



Ministry of Housing and Urban Affairs