage being generated by the smaller towns. The following are the key factors contributing to the successful implementation of this project:

Political will: The administrative officials of UADD took this as a challenge to provide a low-cost efficient treatment system to smaller and financially weak ULBs and started a pilot project in Shahganj and supported it with technical assistance for its successful implementation. Use of locally available technology and community support were the key factors to maintain this political will.

Sustainability: This plant could be a possible sustainable sanitation solution to small ULBs. It is a low-cost gravity-based treatment plant with minimal O&M cost, which is easy to manage. Revenue generated from the septic tank cleaning services can be used in vacuum emptier and plant maintenance.

Proliferation of FSSM in MP through SBM-Urban: Today, FSSM has become an integral component of the SBM-Urban Mission. As per SBM-U guidelines, a ULB must have an FSTP or co-treatment mechanism to get the ODF++ certification. Madhya Pradesh has taken a big leap in Swachh Survekshan 2020, by scaling up this low-cost model to achieve more numbers of ODF++ certified towns. In Swachh Survekshan 2019 only 14 cities achieved this status but in 2020, 108 cities have achieved this status, which is an almost 771% jump from the previous year. This result has given a renewed thrust to the State when it comes to adopting non-networked solution for treatment of black water.

VII. Potential for replication:

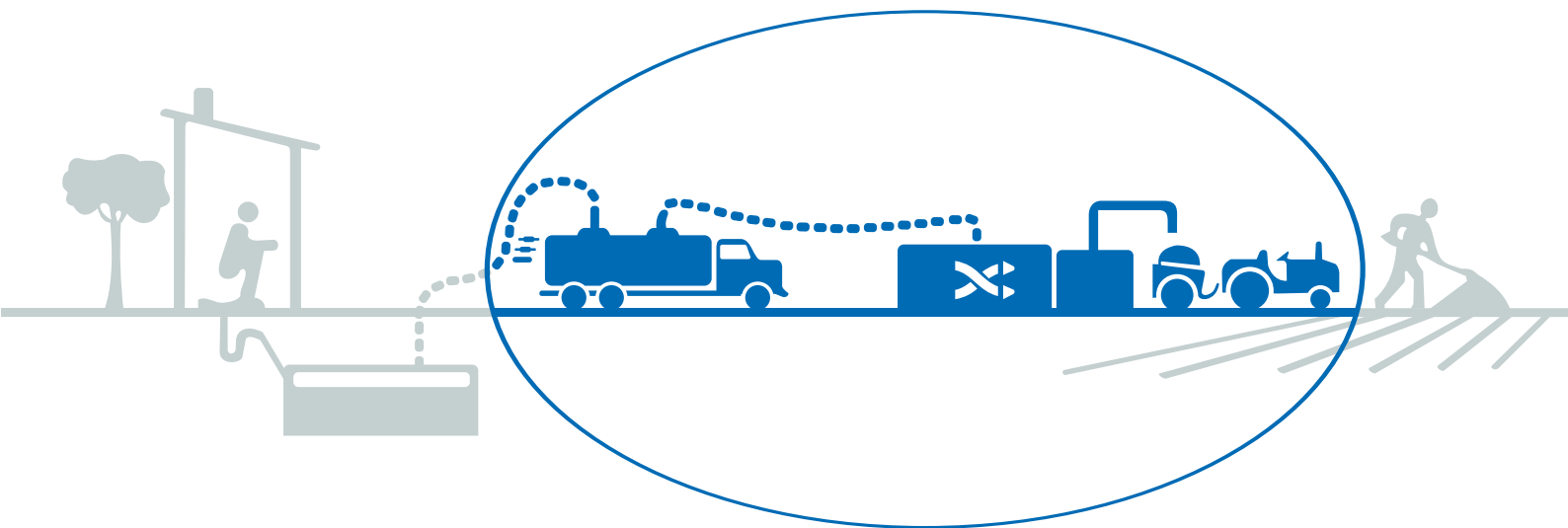
This Mini FSTP will help in safe treatment and disposal of faecal waste for ULBs which have a population size up to 20,000. Nearly 200 ULBs will be benefitted from this initiative. Since this is a low-cost treatment plant and due to the low capital expenditure involved, it can be implemented at almost all ULB independently with their own funds. The O&M cost of the plant is negligible since there is no mechanical and electrical interventions involved.

Lead case study contributor: KPMG

SECTION-E

INTEGRATED MODELS

(ACROSS TRANSPORT AND
TREATMENT)



19. FAECAL SLUDGE MANAGEMENT, DHENKANAL, ODISHA

Abstract

In Odisha, and specifically in Dhenkanal, latrines connected to septic tanks and pit latrines predominate in urban households. When these septic tanks/pits were full, they were desludged and the Faecal Sludge was disposed-off unsafely in water bodies, or on vacant lands. Hence, Project Nirmal was designed and intended to demonstrate the feasibility of a city-wide low-cost decentralized sanitation system for small and medium cities/towns incorporating faecal sludge and septage management (FSSM) for on-site sanitation systems. The sanitation situation in the Dhenkanal municipality of Odisha required intervention across the sanitation value chain. The Faecal Sludge Treatment Plant with a capacity of 27 m³ per day was set-up in Dhenkanal, and an integrated service contract model was put in place—having a designated call center to demonstrate effective, low-cost town scale faecal sludge management system.

I. Context

Dhenkanal Municipality is located in the district of Dhenkanal, Odisha. The total area of the Municipality is 30.92 Sqm, and it is centrally located in the district with a population of around 67,414 and 14,908 households. It is surrounded by Kendujhar to the north, Jajpur to the east, Cuttack to the south, and Angul to the west.

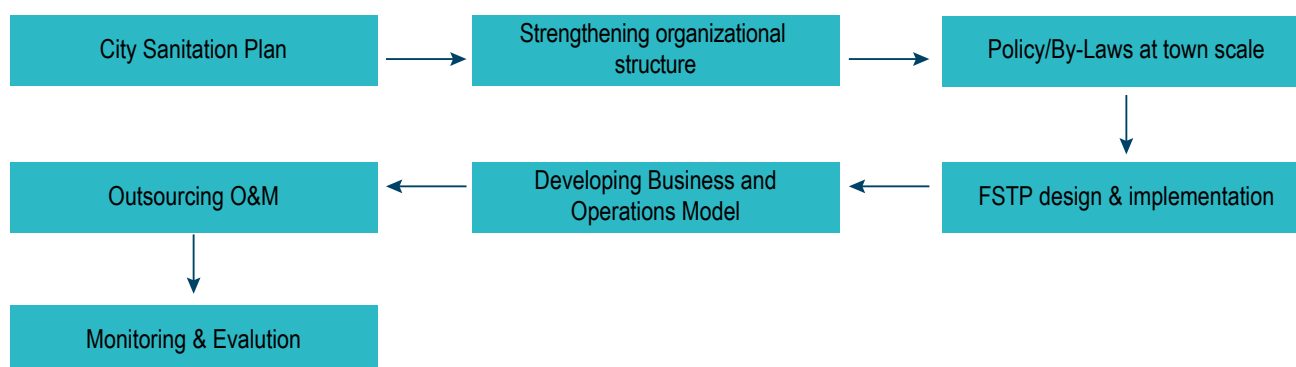
Dhenkanal, like 7000+ small towns in India, did not have access to the centralized Sewage Treatment Plant. The entire town was dependent on onsite-sanitation systems (OSS) such as septic tanks and pits. The OSS was emptied by cesspool trucks when they became full, but there was no facility to ensure treatment of the faecal sludge. This project was piloted to demonstrate sustainable faecal sludge management using a nature-based treatment system in Odisha under Project Nirmal.

II. Intervention

- Partnership with state government and ULBs.
- Demonstration of FSSM technologies
- Capacity-building of key stakeholders
- FSSM awareness campaign
- Integrated FSTP operations and desludging services

III. Implementation approach

Detailed step by step process followed and activities undertaken



Stakeholders and their roles:

- BMGF and Arghyam Foundation – Funding organisations
- Practical Action – Planning and Implementation of FSSM in Dhenkanal
- Center for Policy Research (CPR) – Policy recommendation
- Dhenkanal Municipality–Provide Land and pass the policy resolutions, regulatory authority.
- CDD Society – Design of FSTP and FSSM business plan and operation model, implementation support
- Blue Water Company–Managing the FSTP and desludging operations, which included continuous handholding of the staff, especially the truck operators.

Monitoring and roll-out

The operation and maintenance of the desludging trucks and FSTP were integrated and tendered. This eased the process of managing and monitoring the implementation of FSSM in the town. The integrated service provider was chosen through quality and cost-based selection. Blue Water Company, a start-up in the FSSM service arena, was awarded this contract for a period of one year.

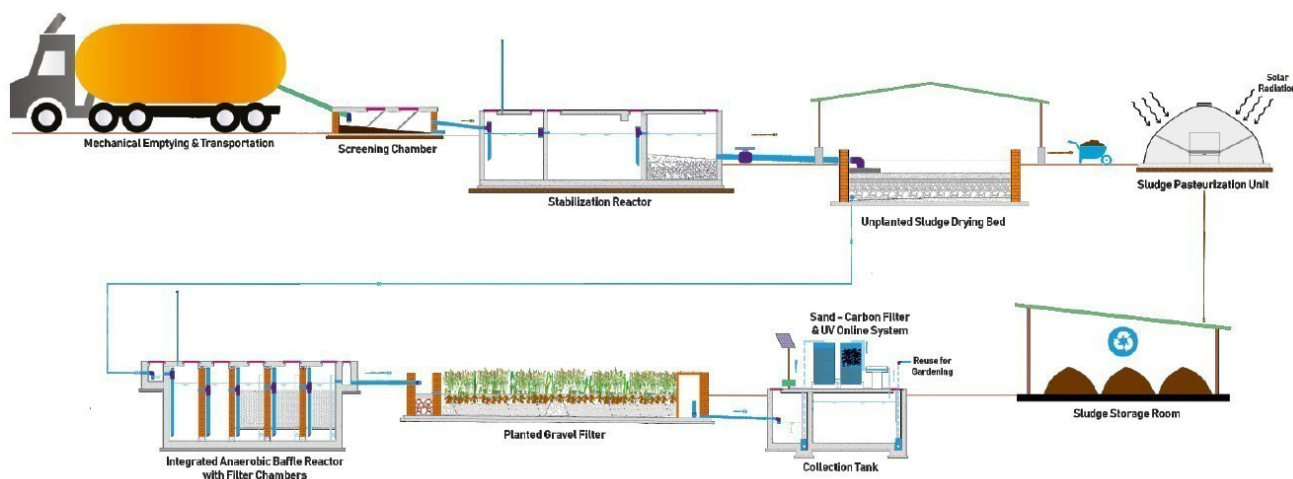
Timeline across planning, implementation, and monitoring post-implementation

- 2017: Baseline assessment, FSSM planning, and FSTP design, FSTP Construction (August 2017 to November 2018)
- 2018: FSTP inauguration
- 2019: FSTP and truck operations by Blue Water Company
- 2020: FSTP and truck operations handed over to the local self-help group as part of the state policy for FSSM operations

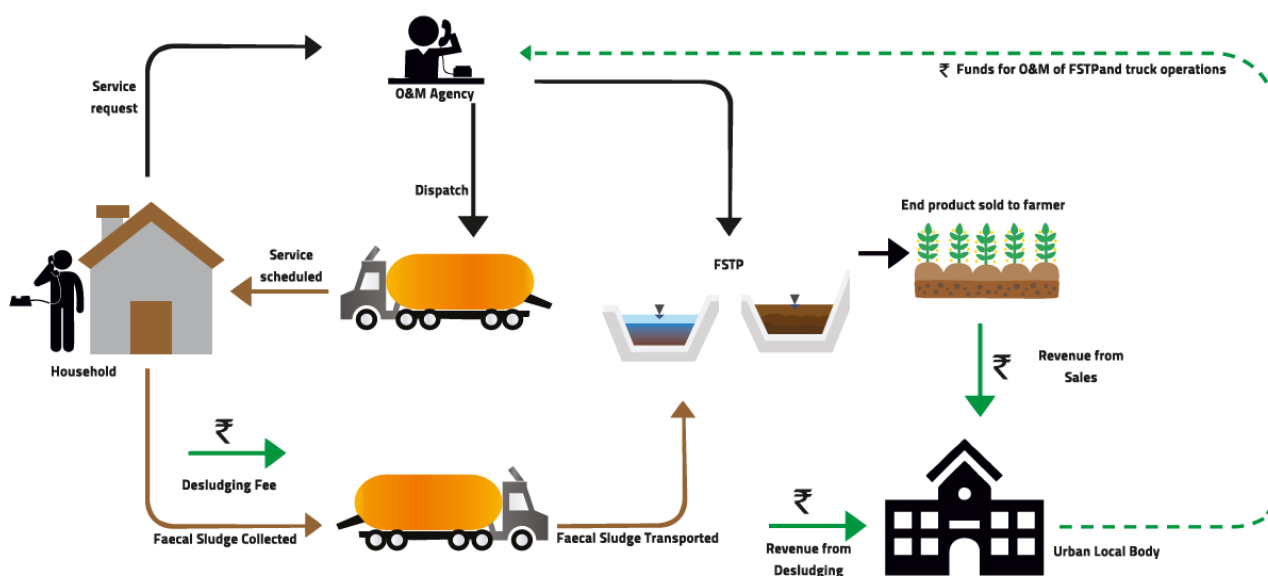
The technology used or implemented

Anaerobic Stabilization Reactor + Unplanted Sludge Drying Bed (ASR + UPDB) with DEWATS–Screen and Grit Chamber, Anaerobic Stabilization Reactor, Unplanted Sludge Drying Bed (UPDB), Integrated Anaerobic Baffled Reactor & Anaerobic Filter (ABR & AF), Planted Gravel Filter (PGF), Collection Tank, Sand and Carbon Filter, Pasteurization Unit.

Flow charts/visuals /data analytics



Treatment Process Faecal Sludge Treatment Plant, Dhenkanal



Value Chain of Dhenkanal FSTP Business Model

IV. Highlights

The detailed planning of the business model and financial sustainability, with due consideration to the socio-economic and spatial realities, enabled FSTPs to cater to a much wider user base. Additionally, FS from rural areas was also being accepted in the FSTP demonstrating urban-rural integration in FSSM.

The reskilling of the former informal workers demonstrated the possibility of rehabilitating them within sanitation services. However, this required continuous efforts and monitoring of their behavior for relapses.

V. Impact

- State Government and the ULBs demonstrated commitment to urban sanitation service delivery by providing FSSM as one of the solutions
- The disposal of FS was regulated and illegal disposal of FS was addressed
- The FS was treated at FSTP and the by-products were reused, thereby, closing the sanitation loop
- Technical capacity of the State and ULBs was augmented by establishing Project Management Units (PMUs)
- Small cities were introduced to data-based GIS planning tools
- Community-level demand generation for city-wide sustainable sanitation through IEC strategy & Committees
- Urban sanitation training programs were institutionalized in regular state training for urban cadre
- The city of Dhenkanal demonstrated a commitment to urban sanitation service delivery by providing FSSM services and integrated truck and plant operations to increase reach and reduce costs
- More than 6 Million Liters of FS was treated, and 4980 people were served till 15th December 2020

VI. Reflections and lessons

Key success and lessons

- Appropriate engagement of stakeholders in various project intervention processes creates better results
- Mass awareness is required to institutionalize the FSSM concept at various levels
- Women's participation is more in comparison to men; the activities should be designed with pro-women perspectives
- Local politicians, particularly the ward councilors, should be handled with great caution to ensure smooth implementation of the project activities
- Constant and continuous follow-up with the government officials is required for timely implementation of the project activities
- Proper processes must be followed to minimize legal conflict

Challenges

- Time-Intensive
- High level of Bureaucracy and lack of ownership
- Lack of protocols/standards and policies for governance and management:
- Lack of understanding and capacities
- Adverse socio-political factors

VII. Potential for replication

This model can be replicated in those towns having a good urban-rural convergence. Also, the towns relying upon private sector operations and maintenance of the entire value chain with regulations/guidelines provided by ULB. The connection between the Dhenkanal FSTP with the surrounding cluster is operationalized through the passage of Municipal Council Resolution by the Dhenkanal Municipality, as well as resolutions by the concerned GPs. This intends to create a convergence model which can be replicated in the other cities and towns of the state and ensure that there is ownership by community/elected representatives or leaders and government officials who can sustain the gains realized. This intervention is first of its kind in the entire state, where systematic activities are being undertaken through a districtwide approach to plug in rural areas within the existing FSSM solution available at a municipality level. This effort is a step towards managing the waste of the entire district of Dhenkanal, therefore, will address the issue of environmental pollution and contribute significantly to the future management practices of ground and surface water sources, which in turn will affect Indians' access to clean and drinkable water. This, in turn, will support the communities being served in being healthier and live in contamination-free environments for children to play and thrive in.

Lead case study contributor: Consortium for DEWATS Dissemination Society

20. CLUSTER APPROACH TO SCALE FAECAL SLUDGE MANAGEMENT IN TAMIL NADU

Abstract

Recognizing the need for creation of treatment facilities within reasonable distance from customer sites, the Government of Tamil Nadu adopted a State Investment Plan in 2018 to scale treatment across the State. The SIP incorporated the cluster approach, wherein Urban Local Bodies (ULBs) were clustered around both new and existing treatment facilities, within a 10 km radius. Clustering of ULBs capitalized on existing resources and capacity, and optimized investment requirements to scale treatment.

I. Context

As per 2011 Census, 48.4% of population resides in urban areas in Tamil Nadu. The urban areas in the state are categorized into a three-tier hierarchy with Municipal Corporations, Municipalities and Town Panchayats. Within these urban areas, on-site sanitation systems (OSS) remains the largest household sanitation arrangement across the state, with nearly 70% of the households connected to septic tanks and pits.

There were large deficits in treatment facilities for faecal sludge and septage generated by households. This shortage of adequate and appropriately located disposal facilities was a significant reason for the prevalence of unsafe disposal, which in turn caused severe environmental pollution and contamination of water bodies.

Recognizing the need for the creation of treatment facilities within reasonable distance from customer sites, the Government of Tamil Nadu (GoTN) adopted a State Investment Plan (SIP) based on the cluster approach to scale the treatment across the State. The cluster approach aimed to ensure that the treatment facilities were located at optimal distance from customer sites to ensure business viability for desludging operators.

II. Intervention

The GoTN, in its Operative Guidelines for Septage Management issued in 2014, adopted an approach of clustering Urban Local Bodies (ULBs) around treatment plants that optimized their utilization. The cluster approach advocated the clustering of existing and potential treatment plants within 10 km radius – identified through discussions with desludging operators across the state, as the optimum travel distance from customer sites to disposal / treatment facilities.

In 2018, using the cluster approach as a key underlying principle the GoTN developed and adopted a SIP. The SIP proposed to scale treatment infrastructure across the State in a phased manner, clustering ULBs around both existing and proposed treatment facilities. By clustering larger Municipal Corporations/ Municipalities with smaller Town Panchayats, the SIP optimized investment requirements to scale treatment, and capitalized on the existing resources and capacity.

III. Implementation approach

The significant steps involved in the implementation of the cluster approach included:

1. **Adoption of the State Investment Plan for scaling of treatment facilities²⁶:** In 2018, GoTN adopted the SIP and the cluster approach formed the basis for statewide scaling of treatment

facilities across 663 ULBs. The SIP proposed a five-phased approach, wherein Phases I and II focused on enabling co-treatment at existing and proposed Sewage Treatment Plants (STPs), Phase III on provision of Faecal Sludge Treatment Plants (FSTPs) that are shared by clusters of Municipalities and Town Panchayats, and Phases IV and V on provision of FSTPs or other treatment solutions for clusters of Town Panchayats or standalone ULBs.

The GoTN allocated a budget of INR 200 crore for the implementation of 49 FSTPs in Phase III of the SIP, in 2018, and subsequently earmarked INR 31 crore for an additional 11 FSTPs, in 2019. There are currently 60 FSTPs under various stages of construction, while the co-treatment has been enabled at 50 STPs. These treatment facilities would serve 192 ULBs through the cluster approach.

2. **Adoption of governance mechanisms:** With the treatment facilities coming into operation, the GoTN recognized the need to formalize the cluster approach and establish mechanisms that would govern the operationalization of the approach. Therefore, the GoTN issued the following two governance mechanisms in May 2020 through Government Order (G.O (2D) 35)²⁷:
 - a. **Drafting of a Memorandum of Understanding (MoU)** to formalize the working arrangements between cluster ULBs for the usage of shared treatment facilities including cost sharing of Operation and Maintenance (O & M) was carried-out. The MoU detailed a set of obligations for the Host ULB *i.e.* the ULB where the treatment facility is located, as well as Participating ULBs *i.e.* ULBs that form the cluster around the shared treatment facility. The key objectives of the MoU were:
 - i. To define the stakeholders involved in the O&M and use of FSTPs, and in the co-treatment process
 - ii. To set-out the responsibilities of ULBs along with the terms and conditions for the use of the shared facility
 - iii. To encourage the usage of treatment facilities, while affording host ULBs the right to recover costs of operating and maintaining these facilities
 - iv. To establish the principles by which O&M costs would be shared between the ULBs served by an FSTP
 - b. **Creation of a Standard License Agreement (SLA)** for private desludging operators to regulate the collection and conveyance process, ensuring safe disposal of faecal sludge and septage. The SLA aligns the desludging operations with the cluster approach, mandating the Host ULB to license private desludging operators serving within the cluster.
3. **Operationalization of governance mechanisms:** The MoU and SLA are being operationalized across Tamil Nadu through capacity building webinars and digital learning modules.

Also, bye-laws for Septage Management, framed as a part of the OG, have been updated to align with the provisions of the MoU and the SLA. The bye-laws, once enacted by the ULBs, will be central to enforcing the sharing of O&M costs between cluster ULBs, as well as the licensing of desludging operators at the cluster level.

IV. Highlights

The cluster approach has allowed the GoTN to capitalize on existing resources and capacity to optimize the investment required to scale treatment. The clustering of ULBs has assigned the O&M of facilities to the larger and better equipped ULBs, while allowing for potential expansion of Faecal Sludge and Septage Management (FSSM) services to rural areas.

The approach has been operationalized through innovative governance mechanisms that are key to strengthening the sustainability of FSSM services. The MoU promotes the shared use of treatment facilities, and safeguarding of funds for the O&M of FSTPs, to ensure their financial sustainability. The SLA, while also encouraging the use of treatment facilities, both, enables and regulates the private desludging market.

V. Impact

The most critical impact of the cluster approach has been the optimization of treatment infrastructure. This, in turn, has had implications on capital investment, as clustering together with the co-treatment approach allows for the utilization of existing treatment facilities to their full capacity. In the case of FSTPs, through the MoU, the approach has enabled sharing of O&M costs, thereby, securing the financial sustainability of the treatment systems. Furthermore, with different types/sizes of ULBs sharing a common treatment facility, the approach has facilitated the optimum use of resources.

VI. Reflections and lessons

The cluster approach has been critical to scaling FSSM in Tamil Nadu. It has facilitated smaller ULBs to share treatment facilities with larger, better-equipped ULBs, thereby, optimizing the use of the existing and upcoming treatment infrastructure.

However, there are challenges to operationalizing the cluster approach. The MoU, which has been the first such agreement in the area of sanitation to be institutionalized at the state level, needs a clearly defined processes for its execution. Nevertheless, these processes will crystallize as clusters of different types of ULBs adopt the MoU, and commencement of FSTPs/co-treatment operations is initiated.

VII. Potential for replication

The cluster approach has several replicable features including:

1. Clustering of Local Bodies (expanded to cover rural areas)
2. Sharing of FSTP O&M costs between Local Bodies
3. Ring-fenced account to safeguard funds for O&M of treatment / disposal facilities
4. Recording and sharing details of facilities' performance to promote transparency and accountability
5. Standardized licensing system for private de-sludging operators
6. Addressing sanitation workers' safety and welfare requirements through licensing

The Proposed Cluster-based Model for Odisha

Once the cluster model is implemented in Odisha, the state will be able to extend services to three towns, with immediate effect, through the existing operational FSTPs. An additional eight towns will be serviced once the plants, proposed under phase 2 of the state-wide scaling strategy, are commissioned. This approach of clustering urban settlements will save the Odisha Government nearly INR 40 crores. Letter issued by Odisha Water Supply and Sewerage Board formalizing the cluster model can be accessed [here](#).

Extending FSSM services to rural areas in Balasore as a pilot

Odisha Government has decided to extend the services of the FSTP in Balasore district to the rural areas of 90 Gram Panchayats, located within the 20 km radius of the facility. This will ensure that the households within the catchment area are desludged regularly, and the faecal sludge and septage is collected to be treated at the facility, without any hindrance.

1. Charges for availing desludging services will be kept to a minimum, with only a nominal fuel charge included in the cost of the trip, to incentivize the households to desludge regularly.
2. Various IEC campaigns will be launched to incentivize the households to avail the facility

Memorandum of Understanding (MoU) between Dhenkanal Municipality and Dhenkanal Sadar

In pursuance to the understanding with PR Department, H&UDD, UNICEF, and CPR, a pilot project for SLWM in rural areas of Dhenkanal is being undertaken. The urban FSSM facilities in the Dhenkanal district are being extended to select Gram Panchayats, located within a radius of 10 km. In a bid to formalize the extension of delivery of urban FSSM services, Dhenkanal Municipality and the relevant stakeholders have entered into an MoU. The roles and responsibilities to be adhered to by both stakeholder groups have been clearly defined in this MoU.

Lead case study contributor: *Indian Institute for Human Settlements*

Other contributors: *EY*

21. 5 YEARS OF OPERATIONS OF DEVANAHALLI PLANT IN KARNATAKA

Abstract²⁸

The Devanahalli FSTP was inaugurated on World Toilet Day, November 19 in the year 2015. At the time, it was the first planned town-scale FSTP in the country. The term “Faecal Sludge Management” was almost unheard of, apart from a few sector experts. Against this background, there was a conscious effort from CDD Society to ensure that the Devanahalli FSTP design should stand the test of time and that it will be operational with minimal expert supervision even in a small town like Devanahalli. The FSTP was handed over to the TMC in April 2019 and they have been able to operate it with minimal expert supervision. More importantly, the last six months of 2020 have seen full utilization of FSTP capacity.

I. Context

The town of Devanahalli is located 10 km away from the Bangalore International Airport and has seen rapid growth over the last decade. With no sewer networks, the town is dependent on Onsite Sanitation Systems. The sludge emptied from these systems by vacuum trucks was dumped in the open environment – like in most Indian towns. The key issues were -

- Desludging at irregular intervals
- Insanitary toilets
- Indiscriminate disposal of faecal sludge into surface water bodies/storm water drains
- Reuse of faecal sludge without treatment on farmlands

II. Intervention

A Sanitation Safety Planning exercise was undertaken for Devanahalli in 2012-13 that highlighted how water stress in the town was making farmers use faecal sludge (FS) (with rudimentary treatment methods) as a source of water for irrigation amongst other issues. It exposed the numerous pathways of contamination that existed, as a result of raw faecal sludge being indiscriminately dumped into the environment.

In 2015, Consortium for DEWATS Dissemination (CDD) Society was looking for a demonstration site for showcasing approaches to FSSM. This was in alignment with the Devanahalli TMC's need (as a result of the SSP) to identify ways of minimizing exposure pathways from harmful contaminants and pathogens in faecal sludge. Discussions between CDD and TMC led to the idea of implementing a 6 KLD Faecal Sludge Treatment Plant (FSTP) that would help achieve the following:

- A cleaner town (dedicated space for disposal as well as treatment of FS)
- Production of a safe by-product from FS (safe water and nutrients available for farmers)
- Aesthetically beautiful treatment plant (contrary to the belief that treatment plants are dirty places)
- No direct human contact with FS (minimizing health concerns)
- A self-sustainable facility (to ensure infrastructure is built to last)

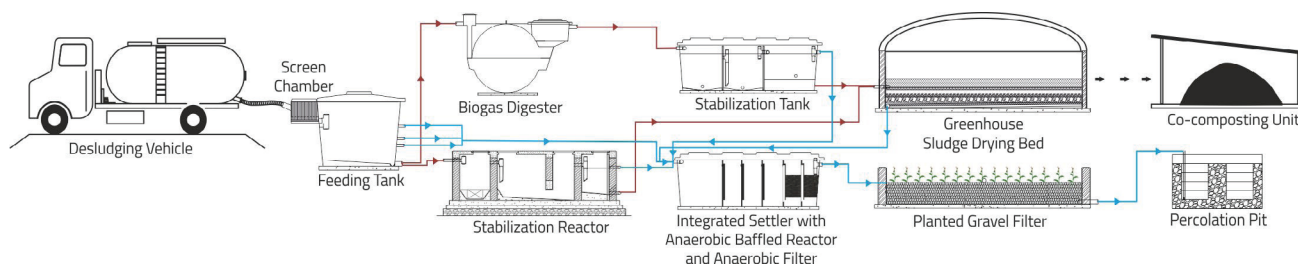
III. Implementation approach

After Devanahalli was identified as the town for FSTP implementation—a workshop was conducted for town officials and private sanitation players, and an MoU was signed for:

1. Implementing holistic FSSM systems
2. Constructing a FSTP

Site identification and technical planning started right away, given the enthusiasm of local officials. Funding was tied up through – BMGF & BORDA

The image below depicts the process flow for FS treatment in Devanahalli FSTP.



Timeline

- 2015 – Inauguration of 6 KLD FSTP, followed by Operations & Maintenance by CDD Society
- 2016 – Regulations passed for safe disposal of FS, outsourcing O&M of truck and FSTP, monitoring construction of OSS and inclusion of Fee for FSSM in Property Tax
- 2017 – First batch of soil conditioner is provided to farmers for safe reuse
- 2017-19 – Tech improvements in sludge digestion process through introduction of Anaerobic Stabilization Reactor and augmenting drying bed performance through use of Mangalore Tiles, Solar Roof
- 2019- Operations totally taken over by the TMC
- 2020- FSTP reaches full utilization in the 2nd half of the year.

IV. Highlights

- First planned FSTP in the country through Unplanted Drying Bed technology that has been replicated widely – “Devanahalli Model” is a colloquial term.
- Works entirely on gravity, with power sources being used only for exhaust fans for greenhouse roof
- Produces soil conditioner that is not only pathogen free but meets FCO standards – that has enhanced yield of farmers – who were otherwise using raw FS. Sale of soil conditioner contributes to 29% of the revenue in FSSM
- Price fixing by TMC to make desludging affordable.

V. Impact

- It is possible to put treatment infrastructure in place that can be easily operated and maintained in a small town like Devanahalli.
- The enhanced FSTP designs, based on the initial Devanahalli FSTP design, have been widely adopted by different states in the country
- It has successfully demonstrated that soil conditioner that is pathogen free can be produced through co-composting process – efficacy of soil conditioner is validated by continuous demand from farmers.

- Different cities have come up with their own FSSM policies and guidelines—adopting context-specific measures
- Landscaping, operator and office rooms becoming a key feature of almost every FSTP
- CSR investment has flowed into Devanahalli to help continue its journey towards a model Sanitation Town
- More than 3000 Visitors from India and Abroad have visited the FSTP to understand FSSM and FS treatment.

VI. Reflections and lessons

Stakeholder engagement is essential at all stages of the Project, especially to avoid delays in implementation and ensure long term sustainability.

Reuse needs to be integrated into treatment process – it cannot be an afterthought. Co-composting was a viable option in Devanahalli because the farmers who intend to use the soil conditioner are nearby to the FSTP. They were handheld and trained to understand the need for using treated FS rather than raw FS.

VII. Potential for replication

The Devanahalli FSTP design was enhanced by adding Anaerobic Stabilization Reactor and optimizing performance of drying beds. Dhenkanal, Angul, Siriclla, Siddipet are all FSTPs designed using the enhancements and more than 25 FSTPs across Tamil Nadu are under construction using the enhanced designs.

These designs are ideal for towns with treatment capacity needs up to 25-30 KLD – thus helping in keeping the operating costs low.



Devanahalli FSTP

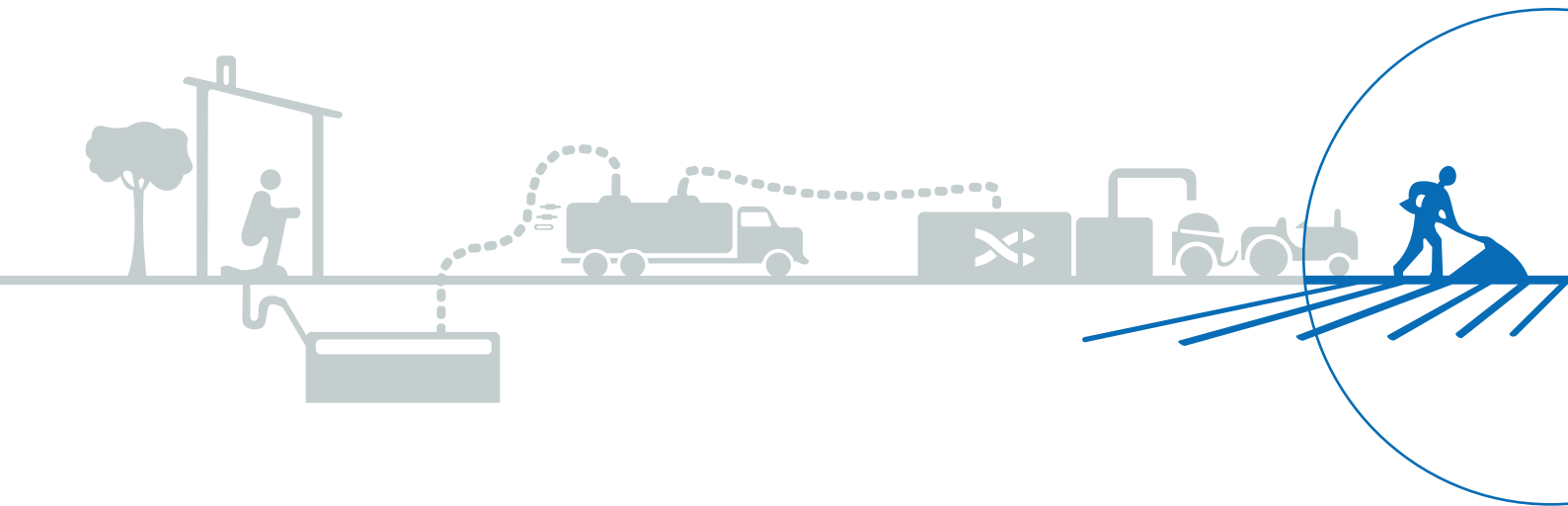


Field trials for evaluation of Co-composted FS efficacy

Lead case study contributor: Consortium for DEWATS Dissemination Society

SECTION-F

REUSE AND RESOURCE RECOVERY



22. REUSE AND RESOURCE RECOVERY AT WAI AND SINNAR FSTP

Abstract

With several Faecal Sludge Treatment Plants (FSPTs) constructed across the country, there is great potential of reusing the by-products generated from FSTPs. The reuse and resource recovery approach helps in viewing treated waste as a valuable resource and can help move towards a more circular economy. This can also help cities attain Water plus status as defined by Ministry of Housing and Urban Affairs (MoHUA). Wai and Sinnar are examples of such cities, where the treated wastewater and dried sludge have been reused for landscaping, urban forest and agricultural purposes, and business models for reuse have been developed.

I. Context

Wai and Sinnar are two medium-sized towns in the state of Maharashtra, India. In their sanitation characteristics and challenges, they are representative of most small and medium Indian towns in India that are home to nearly 40% of India's population. Wai is located at the foothills of Panchgani and has a population of 43,000; Sinnar is located near Nashik and is a fast-growing industrial town, with a population of 72,000.

These two cities overcame a myriad of sanitation issues such as open defecation, untreated disposal of faecal waste and growing environmental pollution to be declared ODF++ by MoHUA. Wai and Sinnar have shown that it is possible for cities, dependent on on-site sanitation systems, to deliver high quality, affordable, equitable, and inclusive sanitation services to its citizens. Wai and Sinnar also became the first cities to implement scheduled desludging of septic tanks as a service, and also to setup FSTPs where the treated wastewater and dried sludge are being reused for landscaping, urban forestry, and agricultural purposes.

II. Intervention

In order to tackle the issues of growing environmental pollution caused by infrequent desludging of septic tanks and unavailability of adequate treatment facilities, both Wai and Sinnar Municipal Councils devised a Faecal Sludge and Septage Management (FSSM) plan. The FSSM plan included provision of scheduled desludging service and execution of adequate treatment facilities. As per the plan, all the septic tanks in the city would be emptied once in three years and the collected septage would be treated at a dedicated septage treatment facility. To treat the septage, a Faecal Sludge Treatment Plant (FSTP) of 70 KLD capacity was set-up on the land allocated by the council, which is about 5 km away from the city center. The Wai FSTP was funded by a BMGF grant, and the Sinnar FSTP was funded by Sinnar Municipal Council. The operations of both these FSTPs were carried-out by a private operator.

As the volume of treated wastewater from the FSTPs was quite high, the cities decided to explore on-site and off-site reuse options. Based on the detailed assessments, the cities decided to reuse the byproducts on-site. At Sinnar and Wai FSTP, both the councils allocated 8000 sqm of land to set-up a resource center with landscaping and urban forest. In Sinnar, the council engaged with the SHGs groups through a tender for O&M of this landscaped and urban forest area, whereas in Wai this was managed by the FSTP operator.

III. Implementation approach

Identification of possible options: The first step in strategizing a reuse and resource recovery plan was to understand the quantity and quality of the byproducts generated. After assessing the quantities generated, quality tests of the byproducts were conducted to understand their possible applications. Once found to be within the recommended limits, an exhaustive list of various on-site and off-site options of reuse of byproducts was developed. These options were then assessed based on the following parameters:

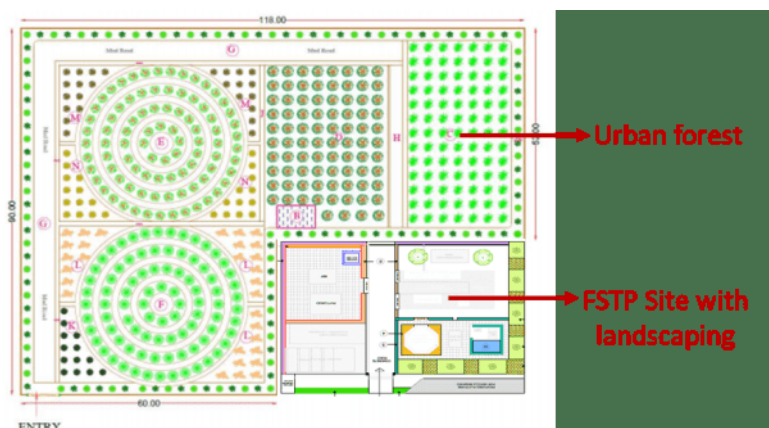
- Physical parameters like land availability, quantity and quality of byproducts, distance of reuse option from site
- Financial parameters like the capital and O&M cost for reuse option
- User perspective in terms of demand for byproducts.

Stakeholders involved: During the assessment stage, various consultations were undertaken with the local government officials, FSTP operator, and possible consumers of byproducts to understand their perspective and requirements. Based on this understanding, the final proposal of urban forest and landscaping was implemented at both the FSTPs. In case of Sinnar, the council entered into a contract with an SHG group, through the bidding process, to manage the urban forest and landscape at the FSTP, for one year. Similarly, the Council of Wai entered into an agreement with the FSTP operator to develop and manage the urban forest.

Funding: At both the FSTPs, council provided 8000 sqm of land for landscaping and urban forest. The capital cost of setting-up the urban forest and landscape at Sinnar FSTP was provided by BMGF and HSBC, and in Wai it was funded by the FSTP operator. The O&M cost for landscape and urban forest management at Sinnar FSTP was borne by the Sinnar Municipal Council, while at Wai, it was borne by the FSTP operator.



Urban forest and landscaping at Sinnar FSTP



Urban forest and landscaping at Wai FSTP

Implementation process and phases: In Sinnar, the phase I of landscaping and urban forest was implemented, wherein plant species suitable to the soil type were cultivated. Meanwhile, drip irrigation systems were installed to transfer treated wastewater from the FSTP site to the urban forest area. Based on this experience, the phase II of urban forest was implemented in Sinnar.

In the case of Wai, the landscaping was done first and the treated byproducts were used in the landscaped area and in the garden on the SWM site. Based on the soil type, revenue generating plant species for urban forest have been identified, and the proposal is, currently, under implementation. The treated wastewater will be pumped for reuse at the urban forest. The council will be signing an agreement with

the private operator for developing and managing the urban forest, and the revenues generated from the sale of these plants will be handed over to the Wai Municipal Council.

The treated solids are used as soil-enricher at both the urban forest and landscape sites in both the cities:



Landscaping and urban forest at Sinnar FSTP



Landscaping at Wai FSTP

IV. Highlights

- The process that was followed for implementation of reuse options was led by the Council officials, which ensured strong ownership from the local government of these activities
- At Sinnar FSTP, women from the SHG were engaged by the council through a contract for maintenance of urban forest and landscaped area.

V. Impact

The urban forest and landscaped area at both the FSTPs have added aesthetical value to the infrastructure. As model sanitation towns, Wai and Sinnar receive many visitors (approximately 500 every year) at the landscaped resource centers that have been developed at these FSTPs. The city carries out training and visits of various stakeholders at these centers and shares the sanitation journey of the city. Also, Sinnar, being a water scarce city, has greatly benefitted by using the treated wastewater and avoiding cost to alternative water sources.

VI. Reflections and lessons

The reuse and resource recovery approach helps in shifting the focus from waste being regarded as something that must be disposed-off to something that can be used as a valuable resource to move towards a more circular economy. Few of the key factors that help to make this approach a success are –

1. Ownership at city level – The Municipal Councils at Wai and Sinnar recognized the need and benefits of taking a reuse and recovery approach, thereby, getting involved in all the stages of project implementation. As a result, they enjoy full ownership of the interventions that have been implemented for reuse.
2. Evidence-based approach for selecting an option – There is a need to look at both off-site and on-site reuse options to assess certain parameters before the decision for identifying an option is made
3. Active consultation and dialogue with stakeholders – To build consensus around a particular option, active stakeholder engagement needs to be done with all the stakeholders, including the government and private entities

VII. Potential for replication

With many FSTPs coming up in India, there is a huge potential for scaling up the reuse options explored in Wai and Sinnar. In Maharashtra, around 311 FSTPs are being constructed as per a state level directive, and cities have been instructed to reuse the byproducts. Many cities like Khopoli and Vita have implemented landscape gardens at their FSTP and have started to reuse the byproducts. Similarly, in Satara, reuse options are being planned.

Lead case study contributor: Center for Water and Sanitation, CRDF, CEPT University

SECTION-G

ENABLERS FOR FSSM PLANNING, SCALING UP AND SUSTENANCE



23. A STATE INVESTMENT PLAN FOR SCALING FSSM IN TAMIL NADU

Abstract

The practice of unsafe disposal of septage into water bodies around cities causes contamination of potential drinking water sources. Recognizing creation of treatment facilities as a critical step to reducing such practices, a State Investment Plan (SIP) focused primarily on treatment was developed to cover 663 Urban Local Bodies (ULBs) in Tamil Nadu. The plan was based on the premise that in most cases, access level investments come from the households to finance construction of toilets and septic tanks, and while private sector would finance desludging trucks, investments for decanting and treatment would come from the Government. The plan was adopted by the Government of Tamil Nadu, in 2018, for implementation in phased manner, with an aim of covering 75% of the urban population.

I. Context

Recent statistics show nearly 70% of households across urban Tamil Nadu are connected to On-site Sanitation Systems (OSSs) and 30.3% are connected to piped sewer system. The sewage generated in piped sewer systems is treated in Sewage Treatment Plants (STPs). In 2017, the sewage generated from urban areas of Tamil Nadu was three times higher than the installed capacity for treatment in the state. In addition to the lack of adequate treatment capacity, there was a prevalence of unsafe disposal of Faecal Sludge (FS) accumulated from OSSs into water bodies around cities, causing contamination of potential drinking water sources due to the absence of adequate treatment facilities like a Faecal Sludge Treatment Plant (FSTP). Recognizing the creation of treatment facilities as a viable solution to reducing such practices, the Government of Tamil Nadu (GoTN) adopted the State Investment Plan (SIP) for state-wide scaling of treatment facilities, in 2018. The focus of the SIP was on providing treatment infrastructure, as other investment requirements along the sanitation chain such as the cost of construction of toilets and septic tanks were largely borne by households or the private sector, in the case of desludging trucks.

II. Intervention

In 2014, the GoTN issued Operative Guidelines (OG) for Septage Management for Local Bodies in Tamil Nadu²⁹. The Guidelines aimed to go beyond the objective of constructing toilets, by ensuring the regulation of collection and provision of treatment facilities for safe disposal of septage. Creation of adequate treatment facilities was recognized as a critical step for implementation of the OG. To support the state-wide scaling of treatment facilities, in 2018, the Technical Support Unit (TSU) of the Tamil Nadu Urban Sanitation Support Programme (TNUSSP) developed the SIP. The plan was formulated to estimate the investment required to ensure full coverage of sanitation across 663 Urban Local Bodies (ULBs) in a phased manner. It was framed on the basis of three principles:

1. **Utilization of existing treatment facilities by co-treatment of septage with sewage:** The OG highlighted the potential for co-treatment of FS using the spare capacity of the existing Septage Treatment Plants (STPs). Co-treatment at existing and new STPs came to be one of the core principles in the implementation of SIP. The SIP proposed a co-treatment model, in which co-treatment could be initiated with minimal time and cost through provision and upgradation of decanting stations and pumping stations at existing and potential STPs.
2. **Adoption of a cluster approach:** The cluster approach advocated in the OG, grouped ULBs into clusters around both existing and potential treatment facilities within a 10 km radius. This

approach was incorporated from Phase I to Phase IV of SIP. It allowed SIP to take advantage of the existing resources and treatment capacity, and optimize investment requirements to scale treatment.

3. **Implementation in phases:** The SIP aimed for maximum coverage of the urban population through a five-phased approach. For instance, Phases I and II focused on serving more than 50% of the state's urban population through sanitation systems by co-treatment and clustering of ULBs.

III. Implementation approach

The SIP proposed scaling of treatment facilities in five phases as follows:

1. **Phase I and II: Provision of decanting stations at STP sites:** Large STPs have spare capacity that can be utilized for treatment of faecal sludge and septage. Therefore, in Phase I and II, it was proposed that faecal sludge and septage from ULBs within 10 km radius of an STP would be co-treated along with sewage at existing and proposed STPs, around which they were clustered.
2. **Phase III: Utilizing Solid Waste Management Sites in Municipalities:** ULBs are mandated to reserve space for Solid Waste Management (SWM) for composting. These sites are underutilized. Consequently, in Phase III, FSTPs were to be located on municipal SWM sites.
3. **Phase IV: Utilizing Resource Recovery Parks in Town Panchayats:** Phase IV will utilize land available at Resource Recovery Parks (RRPs) in Town Panchayats for construction of FSTPs, and similar to Phase III, each FSTP will serve a cluster of ULBs.
4. **Phase V: Stand-alone Cities:** This phase covers ULBs that have not been included in any cluster in the previous phases, and will require standalone treatment options.

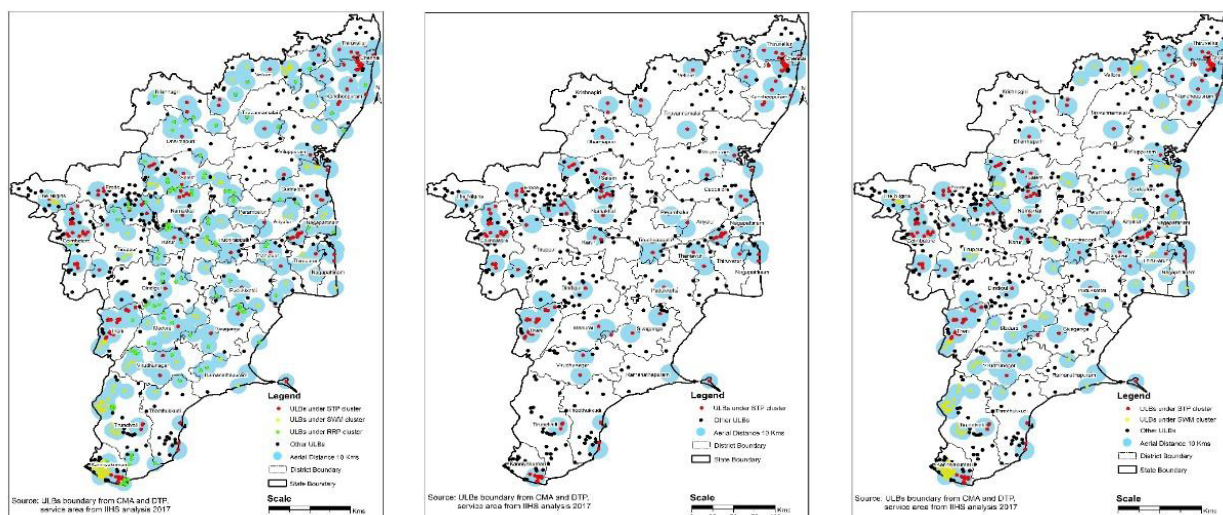


Figure 12: Coverage through the Five Phases of the SIP

Source: TNUSSP Analysis, 2018

Securing investment for Phase III: In 2018, GoTN adopted the SIP through a Government Order which included a budgetary allocation of INR 200 crore for the implementation of 49 FSTPs under Phase III of the SIP. Subsequently, in early 2019, the GoTN issued Government Order (Ms.) No. 12 that sanctioned an additional INR 31 crore for the construction of 11 FSTPs in Town Panchayats. Currently, the GoTN is working on the implementation of Phases – I and III – simultaneously.

Implementation of FSTPs: There are 60 FSTPs, currently, under construction across the State. The Tamil Nadu Urban Sanitation Support Programme has been assigned the responsibility of providing Quality Assurance (QA) and technical support for the implementation of the new FSTPs in Tamil Nadu.

Implementation of co-treatment at STPs: Co-treatment is being enabled at 50 STPs across the State. A detailed assessment of STPs was carried-out to suggest necessary infrastructure and other operational improvements, which require minimal investment to enable co-treatment.

As these treatment facilities come into operation, they will serve a total of 192 ULBs, either as standalone facilities or as a common treatment facility shared by a cluster of ULBs. A Memorandum of Understanding (MoU) has been created to establish a formal process, by which ULBs would utilize the upcoming shared treatment facilities.

IV. Highlights

The key innovations adopted through SIP include:

1. Scaling of treatment by saturating the utilization of existing treatment facilities through co-treatment.
2. Clustering of ULBs that allows smaller ULBs to share treatment facilities and its O&M cost with other larger ULBs.
3. Mitigating land availability issues by co-locating new FSTPs at existing SWMs and RRP.

V. Impact

The adoption of the SIP has enabled Tamil Nadu to not only rapidly scale treatment infrastructure but Faecal Sludge and Septage Management (FSSM) as a whole across the State. With a nominal investment of a little over INR 230 crores, it is anticipated that 75% of the State's urban population will be covered by the end of 2021 as shown in table below.

Table 9: Anticipated roadmap for coverage of urban population (excluding Chennai)

No.	Details	P1	P2	P3
1	No. of STP locations	41	34	49
2	City Coverage-			
2.1	Corporations (excl. Chennai)	8	3	
2.2	Municipalities	26	30	51
2.3	Town Panchayats	35	53	59
2.4	Total cities covered	69	86	110
3	Households Coverage-	24,08,835	13,39,048	9,48,335
3.1	HH covered under UGSS	7,41,487	1,95,131	
3.2	HH covered under FSTP	16,67,348	11,43,917	9,48,335
3.3	No. of persons/HH	3.86	3.82	3.89
4	Population Coverage	92,91,118	51,11,371	36,90,113
5	Cumulative population coverage	40%	60%	75%

These upcoming facilities will also provide new income generation opportunities while contributing towards resource recovery and reuse. The SIP contributes significantly towards increased provision and improved operation of treatment systems that meet quality standards and thereby positively impacts public health and environment in the State.

VI. Reflections and lessons

Tamil Nadu was one the first states to recognize the importance of FSSM to achieve safe, sustainable and inclusive sanitation across the state. However, even as the state set the pace in adopting FSSM, both, as an economical standalone solution, as well as a complementary solution to networked systems, significant efforts were needed to build credibility and support for FSSM as a whole. In this regard, the adoption of the SIP provided impetus to other interventions along the full cycle of sanitation and affected better sanitation outcomes by generation of greater awareness of FSSM and WASH practices, across urban communities in the state.

VII. Potential for replication

The key principles underpinning Tamil Nadu's State Investment Plan have already been adopted in a few other states across India. The approach offers cost-effective and resource-optimizing means to accelerated scale-up of treatment infrastructure and FSSM more broadly.

Lead case study contributor: *Indian Institute for Human Settlements*

EXHIBIT 6

INSTITUTIONAL ARRANGEMENTS AND STRUCTURED MONITORING

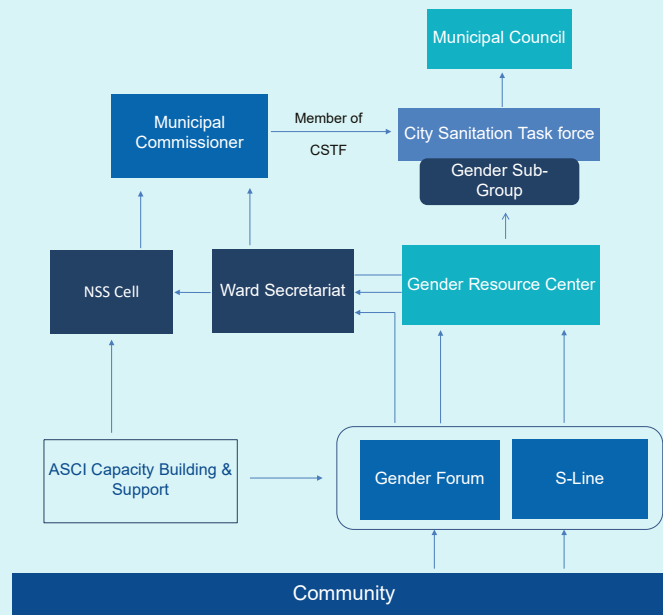
Background

Sanitation is a state level subject, and ULBs are responsible for the last-mile implementation of sanitation initiatives on-ground, including FSSM. While national and state policy interventions in FSSM provide a framework to act under, it is the effective functioning of local actors that help drive outcomes on the ground. While political will and local champions have been able to create positive change, uniform outcomes in FSSM can only be demonstrated through the presence of institutional arrangements and via structured monitoring. States have realized that the absence of such institutional mechanisms result in poor awareness of roles and responsibilities among various stakeholders, leading to poor co-ordination and collaboration among them. Its absence also inhibits capacity building of resources within the local governance systems, and can hinder community-buy in. They have therefore invested in setting-up dedicated institutional structures and nodal bodies that can help drive the FSSM agenda through strategizing, designing and monitoring. ULB too have been encouraged to set-up institutional structures that help strengthen ownership of FSSM initiatives and build consensus between all stakeholders to deliver time-bound outcomes. Depending on the needs of each area, these structures take the form of City Sanitation Task Forces (CSTFs), ward secretariats, project monitoring committees, septage cells, etc. Community Based Organizations like SHGs are also co-opted in to ensure community buy-in through social mobilization and awareness building activities.

Intervention

A few states have created dedicated engagement platforms at the state and grassroots level with a specific focus on FSSM and have provided them with dedicated resources and invested in their capacity building. Mechanisms at the state level seeking to help centralize and drive such initiatives include:

- *State Project Advisory or Monitoring Committees:* Such platforms were created in the states of Andhra Pradesh, Maharashtra, Odisha and Tamil Nadu amongst others to streamline respective state works on FSSM and decision making. It consists of all the key decision makers responsible to drive the work such as the Principal Secretary, the Director of Municipal Administration, the Additional Secretary, the Member Secretary and Project Directors of engineering departments, district/ city representatives, practitioners and advisors and other experts. The Committees come together on quarterly basis to assess the progress on FSSM and take the timely decisions to fast track the work.
- *Dedicated Septage Cell for FSSM –* A Septage cell is created within the Odisha Water Supply & Sewerage Board. The cell is a formal body which is responsible for the execution of all FSSM related activities in urban Odisha. This consists of a designated group of officials, led by a Chief Engineer, supported by project engineers and deputy project engineers. The Cell is dedicated to overseeing FSSM initiatives, reviewing designs, and managing timely project executions.
- *Swachh Andhra Corporation in Andhra Pradesh–*In an effort to achieve universal access to sanitation across urban and rural areas, the state established the Swachh Andhra Corporation in 2015. From the perspective of FSSM, it undertakes construction of household toilets, CT/PTs, as well as a number of IEC and BCC activities. SAC is also responsible for releasing tenders for the construction of FSTPs in the state. Additionally, it also surveys and maintains a dashboard on the status of construction and maintenance of toilets across ULBs in Andhra.



- Examples of grassroots / local level structures that have helped systemize and institute measures to achieve FSSM by bringing together various stakeholders, including the local community, include the following:
- *The Ward Secretariat*, a recently introduced model unique to Andhra Pradesh—Instituted under the Municipal Commissioner in the ULB, the officials in the Secretariat, work closely with Gender Forum members to address the sanitation concerns of the community and for improvement of the sanitation situation in their respective wards. Monthly meetings are held with gender forums, which allow for quick grievance redressal, enabling the fast-tracking of sanitation projects.
- *The Single Window Forum*, Bhubaneswar – In an effort to encourage periodic desludging across residents in Bhubaneswar a Single Window Forum was across all BMC wards. The initiative has been successful in linking 513 HHs with private operators, and provides services at a subsidized cost for over 152 of the households. The process functions at 3 levels,—city, ward and slum or settlement. At the city level, one representative of the trained SWF will remain available every day at the BMC office to flag off and monitor the movement of cesspool vehicles from the BMC office to the different slums. This will be recorded and while it is being tracked, the information will be conveyed to the Ward-level Single Window Forum members. They, in turn will confirm the day's plan with the Community Management Committee (CMC) members. The CMC members will in turn ready the households along with a team of volunteers, who are supporting them in tracking and recording the quality of desludging at the household level. Here, the CMC takes care to prioritize vulnerable and marginal households with/of pregnant and lactating women, families with chronically ill person, disabled and SC/ST etc.

Impact

- Having institutional mechanisms at various levels, aide in recognizing the urgency of FSSM initiatives, ensure better monitoring and adherence to timelines.
- These structures resulted in better understanding of roles and responsibilities amongst stakeholders and better coordination.
- Structured institutional mechanisms also act as platform to facilitate multi-stakeholder interactions, which go a long way towards garnering community buy-in, thereby ensuring inclusive sanitation.

24. CAPACITY BUILDING FOR NON-SEWERED SANITATION: LEARNINGS FROM SANITATION CAPACITY BUILDING PLATFORM, NIUA

Abstract³⁰

The Sanitation Capacity Building Platform (SCBP) was set-up in 2016 to build capacity of town and city officials for planning, designing and implementation of non-sewered sanitation and Faecal Sludge and Septage Management (FSSM). Over the years, SCBP has evolved as a platform of partners collaborating to develop training modules and learning content on FSSM, at both the state and the national level. The platform caters to the capacity building needs of state and non-state actors by partnering with national nodal training institutes under the existing national urban sanitation programmes and missions of Government of India. In the drive to upscale FSSM, the platform has been instrumental in its outreach to about 500 towns, across 17 states of India.

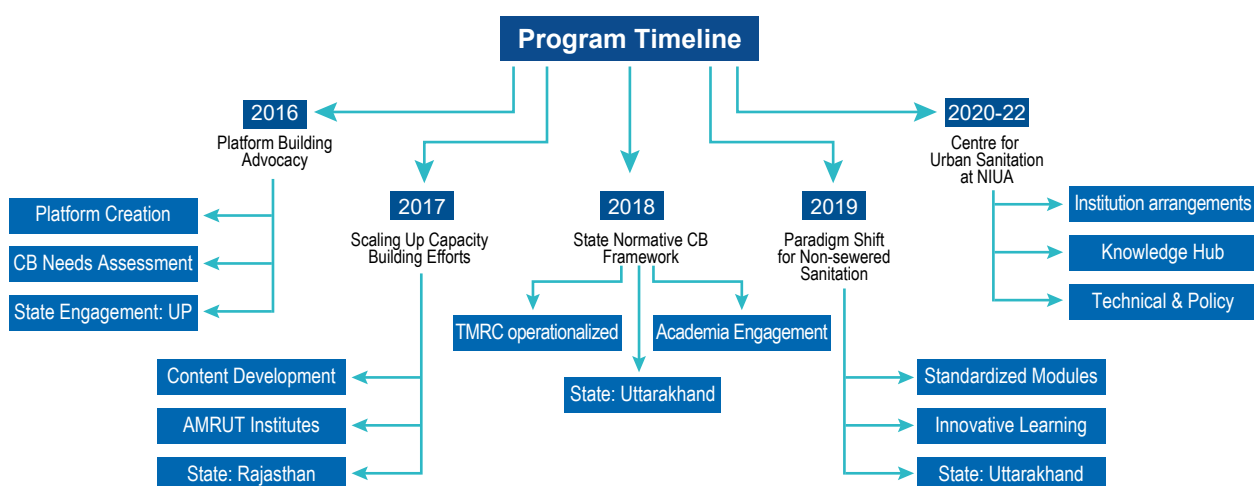
I. Context

According to the Census of India 2011, India's urban population was about 37.7 crore, or just under one-third of the overall population of the country. The urban population witnessed a jump between 2001 and 2011, and has continued to increase rapidly, putting stress on the existing sanitation infrastructure. Further, only a small number of Indian cities are serviced by networked sanitation infrastructure, and the pace of urbanization is faster than the rate of expanding infrastructure for networked sanitation. This is pushing cities and states to adopt decentralized sanitation services and related infrastructure to compliment networked sanitation. In order to realize the full scope of decentralized sanitation, extensive capacity building and advocacy measures are required.

With this aim in mind, multiple organizations working on non-sewered sanitation systems came together under the National Faecal Sludge and Septage Management Alliance (NFSSMA), to converge efforts and resources, increase efficiency, avoid duplication of work, and to foster a learning environment for all stakeholders.

II. Intervention

In order to strengthen national and state level interventions in the area of non-sewered sanitation, Sanitation Capacity Building Platform (SCBP) was set-up in 2016, to build capacities of the town and city officials for planning, designing and implementing non-sewered sanitation and Faecal Sludge and Septage Management (FSSM).³¹



SCBP evolved from developing the capacity of only a few towns to becoming a platform of partners collaborating to develop training modules and learning content at the national level³² The program developed and tested its capacity development approach in 3 states, and carried-out dissemination outreach to state and town level government administrators and engineers through the national nodal training institutes, under the existing national urban sanitation programs and missions of the Government of India. From curating FSSM training modules, engagement with academia and nodal training institutes, a normative state FSSM capacity development framework was developed.³³

III. Implementation approach

While the initial focus was on enhancing capacities of partner organizations, the long-term goal was to strengthen these organizations to provide technical assistance to state and city governments, led by a central capacity building hub.

Based on the understanding that effective capacity building could only take place when a minimum engagement and outreach was achieved, SCBP scaled-up its efforts to undertake a paradigm change for FSSM, at the state and national level. Partnerships were forged with an array of organizations/institutes for the development of training content and delivery of trainings. Further, support was also provided for policy and technical assistance.

Over the years, SCBP has expanded its reach to about 500 towns across 17 states of India. Besides capacity building for officials of urban local bodies, state and para-state agencies, SCBP now supports capacity building in FSSM for private sector consultants, elected representatives, academia, and NGOs. The engagements can be clubbed into three main areas:

1. State level capacity building
 - a. Capacity building of officials of 91 towns and cities of Uttarakhand, in partnership with ATI, Nainital
 - b. State FSSM perspective (Rajasthan and Uttarakhand)
 - c. City Sanitation Plans (4 towns of Odisha) with FSSM perspective
 - d. 191 ULBs of Rajasthan and 91 ULBs of Uttarakhand supported for ODF and FSSM
 - e. 61 AMRUT towns of UP and 15 NMCG towns in Uttarakhand supported for FSSM
 - f. First Detailed Project Reports (DPRs) for setting up Faecal Sludge Treatment Plants in 5 towns (Uttarakhand, UP, Bihar, Port Blair and Rajasthan)
2. Institutional capacity building at national level
 - a. Capacity building of 13 Nodal AMRUT Institutes
 - b. State and para-state agencies supported for planning and technology
 - c. 5000 officials from 17 states provided with FSSM trainings
 - d. 80 ULB officials from 7 states were taken for exposure visits to the Devanahalli FSTP plant
3. Evidence-based advocacy
 - a. Training Needs Assessment for FSSM undertaken for 4 states (Uttarakhand, UP, Bihar and AP)
 - b. Thematic and Spatial Research on Urban Sanitation undertaken for 10 states
 - c. State FSSM Policy Drafts prepared for 3 states (Uttarakhand, Uttar Pradesh and Rajasthan)
 - d. 17 training modules and 21 digital content courses (online trainings, gamification and self-learning courses) developed
 - e. Resource book of government advisories (16) and practitioners' resources (18)

Other than the above, a state level deep-dive engagement in Uttarakhand, including a plan for scaling up of FSSM across the state, is currently being developed.

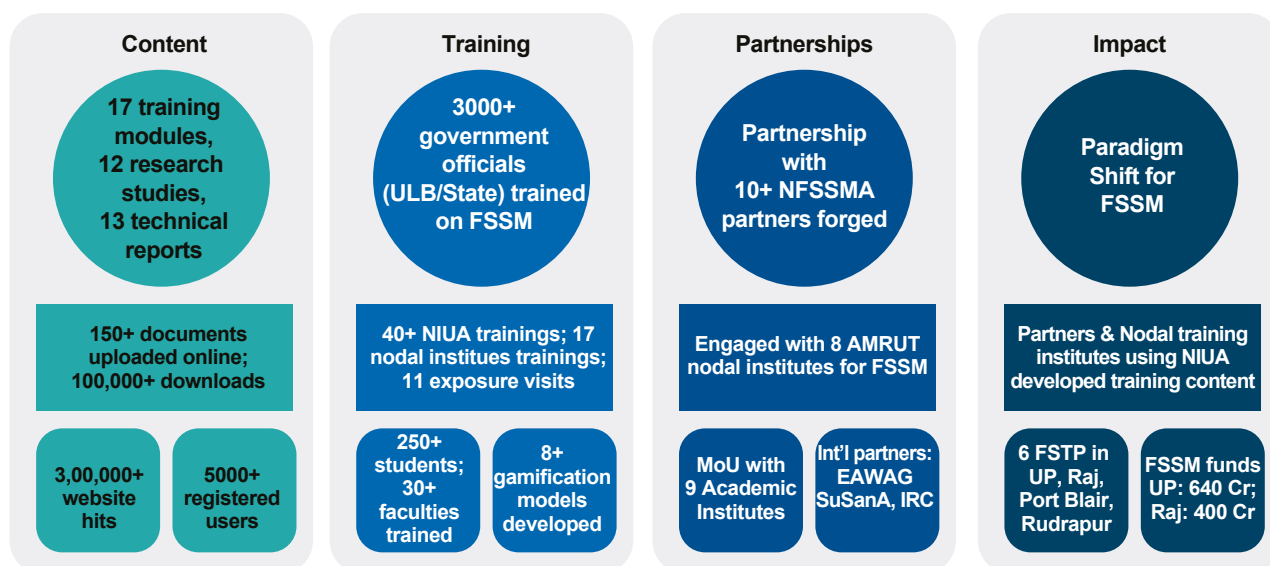
IV. Highlights

Conceptualizing and implementing FSSM signals a paradigm shift in the urban sanitation approaches in India, and therefore, it is vital that contextual training content be used for capacity building of government officials, as opposed to the use of existing content prepared in a non-Indian context. Consequently, a Normative Framework for state-level capacity development for FSSM was developed as a strategy note, aided by a digital dissemination strategy, in light of the restrictions imposed due to the Covid-19 pandemic.³⁴ Here are a few highlights:

- Quality assurance of training modules was a vital part in the training content developed by SCBP on various aspects of FSSM. This was facilitated by the constitution of a Training Modules Review Committee (TMRC) comprising members of the NFSSMA, anchored by SCBP
- Successful models were documented, as case studies, to be presented to the officials, in order to explain practical aspects of planning and implementing FSSM in cities. These case studies ranged from towns lying in various agro-climatic regions, such as Port Blair, Bhubaneshwar, Wai, to Devanahalli.
- SCBP worked closely with the Ministry of Housing and Urban Affairs, which endorsed a set of three FSSM Training Modules and the Policy Framework and Workbook for Water and Wastewater Management in 2019. SCBP also submitted its learnings on capacity development to the draft National Urban Sanitation Policy 2.0.
- SCBP engaged with academia to integrate FSSM as part of the course work and curriculum of Indian universities and institutions, representing engineering, urban planning, and humanities streams.

V. Impact

SCBP *website* is a one stop solution for all capacity building needs, training modules, government policies, guidelines, orders and reports, training modules, tender documents, case studies etc. The platform also shares the most relevant work on non-sewered sanitation from other organizations including reports and publications, videos and learning material.



VI. Reflections and lessons

Challenges

- Urban sanitation systems thinking has been dominated by centralized sanitation systems. To achieve safely managed systems in due time along with efficient fund utilization, decentralized and non-sewered sanitation systems (as complimentary systems), needs to be focused upon. This requires working at scale with the highest levels of political, policy-making and executive authorities of all the towns and cities in a state.
- Constraints of training institutes in terms of limited staff and resources, , and curriculum being more focused towards centralized sanitation systems hinders scaling-up of capacity development.
- State and city government officials often have limited resources at their disposal, while also handling multiple portfolios in many cases. This hinders their availability and focus for capacity building activities.

Lessons learnt

- Developing original learning content for training programs, delivered as a professional training or course work, is required. Training modules should be contextualized, and a one-size-fits-all approach should be avoided. A practical vision of the 21st century urban sanitation system, demonstrated for an Indian town, is useful to assure urban local body and town officials
- Institutional development, enabling FSSM policies at state level, and engaging with decision-makers are essential for promoting FSSM. Under SCBP, this was undertaken for the states of UP and Rajasthan to develop state FSSM Guidelines. A similar approach was adopted for Uttarakhand to roll-out a state FSSM protocol
- Encouraging peer-to-peer learning through informal and formal workshops, meetings and visits, and knowledge exchange programmes among different state and town officials and experts are beneficial
- There is a need to work collectively, share and collaborate, as no single agency or partner can deliver “end-to-end FSSM solutions”
- Engagement with the private sector, collaboration in research and projects with academic institutions and with media, advances the capacity building agenda

VII. Potential for replication

The current approach followed by SCBP needs to be scaled-up. This requires regularly updating the training content, which has been developed over-time, to ensure quality assurance in the delivery of training by creating a pool of trainers, beyond the facilitators from the NFSSMA network. It is important to use new platforms (face-to-face; online), and teaching-learning methodologies to disseminate and impart knowledge and action research. Besides, forging new partnerships with state and non-state institutions, in order to scale and add the non-sewered sanitation approach in the academic curriculum, is a step to success.

Lead case study contributor: *National Institute of Urban Affairs (NIUA)*

25. STATEWIDE APPROACH FOR SCALING UP FSTP: MAHARASHTRA

Abstract

The state of Maharashtra has 60 million people living in 396 Urban Local Bodies (ULBs). Most of these ULBs depend on the on-site sanitation systems. Therefore, the state government decided to implement a state-wide programme for Faecal Sludge and Septage Plants (FSTPs). It also decided to co-treat faecal sludge and septage at nearby Sewage Treatment Plants (STPs), where possible.

After the state became ODF in 2017, the focus shifted to ODF Sustainability and FSSM. The state government resolution in December, 2018, identified 70 cities that would treat its faecal sludge and septage at its own, or nearby, STPs. The remaining ULBs planned their own FSTPs. As of December 2020, 120 FSTPs are operational and others are under various stages of implementation.

I. Context

Maharashtra is the second-most urbanized state in India accounting for nearly 10% of India's urban population residing in 396 ULBs. It has been a pioneer state in the implementation of the Swachh Bharat Mission in urban areas.

Maharashtra was one of the first states to be declared as ODF on 1st Oct 2017. On that occasion, the government of Maharashtra (GoM) issued a 7-point sustainability charter that drew focus on ODF Sustainability and ensuring effective collection and treatment of faecal sludge and septage in all cities.

There are 47 ULBs in the state that have sewage network. Thus, FSSM is the key priority of the state as a large number of ULBs are dependent on on-site sanitation systems. Without adequate treatment facilities in these cities, the septage was disposed in open lands or used in farmlands without any treatment.

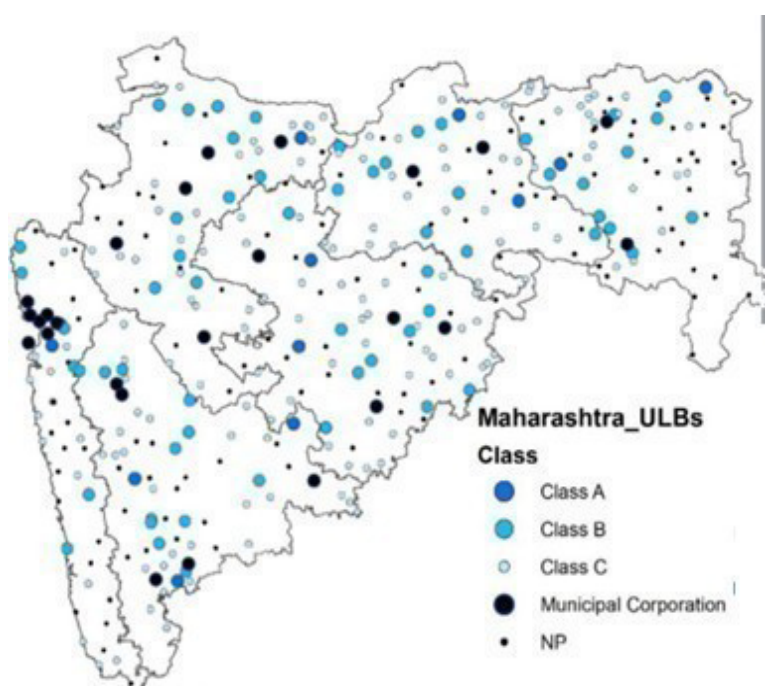


Figure 13: Map of Maharashtra

II. Intervention

The Government of Maharashtra (GoM) adopted systematic approach to implement city-wide FSSM plans across the sanitation service chain in the ULBs. The GoM received support from CWAS, CRDF, CEPT University, funded by Bill & Melinda Gates Foundation (BMGF), housed at its Swachh Maharashtra Mission for Urban Areas (SMMUA) for implementation of FSSM strategy.

The state government decided to implement a state-wide programme for Faecal Sludge and Septage Plants (FSTPs). It also decided to co-treat faecal sludge and septage at nearby Sewage Treatment Plants (STPs), where possible. After the state became ODF in 2017, focus was on ODF Sustainability and FSSM. The state government resolution in December 2018, identified 70 cities that would treat its faecal

sludge and septage at its own, or nearby, STPs. The remaining ULBs planned their own FSTPs. It was decided to adopt a simple technology for FSTP that would have low capital outlay and low operation and maintenance expenses.

III. Implementation approach

All ULBs were classified into 3 categories, a) ULBs with functional sewerage treatment plant (STP), b) ULBs that could provide FS co-treatment to the STPs in nearby ULBs, and c) ULBs that would need independent Faecal Sludge Treatment Plant (FSTP).

- a. **Co-treatment of faecal sludge at own, or nearby, STPs:** The Government of Maharashtra issued a government resolution (GR) on co-treatment of faecal waste to own or nearby STPs (GR: SMU-2018 /Cr No. 351/UD-34 on 15th December, 2018). ULBs that had a functional STP, but did not have full sewerage coverage could treat septage collected from on-site systems in their own STPs. The GR identified potential ULBs that could do co-treatment of their septage at STPs of nearby ULBs, located within a 20 km of radius from existing STPs. A model MoU was drafted and provided to sending and receiving ULBs, with a view to institutionalize the co-treatment process. Currently, 70 ULBs are practicing co-treatment of faecal sludge at their own, or nearby, STPs.
- b. **Setting up independent FSTPs:** GoM decided to set-up the independent FSTPs in ULBs that are entirely dependent on on-site sanitation systems, and where plans for sewerage projects in the near future are not foreseen. 311 ULBs were identified for setting-up independent FSTPs in Urban Maharashtra. A GR of 8th November, 2019 (SMM – 2019 / Circular No. 124 / UD-34, dated 8th Nov, 2019) allowed construction of independent FSTPs in ULBs. This GR also indicated that an FSTP shall have to co-locate with an existing Solid Waste Management (SWM) site.

Systematic approach towards building faecal waste treatment infrastructure:

Rather than employing a conventional approach—where each ULB would have to seek technical and administrative approval of its FSTP—the state government decided on a set of technologies for implementation of FSTPs at scale. A single-window approval and fast-track implementation was designed. The availability of pre-approved technical design, as well as structural and hydraulic design templates of FSTP, helped ULBs to fast-track implementation of FS treatment facilities. For fast-track implementation of independent FSTPs, a single-window approval process was developed.

State level Mechanism for implementing FSTPs

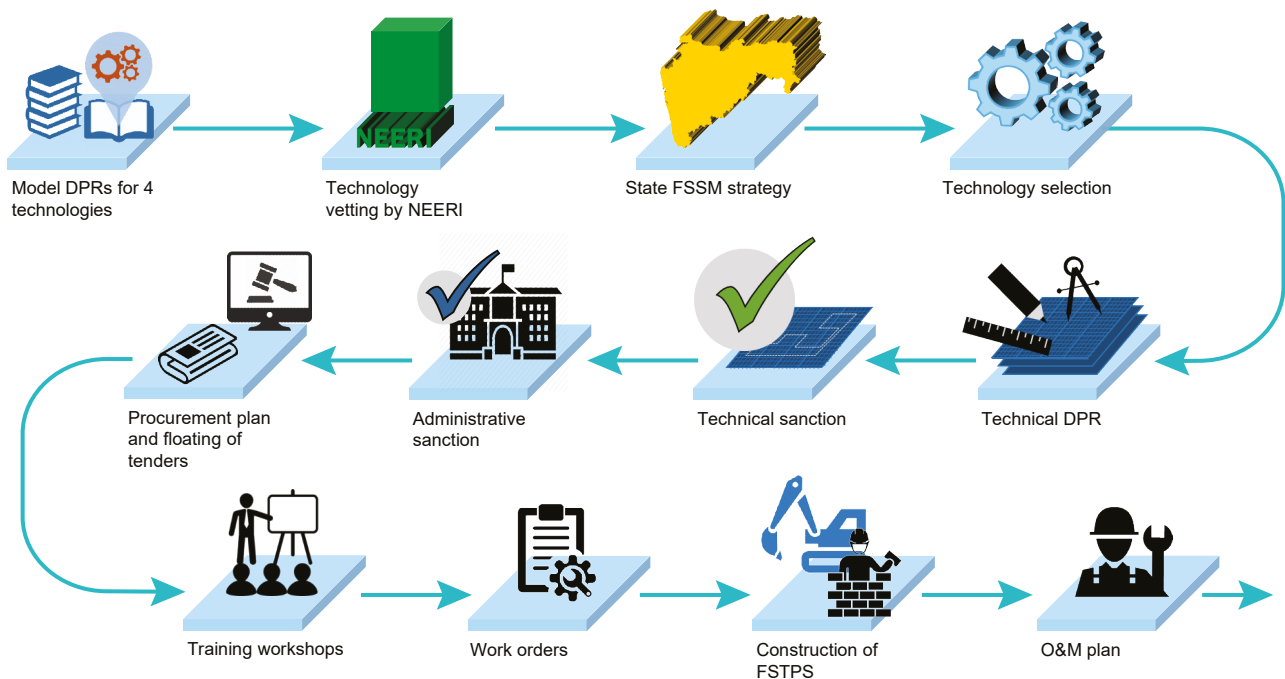
DPRs and approvals

- State Government shared the tender documents, drawings, and estimates with Detailed Project Reports (DPRs) for different capacities of FSTPs, with the ULBs.
- Technical and administrative approval was given to all the ULBs to construct as per DPRs. The ULBs were required to agree to construct the FSTPs from their own funds and maintain the assets.

Procurement process

- ULBs were required to float a short tender notice for construction of FSTPs.
- In case a ULB received 3 bids or more, ULB could award the work to the lowest bidder

- Meanwhile, if a ULB received fewer than 3 bids, ULBs were instructed to extend the notice period and then award the tender to the lowest bidder, after the end of notice period
- ULBs were encouraged to explore SHGs and/or private sector for O&M of FSTPs.



Financing

- Capital costs of these FSTPs would be financed through the 14th finance commission grants, available to each ULB
- O&M costs would be financed by the ULB

IV. Highlights

Adoption of cost effective and less mechanized FSTP technology

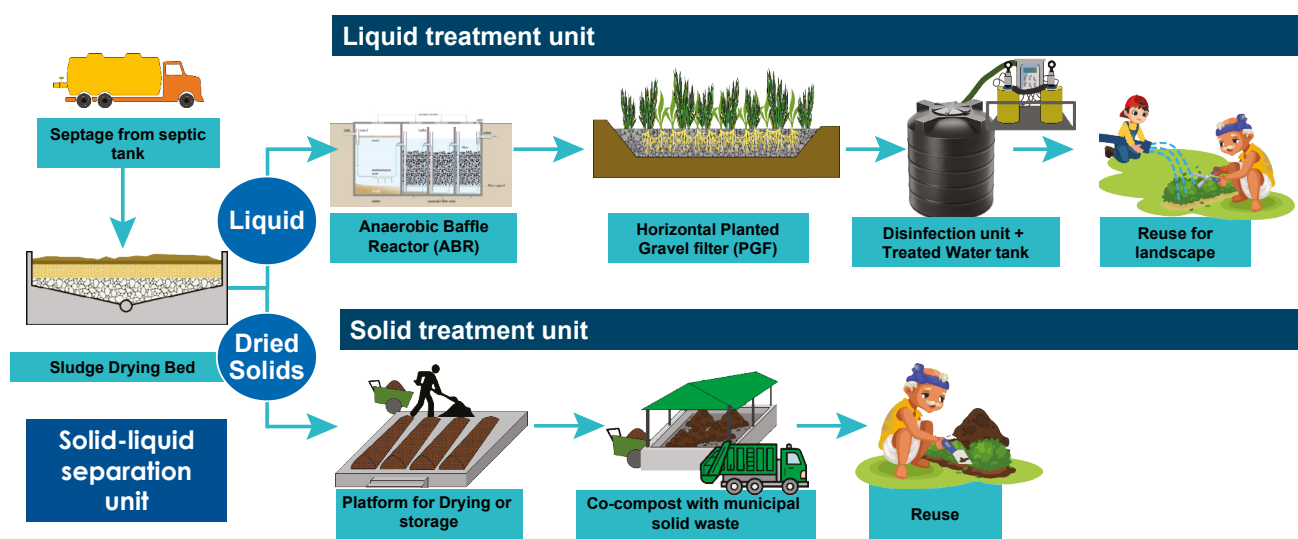
The technology involved five major treatment modules namely Screening Chamber, Sludge Drying Beds (SDB), Anaerobic Baffled Reactor (ABR), Horizontal Planted Gravel Filter (PGF), and Disinfection unit.

The facilities had a gravity flow-based system, where septage collected through vacuum emptier trucks was discharged to screening chamber from where it flowed to different units owing to gravity.

Treated wastewater was reused for landscaping/tree plantation, and dried sludge was co-composted at co-located solid waste composting plant.

Many benefits were achieved due to the single window process

- A single window approval helped ULBs to curtail the complex and lengthy approval process
- Pre-approved technical design, structural and hydraulic design templates of FSTP helped ULBs to fast-track implementation of FS treatment facilities.
- Mandatory compliance of third-party technical audit through the empaneled engineering colleges, ensured quality assurance and quality control during construction of FSTPs



V. Impact

120 FSTPs are operational within a span of 1 year and another 100 are in various stages of construction. ULBs in Maharashtra are now considering implementation of scheduled desludging.

VI. Reflections and lessons

The systematic efforts of state government of Maharashtra in sanitation space and particularly for FSSM sector have been recognized by both national government and other sector experts. It is clearly reflected in the recent result of Swachh Survekshan 2020, where a large number of ULBs in Maharashtra secured high ranks. The lessons from Maharashtra's experience can be very useful for policymaking and developing state-wide strategy for other states of India. In the past, Maharashtra's experience has been instrumental in developing ODF/ODF+/ODF++ framework. Most of the operational FSTPs are being operated by ULBs by assigning its own staff from sanitation department. Most of the FSTPs are using treated water for gardening on FSTP site. The dried sludge is used after mixing it with compost from solid waste.

The UDD, GoM developed various guidelines for septage management, and conducted regular capacity building programmes for all ULBs to implement FSSM plan. UDD conducted regular review meetings to track the progress at city, district, division, and state levels. A state-wide monitoring system and dashboard was developed to track the implementation of FSSM plan. A series of field visits and on-call assistance was provided by technical experts to guide the ULB officials during the implementation and operation of FSTPs. Consequently, Maharashtra is also developing a strategy on convergence of NULM and SBM for improved sanitation service delivery, with participation of SHGs in operation and maintenance activities.

VII. Potential for replication

The work in small and medium towns of Maharashtra is representative of around 7000+ towns of India, including 3600+ statutory towns and 3800+ census towns. The experience in Maharashtra could potentially impact 150 million people, who live in small and medium towns of India.

Lead case study contributor: Center for Water and Sanitation, CRDF, CEPT University

EXHIBIT 7

QUALITY CONTROL AND ASSURANCE MECHANISM ACROSS STATES

FSSM being a nascent sub-sector, novel approaches have been adopted across all the phases of a typical project, *i.e.*, planning, procurement, implementation, and operations. As these methods and processes mature into standard procedures, there is a need for Quality Assurance and Quality Control (QA/QC) processes to ensure that desired outcomes are achieved consistently over the desired life span of the project.

A review of the QA/QC processes adopted by four states during their FSSM roll-out at scale brought out the following observations:

1. State mandated processes are predominantly aimed at QC during construction and limited to compliance and vigilance checks. Checks for functional quality are not a focus area.
2. Personnel limitations lead to infrequent and inadequate site visits. In addition, the personnel require intensive training before conducting the site visits.
3. As a result, most states augmented their capacities by relying on private personnel – through mechanisms such as Independent Engineer or third-party personnel for QC checks.
4. QA mechanisms, *i.e.*, processes aimed at mitigating avoidable risks during the planning phases were deployed with the support of sector experts in most states.

Quality Assurance Framework for FSSM		Access	Emptying & Transportation	Treatment for Disposal	Treatment for Reuse
Legislation, Rules and Policy Framework		National FSSM Policy 2017 and State policies			
Defining Quality Standards	Outcome quality	Quality standards that influence outcomes, e.g., biosolids standards			
	Process quality	Standards and guidelines for processes			
	Service quality	Benchmarks for services, including the citizen perspective, e.g., 100% coverage, response time for filling service requests etc.			
QA Guidelines	Ownership	Who is responsible for each aspect of FSM?			
	Quality guidelines	What provisions and guidelines exist to ensure quality programs are implemented and compliance ensured based on risk assessment			
Tools for QA		QA Matrix developed - Checklists, templates etc., that help operationalize the Quality Guidelines			

Figure 14: The Quality Assurance Framework for FSSM will help implement quality processes across all project phases

As FSSM scales up there is an urgent need for institutionalizing these Quality initiatives in order for them to be effective. To this end, Quality Assurance processes have been developed for the sector with typical interventions such as detailed checklists, guidelines, and SOPs. These processes now require

institutionalizing within the State machinery in order for the QA to be an embedded process rather than an afterthought.

An overview of the Quality Assurance framework is presented in Figure 16. The QA framework for FSSM has been developed by the NFSSM Alliance based on international best practices in Quality.

ISO Certification for FSSM in a city:

Odisha is the first and only state in the country to have all its operational Septage Treatment Plants (SeTPs) ISO (International Organization for Standardization) certified. All the plants have obtained 3 certifications namely, **ISO 9001: 2015, OHSAS 45001: 2018, ISO 14001: 2015**. These certifications assure quality of treatment.

Bhubaneswar became the first Indian city and second city in the world to get an **ISO 9001:2015** certification for Faecal Sludge and Septage Management (FSSM) services. This certificate confirms that the services provided in the city for FSSM meet the highest industrial standards. Bhubaneswar Municipal Corporation (BMC) has issued a notification in the newspaper for registration of private operators and private cesspool vehicles with an incentive that first 50 vehicles coming forward for registration will be fitted with GPS devices free of cost by BMC. As a result, 29 cesspool vehicles operated by private operators in the city have been registered with BMC and fitted with GPS device for monitoring purpose. BMC has taken steps to form enforcement squad to check illegal disposal of sludge by the cesspool operators. Further, the corporation has taken steps to provide affordable cesspool services to the urban poor residing in slums areas of all 67 wards.



EXHIBIT 8

STATE LEVEL SYSTEMS FOR FSSM MONITORING

Background

At a state level, districts or even ULBs it is essential to monitor the progress of FSTP construction activities. Monitoring mechanisms shall enable to ensure timely completion and have the potential to ensure quality of works.

In the same manner several activities are performed at each town and city in regards of Faecal Sludge and Septage Management (FSSM). Some of these are milestone (like allocation of land for treatment plant), some which are frequent (like desludging operations). A solution is required to make sure that the activities are performed as required. The monitoring maybe being taken up at various levels of the government machinery.

Intervention

Dashboards to monitor daily and milestone level events are prepared by states. These dashboard help monitor construction and other activities (more than 50 information points). This helps key decision makers to intervene wherever and whenever necessary. Some of the dashboards are shown below:

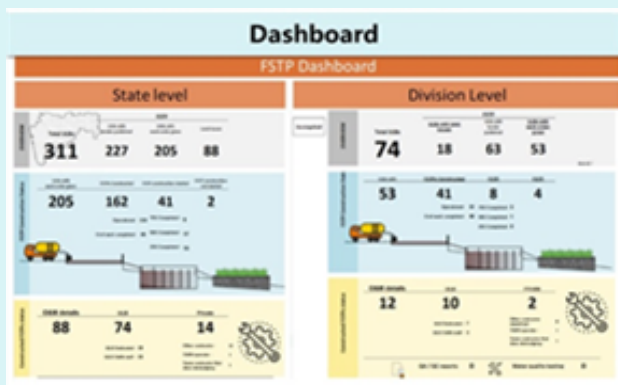


Figure 15: State level FSSM monitoring dashboard Maharashtra

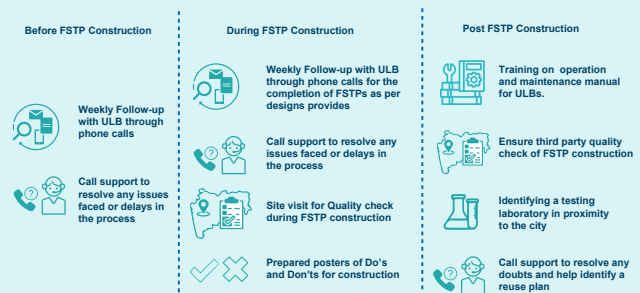


Figure 16: Construction monitoring dashboard Maharashtra



Figure 17: State level FSSM monitoring dashboard: Odisha



Figure 18: Construction monitoring dashboard: Odisha



Figure 19: Construction monitoring dashboard: Tamil Nadu

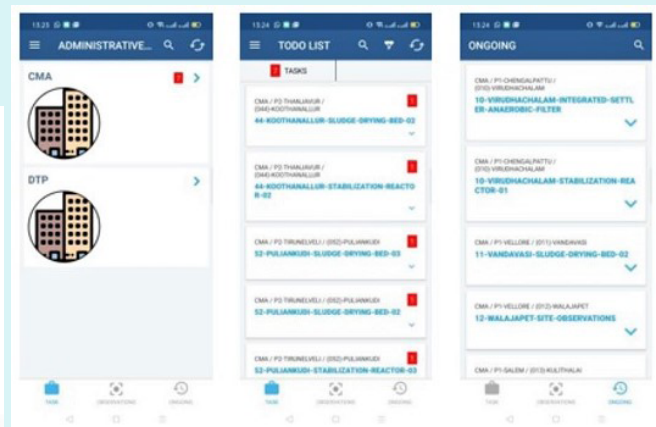


Figure 20: App based FSSM monitoring dashboard: Tamil Nadu

Impact

- The dashboards have enabled the following outcomes
- Daily monitoring at the highest level of bureaucracy and follow ups with anyone necessary
- Quality of works in line with QA/QC protocols
- Timely completion of works and milestones
- Ensure all milestones are reached
- Service quality of the highest standards

26. QUALITY ASSURANCE SUPPORT FOR IMPLEMENTATION OF FAECAL SLUDGE MANAGEMENT PLANTS IN TAMIL NADU

Abstract

Sixty Faecal Sludge Treatment Plants (FSTPs) were under construction in Tamil Nadu. Since FSTPs were constructed in the state for the first time, the knowledge of various government and private stakeholders on the Design, Construction, and Operation and Maintenance (O&M) needed to be strengthened. This case study explores how quality assurance support not only ensured safe and sustainable construction practices, adherence to quality, and monitoring and evaluation, but also secured multi-stakeholder engagement and participation for knowledge-sharing, and continued operations and maintenance.

I. Context

The Government of Tamil Nadu (GoTN) issued the Operative Guidelines for Septage Management in 2014 to ensure safe sanitation in the State by eliminating open defecation and preventing environmental pollution. To address these objectives, in 2018, the GoTN, with the support of Tamil Nadu Urban Sanitation Support Programme (TNUSSP) finalized a State Investment Plan (SIP) with a phase-wise approach for scaling treatment.

The implementation of the SIP commenced with the construction of 60 new Faecal Sludge Treatment Plants (FSTPs). Given that the technology for FSTPs was a relatively new concept for both the private players undertaking construction as well as the government officers supervising the construction across the State, the GoTN setup a process of Quality Assurance (QA) with the key objectives of which were to ensure adherence to quality and timely escalation of issues to the relevant authorities during the various stages of construction.

II. Intervention

The QA process aimed to monitor the construction progress and quality of all FSTPs, by a dedicated team of qualified engineers from the TSU and a third-party contractor. It was also designed to strengthen QA during the commissioning and initial Operations & Maintenance (O&M) stages. Various mechanisms, such as periodic field visits, digital reporting and monitoring tools, exposure visits and detailed checklists were used by the QA team to review progress, check for compliance with design and quality standards, as well as to resolve implementation issues. The process was further enabled by a mobile-based construction monitoring platform application. The application included two checklists, one for stage-based reporting of construction progress, and the second for conformity of construction with design specifications and construction quality parameters.

III. Implementation approach

The GoTN instituted the QA process with the help of the Technical Support Unit (TSU) of the TNUSSP. This involved constituting a QA team with specialists from the TSU, along with qualified engineers from third-party private contractors.

The QA team monitored and supervised the implementation of FSTPs from the tender stage to the completion of construction, commissioning, and field trials. The scope essentially covered seven key stages of the implementation of the biological treatment systems:

1. **Pre-construction stage:** which included checking of site clearances and drawings as well as the marking stage.
2. **Excavation, ground preparation and laying of Plain Cement Concrete (PCC)**
3. **Laying of Reinforced Cement Concrete (RCC):** which included review of final PCC/RCC levels and masonry, dimensions of treatment modules, and excavation of Planted Gravel Filter or other tertiary treatment.
4. **Fixing of pipes and floor levels:** involving inspection of inlet, outlet, baffles, all pipes, and filter material and marking for laying filter material.
5. **Finishing works:** which included review of plastering works, painting, and placement of filter material, perforated slab, manholes.
6. **Commissioning:** involving support for commissioning process and advice on performance testing.
7. **Testing and trial run:** involving inspection of water flows, plantation quality, plastering and water tightness in water retention structures.

During the above stages of FSTP implementation, QA support was provided through the following set of activities:

1. **Planning and orientation sessions:** QA support was initiated through orientation workshops and training sessions for ULB staff and private contractors to familiarize them with the process.
2. **Periodic field visits:** routine visits to the field by engineers from the QA support team as well as expert visits to address specific issues were undertaken.
3. **Reporting and monitoring:** ULB staff were required to regularly document progress, which would be inspected by the QA team. Additionally, weekly calls, a WhatsApp group and a helpline were setup for sharing of day-to-day progress as well as resolving site-related issues.
4. **Exposure visits:** to FSTPs in Karunguzhi Town Panchayat, Periyanaicken-Palayam and Narasimhanaicken-Palayam town panchayats in Coimbatore district, and Odisha were organized.
5. **Documentation support:** The QA team provided documentation assistance such as detailed Site Investigation Report template with field inspection checklists, FAQs on design and construction aspects, and templates to help ULBs obtain Consent to Establish (CTE) and Consent to Operate (CTO) certificates.

Daily updates and progress were documented using presentations, photographic compilations, spreadsheets and Gantt charts. A virtual reality video of FSTPs in Dhenkanal, Odisha, and Karunguzhi and Kangeyam was prepared for government officials, and an IT Dashboard was also created for them to monitor and review the progress of construction. Funded by grants from a donor organization, the entire QA process budget was set to be one per cent of the cost of construction of a single FSTP.

IV. Highlights

The QA support team was able to bridge any knowledge gaps by regular monitoring and inspection at all critical stages of construction. The process leveraged technology and a variety of other mechanisms, such as:

1. **FAQs:** developed to address general queries regarding the design and construction aspects of FSTPs
2. **Field Inspection Checklists:** covered all important activities during field visits, all aspects of FSTP after implementation, and during O&M activities at sites after completion

3. Digital review and monitoring tools: Helpline, WhatsApp groups, Virtual Reality video with a 360-degree view for government officials
4. IT Dashboard: created to help government officers to efficiently monitor the progress in all 60 FSTPs
5. On-site cross-learning and orientation programmes

The simultaneous construction of 60 FSTPs in various locations of the state meant that the government officers would have had to travel to each site to monitor and review the progress of each work. However, the use of digital support tools ensured swift resolution of issues as well as regular updates on progress.

The IT Dashboard also enabled the officers to monitor all the FSTP sites at near-real-time from their respective locations. Additionally, the virtual reality video offered realistic, 360-degree view of the FSTPs and their O&M aspects, and facilitated seamless transfer of knowledge. Knowledge transfer was also enabled through peer-to-peer learning among ULBs.

V. Impact

The systematic recording of updates and progress as a part of the QA process has ensured adherence to quality of construction and timely completion of activities. It has helped avoid mistakes during key stages of implementation, which would have resulted in significant losses of money, resources, and time, by ensuring proper communication and exchange of information among all stakeholders. The QA process contributed towards building the capacity of both public and private sector in general, by facilitating peer-to-peer learning among ULB officers and even enabling private contractors to seek-out other Faecal Sludge Management projects.

VI. Reflections and lessons

The review meetings with all stakeholders during the pre-construction stage ensured that ULB engineers acquired proper drawings and layouts from the QA support team, which helped in preventing mistakes. The dedicated involvement, cooperation and learning by ULB staff and private contractors ensured the successful completion of tasks and assessments on time.

The use of technology like virtual reality video and IT Dashboards was helpful in providing better insights and monitoring the quality and pace of construction, near-real-time. The successful training programmes and workshops to private contractors have helped them bid for more FSTP projects.

Challenges: The initial stages of the FSTP construction involved extensive planning and support, which required considerable investment in terms of human resources and time. Also, since the FSTP construction and QA support was a new area of work, it demanded substantial capacity building for all private players.

VII. Potential for replication

The standardized approach and use of technology to provide Quality Assurance support can be easily adapted to a range of contexts and treatment technologies.

Lead case study contributor: *Indian Institute for Human Settlements*

27. MALASUR-MAKING THE INVISIBLE, VISIBLE: A CITIZEN FACING SOCIAL AND BEHAVIOR CHANGE COMMUNICATION CAMPAIGN ON FSSM

Abstract

India has made significant progress in addressing sanitation challenges under the Swachh Bharat Mission. But there is little awareness about the sanitation value chain among populations, and little or no care for what happens to faecal matter after it is flushed. The challenge, therefore, posed is for communication to make a seemingly invisible issue relevant to people in urban India by making the threat personal. Malasur (the demon of defecation) is a social and behavior change communication (SBCC) campaign that was developed to influence attitudes towards faecal sludge and septage management (FSSM) practices. The campaign was launched on World Environment Day (5 June 2020) by Hon'ble Sh. Hardeep Singh Puri, Minister of State (Ministry of Housing and Urban Affairs), GoI. In partnership with the state technical support units, cities and states have begun to implement it at scale.

I. Context

With the success of the Swachh Bharat Mission (SBM), there has been a dramatic increase in the number of toilets being constructed. While this helped in preventing open defecation, it is one of the aspects of the sanitation value chain. Without proper collection, transportation and treatment, faecal waste from these additional toilets will amplify the urban sanitation challenge. India has been making strides towards establishing service delivery mechanisms for the management of faecal sludge, especially where underground sewer systems do not exist, but without a corresponding demand for the FSSM services, sanitation targets would remain unattainable. SBCC campaigns are, therefore, imperative to shift attitudes among populations to adopt correct FSSM practices.

BBC Media Action in partnership with the state level technical support units (TSUs) and with funding from the Bill and Melinda Gates Foundation (BMGF) designed an evidence-based, insight-driven SBCC intervention with the overall goal of heightening risk perception around FSSM.

BBC Media Action conducted formative research (qualitative exploration and quantitative survey) in Narsapur, Trichy, and Berhampur among 1740 households to assess the barriers, triggers, attitudes, and current practices towards FSSM. Three segments in the population were found, based on their actual sanitation practices and their response to the statement 'It is okay to wait to clean/empty the septic tank until it is full'. Out of the households surveyed, 22% were classified as proactive desludgers. About 66% were classified as reactive desludgers, who would desludge only when they are faced with the problem of a backflow or overflow, and cannot use the toilet. A full 11% were found to be connected to open drains. The findings across these segments showed that the predominant attitudes were to avoid the problem for as long—and by any means possible – by building enormous tanks that do not need to be cleaned in their lifetimes, or by desludging as an emergency measure, once the tank overflows. This was also combined with the thinking that it is someone else's responsibility – the sense that an individual household doesn't create the problem and, therefore, should not be held responsible for the solution.

Few of the significant findings were:

- 90% believe faecal sludge flowing into open drains spreads diseases. Only 53% are bothered by the open drains in their surroundings
- 78% believe a septic tank should be as large as possible

- 66% believe it is okay to wait to empty septic tank until it is full
- 80% believe the government should construct septic tanks while 78% believe the municipality is responsible for desludging

II. Intervention

Based on the formative research, the communication objectives were to increase awareness, heighten risk perception and build a sense of urgency. The team needed to pivot faecal sludge to something precious—what could be more compelling than a link to water and to bring the issue up close and personal. The key insight that came out of the immersion process (which included desk research, in-depth conversations with partners and stakeholders and experts within the urban sanitation networks) was ‘out of sight, out of mind’. FSSM is an invisible issue for households. It is not a matter of conversation or concern, as they do not understand it or recognize the risks associated with unsafe FSSM. The basic tenet for the campaign was to raise the profile of faecal sludge management by positioning faecal sludge as a clear and present danger to households, if ignored.

The team worked through an idea that was insight-driven, user-centric, media agnostic, and disruptive. The team focused on using Indian mythology and the traditional tales of good and evil, of gods and demons. Consequently, Malasur – the demon of defecation—was conceptualized.

Malasur is a visual personification of faecal sludge. Malasur is this unseen demon who lives under your feet, bubbling away, biding its time, waiting until that opportune moment when it can erupt into a backflow or an overflow. Malasur is a threat to your water unless you build the right kind of septic tank, do regular desludging, and keep an eye on where your faecal sludge is being dumped.

A 360-degree campaign was developed using *film*, radio, outdoor, GIFs, outreach material, and a comprehensive toolkit to enable stakeholders (government and non-government) to implement the campaign across different geographies and platforms. The Malasur campaign and *toolkit* (in 11 languages to help implement the campaign) was unveiled by the Minister of State, Shri Hardeep Singh Puri, Ministry of Housing and Urban Affairs, on 5 June 2020 – World Environment Day, marking FSSM as a national priority and establishing Malasur as the national campaign on FSSM.

The toolkit contains all Malasur campaign collaterals or outputs in ready-to-print, open files across various platforms. These are outputs on outdoor media (hoardings, wall paintings), in-transit media (cesspool truck, auto rickshaw/ tuk-tuk and van), mid-media (miking, street play) and audio visuals (cinema slides, animation films, GIFs). These have been developed in 11 languages to cater to the language diversity in India. The toolkit is not only a compendium of digital artworks but also contains instructions on scientific and strategic implementation and monitoring (e.g. roll-out the campaign for a minimum of 3 months, in two bursts, each message to be implemented sequentially and so on). This plug-and-play model ensures that anyone who wants to implement the campaign has to just add their relevant logos and telephone numbers and push it out for production and implementation as per the guidelines in the toolkit.

The campaign has been rolled out across Warangal (Telangana), Rajam (Andhra Pradesh), 114 urban local bodies in Odisha, and will also be released in Lucknow and Kanpur in Uttar Pradesh, and Pithampur in Madhya Pradesh. The campaign is being implemented as part of Swachh Survekshan 2020 and 2021.

In the first two weeks after its launch on social media, the film earned 525,000 impressions on Twitter and was watched more than 300,000 times.

The Malasur campaign has been piloted, pre-tested and evaluated, providing valuable learnings on how to design communication strategies and solutions around FSSM behaviors:

- Disruption works – a campaign benefits greatly from a hook that can break through clutter in highly crowded urban landscapes, mass media and social media platforms
- Each output needs to carry uni-focused messaging – faecal sludge is complex, so break it down to simple, easy actions
- Pivot to water is compelling – faecal contamination of water provides a strong reason to believe the threat, leading to intent and action
- A clear call to action – link to a helpline number/licensed desludging operator adds to the credibility of the campaign
- Bespoke implementation plans specific to each city are more useful

III. Key learnings from Malasur reach and effectiveness study in Warangal: [Malasur campaign was launched in 48 wards out of a total of 58 wards in Warangal].

- Despite COVID, campaign has a high reach in Warangal @61% with Swachh Autos contributing most to the reach numbers (for comparison mass media ad reach norms = 46%)
- Reach is higher among people with relatively better financial capacity to undertake desludging – indicating stickiness of campaign among relevant target groups.
- Linking Faecal Sludge to Water Contamination has highlighted the already established link between contaminated water and ill health and therefore linking faecal sludge to health. Malasur has given a handle to talk about faecal sludge which is an ‘unmentionable’ topic otherwise
- High motivation observed to act towards understanding septic tanks and desludging within next 3 months. 70% positively disposed to calling helpline
- Reinforces collaborative effort (state TSUs and BBC Media Action) and implementation support are critical pillars

Note: Reach % is the percentage of people in the target universe (state/ city/ ward) who have seen or been exposed to the campaign when asked through a random survey. For our study, in particular, an independent research agency conducted 1577 random listing interviews across selected blocks of Warangal city. From these face-to-face interviews, it was determined that 61% of the people they met had seen the campaign either on swachh autos or hoarding or CTPTs. The largest share of the reach i.e. 50% was from people who had seen it on Swachh Autos – which goes to show that this was the most effective medium among all. The research agency had also provided benchmarks based on other campaigns that they had tested and it is 46% across TV ads.”

As FSSM outcomes become increasingly critical in improving the total sanitation landscape of a country, as more faecal sludge treatment plants come up, there is a growing realization within the WASH sector, that behavior change and demand creation are as important a part of the conversation as infrastructure. Malasur with its beady eyes and tentacles gives a face to a problem that did not exist in public and proves that a big idea, implemented well can move the needle towards safe water and healthier citizens.

IV. Similar initiatives from other states

1. Kakkaman (shit man)- A behavior change and communication campaign for FSSM, Tamil Nadu

The Government of Tamil Nadu (GoTN) recognizes the importance of Full Cycle of Sanitation (FCS) for an improved standard of public health. To create a supportive environment for ensuring and sustaining urban sanitation across the state, GoTN has created a Behavior Change and Communication (BCC) campaign to engage citizens to actively to 'speak' about sanitation and give a 'call to action' to move towards safe sanitation. To take the key concept of total sanitation to the public in a simple and fun way, a mascot called 'Kakkaman' (Shit-man) was developed. The campaign was launched digitally on World Toilet Day 2020, to educate the public on the importance of proper sanitation practices through the voice of 'Kakkaman'. A pilot and a statewide roll out for the campaign is being planned in 2021.

The GoTN has commissioned 60 Faecal Sludge Treatment Plants (FSTPs) across the state which are under various stages of construction, and is also enabling the co-treatment of faecal sludge along with sewage at 50 Sewage Treatment Plants (STPs). While the establishment of these designated treatment facilities are an important first step, their effective utilization depends on the uptake by a range of sanitation stakeholders along the FCS.

Initial research conducted under the Tamil Nadu Urban Sanitation Support Programme (TNUSSP), indicated that there was widespread taboo and stigma surrounding sanitation. This highlighted a need to openly discuss the problems of sanitation, and possible approaches, rather than approach it with fear. It also highlighted a need to reposition sanitation as something aspirational, linking it to quality of life and thereby enabling consumers to have agency. To mainstream sanitation as a topic of discussion and introduce the concept of full cycle of sanitation, a mascot called 'Kakkaman' or 'Shit-man' was conceived.

The mascot was envisioned as an identifying element for sanitation and FSSM amongst the public. The characteristics of Kakkaman were consciously designed to make the State's sanitation mascot look friendly and approachable. This was seen as key to encourage conversations around safe sanitation. Additionally, an innovative campaign film featuring Kakkaman in a musical narrative that conveyed the idea of FCS along with the initiatives of GoTN was created. With an engaging narrative along the FCS, the film aims to instill a sense of responsibility towards the larger sanitation outcomes starting from one's home, and eventually their neighborhood, city, district and the state on the whole. The campaign aimed to increase a sense of ownership with respect to sanitation among individual consumers, households and other stakeholders.

Starting from 2017, the Kakkaman mascot was pre-tested in Coimbatore and Trichy districts to get public feedback and response. The mascot was well received amongst the pre-tested audience owing to the lively and interactive methods adopted, which engaged citizens to actively 'speak' about sanitation and take up the 'call to action' to move towards safe sanitation.

Kakkaman would inform the people of Tamil Nadu about the upcoming treatment facilities near them, the importance of their functioning and usage. 'Call to action' messages were designed for key stakeholder groups who will be the main enablers of this change including government officers, users of these services (households, establishments etc.), service providers across the FCS (sanitation workers including de-sludging operators, contractors etc.) and WASH sector professionals.

The Kakkaman campaign was launched digitally on World Toilet Day 2020 to engage with the public and promote key messages on achieving safe sanitation through a series of posters, polls, quizzes, competitions, and stakeholder interviews on TNUSSP handles on various social media platforms. The first set of campaign messages were on creating awareness about FCS, followed by a 'call to action' for stakeholders across the FCS to build a safe Tamil Nadu. The Kakkaman film was released on social media by sanitation organizations and social media influencers.

To engage audiences in a complex subject like faecal sludge management, it becomes important to personify the subject and the risks to enable dialogue and the intention to adopt correct FSSM practices.

2. Communication for sustainable sanitation in Wai, Maharashtra³⁵

In 2018, Wai was chosen as one of eight cities globally for the City Wide Inclusive Sanitation (CWIS) Programme supported by the Bill and Melinda Gates Foundation (BMGF). During different stages of support by Center for Water and Sanitation (CWAS), CDRF, CEPT University to make Wai a model city for sanitation, various communications and awareness initiatives were developed and carried out. In fact, the success of the effective implementation of FSSM and CWIS principles in Wai is in part due to the communication protocols.

Awareness activities are critical for successful implementation of community based programmes such as Faecal Sludge and Septage Management (FSSM) and increasing coverage of individual toilets. In Wai, for achieving each milestone, the communications strategy took an adaptive approach to achieve results depending on the interventions planned. To begin with, the communications approach was developed through a consultative process with the city government keeping target audience in perspective, as well as through formative research conducted through surveys and focus group discussions with citizens to understand the sanitation situation and their perceptions. The protocols were developed on the basis of a qualitative assessment of required messages to meet the objectives, identifying the intended groups and choosing the appropriate mode for conveying these messages.

Various mass media and interpersonal communication channels were used to convey the interconnected messages. For example, for sending out message to stop open defecation and sustaining ODF, audio messages by councilors were used. Short cartoon video was made and shared on various social media groups in the city and on local cable television. Various platforms and media such as poster, banners, wall paintings, pamphlet distribution, fairs, workshops, trainings, and social media posts were used for generating awareness, consultations and building capacities around achieving ODF, sustaining the ODF status, providing citywide inclusive FSSM services.

Both the executive as well as the elected officials of Wai Municipal Council have now taken ownership of the work on FSSM and have acknowledged the importance of addressing the CWIS principles.

The city of Wai is now declared ODF++. Also, lessons in sanitation planning from Wai have been disseminated across all urban centers across the state of Maharashtra, under the Swachh Maharashtra Mission for Urban Area.

Lead case study contributor: BBC Media Action

Other contributors: IIHS; Center for Water and Sanitation (CWAS), CDRF, CEPT University

SECTION-H

CONCLUSION AND WAY FORWARD



Safe sanitation as envisaged under Swachh Bharat Mission entails safe management of the human waste generated in the 60% of urban toilets in the country that rely on OSS. This waste contains parasites and pathogens with a high potential for spreading disease, and is largely disposed in the open. It therefore needs urgent attention in order to ensure that the intended public health and environmental benefits of safely managed sanitation are achieved.

FSSM provides a low-cost, easily scalable and inclusive sanitation solution. It can complement India's ongoing efforts to extend sewer networks by prioritizing safe management of human waste in a time bound manner. As showcased through this compendium of leading practices, a number of states and city governments are now implementing FSSM proactively across the country.

Drawing inspiration from the National FSSM Policy launched in 2017, these states and cities are moving towards scaling up innovative and inclusive urban sanitation service delivery. This roll out is characterized by private sector participation, local government leadership, civil society initiatives, human-centric design approaches, and gender focused programs across the value chain. This body of case studies is extensive, with solutions demonstrated for almost all contexts in the country. These can serve as a guide to practitioners across India.

While this compendium is an important overview of the leading practices in the sector, several knowledge products have also emerged from these experiences. The following are readily available for practitioners to take up FSSM:

1. Model Concession Agreement and Model RFP Documents for liquid waste management by NITI Aayog ([Link](#))
2. Standards, specifications and benchmarks for FSSM ([Link](#))
3. PPP models under HAM, DBFOT, DBOT formats ([Link](#))
4. Model tenders specific to FSSM ([Link](#))
5. Business and service delivery models for various FSSM implementations (along with cost benchmarks) ([Link](#))
6. Quality Assurance for FSSM – checklists, templates, SOPs, practitioner manuals ([Link](#))
7. Monitoring and Evaluation processes – at various levels e.g.: Database of existing FSTPs for ready reference, FSTP monitoring protocols ([Link](#))
8. Training modules for orientation to advanced training on FSSM ([Link](#))
9. BCC and IEC materials to drive positive FSSM behaviors ([Link](#))

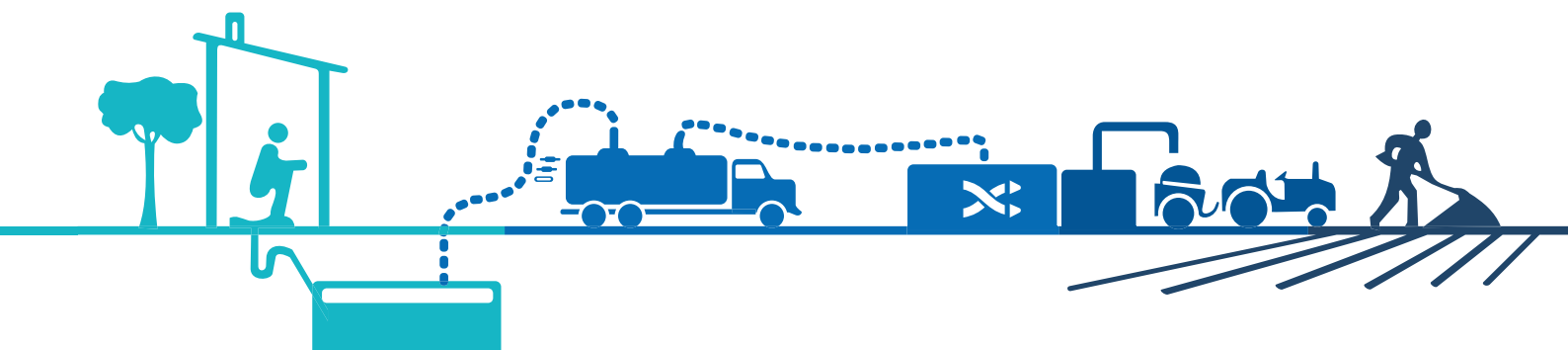
The NFSSM Alliance has played a catalytic role in the FSSM sector in India so far and serves as a ready resource and platform for state and city officials and other key stakeholders who require support to take up FSSM in their respective geographies.

It is estimated that India needs an investment of INR 12,000 crores in FSSM.³⁶ To ensure long term sustainability and quality implementation, states and cities must undertake capacity building, quality assurance and quality control, and monitoring. Moreover, it is critical that states take steps to institutionalize FSSM in the long run through various structures such as the creation of accountable FSSM departments at the state and ULB levels.

FSSM is a key pathway for India to meet the SDG 6.2 goals of safely managed sanitation by 2030. Keeping the most vulnerable and underserved, women and urban poor at the center of this effort, states and cities must move quickly to introduce innovative solutions. With that, India can become an exemplar to the world for not only ending open defecation, but also for safely managed sanitation.

SECTION-I

APPENDIX



CONTACT DETAILS FOR CASE STUDIES

Organization	Contact
Administrative Staff College of India (ASCI)	Prof. Srinivas Chary, Director, ASCI Email: schary@asci.org.in
BBC Media Action	Ms. Reethira Kumar, Senior Project Manager, BBC Media Action Email: Reethira.kumar@in.bbcmmediaaction.org
Center for DEWATS Dissemination Society (CDD), Bangalore	Mr Krishna Swaroop Konidena Email: Krishna.k@cddindia.org
Center for Science and Environment (CSE)	Mr Suresh Rohilla, Senior Director Email: srohilla@cseindia.org
Center for Water and Sanitation (CWAS), CRDF, CEPT University	Dr. Meera Mehta, Executive Director, CWAS Email: meeramehta@cept.ac.in
Ernst & Young LLP (EY)	Mr. Pragyal Singh, Partner, Business Consulting, Ernst & Young LLP Email: pragyal.singh@in.ey.com
KPMG	Dr. Abhinav Akhilesh, Director – Human and Social Services Email: abhinavakhilesh@kpmg.com
National Institute of Urban Affairs (NIUA)	Mr. Depinder Kapur, Team Lead, Sanitation Capacity Building Platform, NIUA Email: dkapur@niua.org
The Indian Institute for Human Settlements (IIHS)	Ms. Kavita Wankhade, Senior Lead-IIHS Email: kwankhade@iihs.co.in
Wash-i	Kalimuthu Arumugam, Program Director Email: akalimuthu@washinstitute.org

ABBREVIATIONS

ABR	Anaerobic Baffled Reactor
ADB	Asian Development Bank
ALF	Area Level Federation
AMRUT	Atal Mission for Rejuvenation and Urban Transformation
ASCI	Administrative Staff College of India
BCC	Behavior Change Communication
BEMC	Berhampur Municipal Corporation
BMC	Bhubaneswar Municipal Corporation
BMGF	Bill and Melinda Gates Foundation
BWC	Blue Water Company
Capex	Capital Expenditure
CBO	Community based organization
CCC	City Civic Center
CDD	Consortium for DEWATS Dissemination Society
CEPT	Centre for Environment Planning and Technology
CMA	Commissionerate of Municipal Administration
CMC	Community Management Committee
CMMU	City Mission Management Unit
CMRC	Community Management Resource Centre
CNPP	Chunar Nagar Palika Parishad
CPCB	Central Pollution Control Board
CPHEEO	Central Public Health and Environmental Engineering Organization
CPR	Center for Policy Research
CRDF	CEPT Research and Development Foundation
CSC	Community Sanitary Complexes
CSE	Center for Science and Environment
CSP	City Sanitation Plan
CSR	Corporate Social Responsibility
CSTF	City Sanitation Task Force
CT	Community Toilet
CTE	Consent to Establish
CTO	Consent to Operate
CWAS	Center for Water and Sanitation
CWIS	City Wide Inclusive Sanitation
DBFOT	Design Build Finance Operate Transfer

DBO	Design- Build- Operate
DBOT	Design, Build, Operate & Transfer
DICCI	Dalit Indian Chamber of Commerce and Industry
DPMS	Development Permission Management System
DPR	Detailed Project Report
DTCN	Detailed Tender Call Notice
EOI	Expression of Interest
EPA	Environment (Protection) Act
EPC	Engineering, Procurement and Construction
EY	Ernst & Young LLP
FAQ	Frequently Asked Question
FC	Finance Commission
FS	Faecal Sludge
FSS	Faecal sludge and septage
FSSM	Faecal Sludge and Septage Management
FSTP	Faecal Sludge Treatment Plant
GDP	Gross Domestic Product
GeM	Government e-Marketplace
GO	Government Order
GoAP	Government of Andhra Pradesh
GoI	Government of India
GoM	Government of Maharashtra
GoO	Government of Odisha
GR	Government Resolution
GoT	Government of Telangana
GoTN	Government of Tamil Nadu
GPS	Global Positioning System
GPS	Global Positioning System
GST	Goods and Service Tax
GWMC	Greater Warangal Municipal Corporation
H&UDD	Housing and Urban Development Department
HAM	Hybrid Annuity Model
HMWSSB	Hyderabad Metro Water Supply & Sewerage Board
HPGF	Horizontal Planted Gravel Filter
ICT	Information Communications Technology
IHHL	Individual Household Latrine

IIHS	Indian Institute for Human Settlements
IHHT	Individual Household Toilet
ISO	International Organisation for Standardisation
KLD	Kilo Liters per Day
KMC	Khopoli Municipal Corporation
MAVIM	Mahila Arthik Vikas Mahamandal
MBBLs	Model Building By-Laws
MCL	Municipal Committee of Leh
MCV	Mini Cesspool Vehicles
MEMPA	Mission for Elimination of Poverty in Municipal Areas
MIS	Management Information system
MLALADS	Member of Legislative Assembly Local Area Development Scheme
MOHUA	Ministry of Housing and Urban Affairs
MoSJE	Ministry of Social Justice and Empowerment
MoU	Memorandum of Understanding
MPLADS	Member of Parliament Local Area Development Scheme
MSJV	Mini Sewer Jetting Vehicles
NBC	National Building Code
NFSSM-A	National Faecal Sludge and Septage Management Alliance
NGO	Non-Governmental Organizations
NGO	Non-Governmental Organization
NIUA	National Institute of Urban Affairs
NOC	No objection certificate
NPP	Nagar Palika Parishad
NUFSSM	National Urban Faecal Sludge and Septage Management
NULM	National Urban Livelihood Mission
NUSP	National Urban Sanitation Policy
O&M	Operation and Maintenance
O&M	Operation and Maintenance
OD	Open defecation
ODF	Open Defecation Free
OEM	Original Equipment Manufacturer
Opex	Operating Expenditure
OG	Operational Guidelines
OSS	On-Site Sanitation
OSSF	On-Site Sanitation facilities

OWSSB	Odisha Water Supply & Sewerage Board
PCC	Plain Cement Concrete
PGF	Planted Gravel Filter
PHEO	Public Health Engineering Organization
PLAM	Performance Linked Annuity Model
PNP	Periyanaickenpalayam
PPE	Personal Protective Equipment
PPP	Public–private partnership
PPTMS	Pattana Pragathi Toilet Monitoring system
PSP	Private Service Provider
PT	Public Toilet
QA	Quality Assurance
QC	Quality Control
QCBS	Quality and Cost Based Selection
RCC	Reinforced Cement Concrete
RRP	Resource Recovery Parks
SA	Shelter Associates
SAC	Swachh Andhra Corporation
SBCC	Social and Behavior Change Communication
SBM	Swachh Bharat Mission
SBM-U	Swachh Bharat Mission-Urban
SC	Scheduled Caste
SCBP	Sanitation Capacity Building Platform
SDB	Sludge Drying Bed
SDG	Sustainable Development Goals
SDGS	Sustainable Development Goals
SeTP	Septage Treatment Plants
SHE Teams	Sanitation and Hygiene Education Teams
SHG	Self Help Group
SIP	State Investment Plan
SLA	Standard License Agreement
SLF	Slum Level Federation
SLWM	Solid Liquid Waste Management
SMCG	State Mission for Clean Ganga
SMMUA	Swachh Maharashtra Mission for Urban Areas
SOP	Standard Operating Procedures

SPCB	State Pollution Control Board
SPV	Special Purpose Vehicle
SPS	Sub Pumping Stations
SS	Swachh Survekshan
ST	Scheduled Tribe
STPs	Sewage Treatment Plants
SUIS	Stand-Up India Scheme
SWM	Solid Waste Management
TCC	Tiruchirappalli City Corporation
TiC	Toilet Integration Centers
TLF	Town Level Federation
TMC	Town Mission Coordinator
TMRC	Training Modules Review Committee
TNCD&BR	Tamil Nadu Combined Development and Building Rules
TNUSSP	Tamil Nadu Urban Sanitation Support Programme
TP	Town Panchayats
TSU	Technical Support Unit
UADD	Directorate of Urban Administration and Development
ULBS	Urban Local Bodies
UPJN	Uttar Pradesh Jal Nigam
WASH	Water Sanitation & Hygiene
WATCO	Water Corporation of Odisha
WAVE Federation	Women's Action in Village Empowerment Federation
WHO	World Health Organization
WSHG	Women Self-Help Groups

REFERENCES

1. <http://swachhbharaturban.gov.in/> accessed 17-12-2020
2. https://nrcd.nic.in/writereaddata/FileUpload/NewItem_210_Inventorization_of_Sewage-Treatment_Plant.pdf with added research by NFSSM Alliance
3. <https://washdata.org/data/household#!/table?geo0=region&geo1=sdg> accessed 17-12-2020
4. Rao, K. C.; Velidandla, S.; Scott, C. L.; Drechsel, P. 2020. Business models for faecal sludge management in India. Colombo, Sri Lanka: International Water Management Institute (IWMI). CGIAR Research Program on Water, Land and Ecosystems (WLE). 199p. (Resource Recovery and Reuse Series 18: Special Issue). [doi: <https://doi.org/10.5337/2020.209>] and <https://swachhbharatmission.gov.in/SBMCMS/writereaddata/portal/images/pdf/sbm-ph-II-Guidelines.pdf>
5. Accelerating Private sector Engagement for FSSM in India', an ISC-EY publication, Nov 2020
6. Analysis by NFSSM Alliance based on survey of its partners working in various states
7. Center for Water and Sanitation- CEPT University. (Nov 2018). Mobilizing sanitation credit through urban SHGs a Case of MAVIM, Maharashtra. Retrieved from https://pas.org.in/Portal/document/ResourcesFiles/pdfs/Mobilizing%20sanitation%20credit%20through%20urban%20SHGs%20-%20A%20case%20of%20MAVIM,%20Maharashtra_12%20Dec%2018.pdf
8. Center for Water and Sanitation- CEPT University. (Sep 2020). Reaching the Unserved : Access to individual household toilets in vulnerable urban areas. Retrieved from https://pas.org.in/Portal/document/UrbanSanitation/uploads/Reaching_theUnserved_Access_to_individual_HH_toilets_CWAS_CEPT_University.pdf
9. GoTN (1972). 'THE TAMIL NADU MUNICIPALITEIS BUILDING RULES, 1972 (G.O.Ms.No.1009, Rural Development and Local Administration, Dated 1972 (1009)'
10. Source: Blue Water Company
11. Mehta M, Mehta D and Yadav U (2019) Citywide Inclusive Sanitation Through Scheduled Desludging Services: Emerging Experience From India. *Front. Environ. Sci.* 7:188. doi: 10.3389/fenvs.2019.00188 <https://www.frontiersin.org/articles/10.3389/fenvs.2019.00188/full>
 OECD (2019) "Making Blended Finance Work for Water and Sanitation: Unlocking Commercial Finance for SDG 6" OECD studies on water. Annex C. OECD Publishing, Paris, <https://doi.org/10.1787/5efc8950-en>. ISSN: 22245081 (online)
 Center for Water and Sanitation, CRDF, CEPT University (2020) "Citywide Inclusive Sanitation model in Wai" A video available on https://www.youtube.com/watch?v=_zKI-7XSLiE&t=1s
 Center for Water and Sanitation, CRDF, CEPT University (2019) "Scheduled Desludging in Wai" Retrieved from https://pas.org.in/Portal/document/UrbanSanitation/uploads/Scheduled_desludging_in_Wai.pdf
 IWMI (2020) "Business models for Faecal sludge and Septage Management in India" pg no.100 http://www.iwmi.cgiar.org/Publications/wle/rrr/resource_recovery_and_reuse-series_18-special_issue.pdf ISSN: 2478-0529 (online)
 CPHEEO, MoHUA (2020), Advisory on onsite and offsite sewage management practices. Annexure III
12. NSSO 76th Round, 2018
13. Municipal Administration and Water Supply Department (2018). In principle approval for creation of 49 numbers of Faecal Sludge and Septage Management (FSSM) treatment facility to cover 51

Municipalities and 59 Town Panchayats – Orders – Issued (G.O. (Ms) No. 88.). Government of Tamil Nadu.

14. Commissionerate of Municipal Administration (2014). Operative Guidelines for Septage Management for Local Bodies in Tamil Nadu. Municipal Administration and Water Supply Department, Government of Tamil Nadu.
15. Municipal Administration and Water Supply Department (2020). Faecal Sludge and Septage Treatment Plants – Approval of Faecal Sludge and Septage Management Licensing Agreement and Memorandum of Understanding of the Faecal Sludge and Septage Treatment Plants prepared by TSU of TNUSSP, IIHS for the use of the constructed Faecal Sludge and Septage Treatment Plants – Orders – Issued (G.O. (2D) No. 35.). Government of Tamil Nadu.
16. Source: CWAS (2010), “Analysis of ongoing slum upgradation programs of AMC
17. Centre for Water and Sanitation-CRDF-CEPT University. (2019). Monitoring FSSM Service Chain. Retrieved from https://www.pas.org.in/Portal/document/UrbanSanitation/uploads/Monitoring_FSSM_service_chain.pdf and Centre for Water and Sanitation-CRDF-CEPT University. (2019). IT Enabled Monitoring Systems for Scheduled Septic Tank Emptying. Retrieved from https://pas.org.in/Portal/document/ResourcesFiles/IT%20enabled%20online%20monitoring%20systems_CEPT_FSM5.pdf
18. Government resolution No : SMM – 2019 / Circular No. 124 / UD – 34 on 8th November, 2019 - link
19. Census 2011
20. Desludging fee for smaller tanker is assumed to be INR 1000 / trip and for that of bigger tanker is assumed as INR 1500/trip.
21. Center for Water and Sanitation, CRDF, CEPT University (2018) “Model tender document for treatment facility” Retrieved from https://pas.org.in/Portal/document/UrbanSanitation/uploads/Model_DBOT_tender_document_for_FSTP.pdf
22. Source: Center for Water and Sanitation, CRDF, CEPT University : cwas@cept.ac.in
23. Swachh Survekshan is the annual cleanliness survey of urban India conducted by the Ministry of Housing and Urban Affairs (MoHUA), Government of India since 2016. Swachh Survekshan 2020 was the 5th edition of the survey.
24. The ODF++ Protocol released by MoHUA focuses on the aspect of safe management and treatment of complete faecal sludge and septage management and ensures that no untreated faecal sludge/septage is discharged/ dumped into drains, water bodies or open areas
25. As per MIS data maintained by Urban Environment Development and Environment Department (UADD) on IHHL and CT/PT.
26. Municipal Administration and Water Supply Department (2018). In principle approval for creation of 49 numbers of Faecal Sludge and Septage Management (FSSM) treatment facility to cover 51 Municipalities and 59 Town Panchayats – Orders – Issued (G.O. (Ms) No. 88.). Government of Tamil Nadu.
27. Municipal Administration and Water Supply Department (2020). Faecal Sludge and Septage Treatment Plants – Approval of Faecal Sludge and Septage Management Licensing Agreement and Memorandum of Understanding of the Faecal Sludge and Septage Treatment Plants prepared by TSU of TNUSSP, IIHS for the use of the constructed Faecal Sludge and Septage Treatment Plants – Orders – Issued (G.O. (2D) No. 35.). Government of Tamil Nadu.

28. Devanahalli FSSM Brochure – CDD Society 2019 - <https://cddindia.org/wp-content/uploads/2019/04/Devaanahalli-Brochure-2019.pdf> and Strengthening O&M of Decentralized Sanitation Systems and FSSM – BORDA 2018 - <https://cddindia.org/wp-content/uploads/2019/04/Strengthening-OM-of-Decentralised-Sanitation-Systems-and-FSM.pdf> and Evaluation of co-composted faecal sludge application in agriculture - <https://www.witpress.com/elibrary/wit-transactions-on-ecology-and-the-environment/238/37456>
29. Commissionerate of Municipal Administration 2014 Operative Guidelines for Septage Management for Local Bodies in Tamil Nadu. Municipal Administration and Water Supply Department, Government of Tamil Nadu.
30. SCBP website: www.scbp.niua.org Normative framework document: https://niua.org/scbp/sites/default/files/State_Normative_Framework_for_CB.pdf
Digital dissemination strategy document: https://niua.org/scbp/sites/default/files/Digital_Strategy.pdf
31. www.scbp.niua.org
32. <https://www.niua.org/scbp/>
33. https://niua.org/scbp/sites/default/files/State_Normative_Framework_for_CB.pdf
34. https://niua.org/scbp/sites/default/files/Digital_Strategy.pdf
35. CWAS (2020), “Communications approach in Wai for ODF, ODF Sustainability, FSSM and CWIS” Retrieved from https://pas.org.in/Portal/document/UrbanSanitation/uploads/Communication_for_Sustainable_Sanitation_for_Wai.pdf
CWAS(2018),” Pamphlet for scheduled emptying awareness”, Retrieved from <https://pas.org.in/Portal/document/UrbanSanitation/uploads/Pamphlet%20for%20scheduled%20emptying%20awareness.pdf>
36. https://pas.org.in/Portal/document/UrbanSanitation/uploads/Financing FSSM Report_June 8 2019.pdf



The Alliance stands strong with 31 members having varied backgrounds including academic institutions, consultants, implementing bodies, quasi-government organizations, data experts and research institutes. Our strength lies in the diverse memberships, their network and our commitment.

MEMBERS



<https://asci.org.in>

ATHENA
INFONOMICS

<https://www.athenainfonomics.com>



<https://www.bbc.co.uk/mediaaction/>

**BILL &
MELINDA
GATES**
foundation

<https://www.gatesfoundation.org>



<https://www.cseindia.org>



<https://cddindia.org>



<https://www.dasra.org>



<https://www.ey.com/>



<https://www.borda.org>



<https://cfar.org.in>



<https://cept.ac.in/center-for-water-and-sanitation-c-was>



<https://www.cprindia.org>



<https://www.giz.de/en>



<http://www.indiasanitationcoalition.org>



<https://iihs.co.in>



<https://www.iwmi.cgiar.org>



<https://home.kpmg/in>



<https://www.niua.org>



<https://www.psi.org>



<https://www.rti.org>



<http://www.samhita.org>



<https://www.tidetechocrats.com>



<https://umcasia.org>



<https://www.unicef.org>



<https://www.usaid.gov>



<https://www.washinstitute.org>



<https://www.wateraidindia.in>



<https://www.worldbank.org>



<https://www.intellectcap.com>



<https://www.janaagraha.org/home/>



<https://s3idf.org>



Copyright, NFSSM Alliance & Niti Aayog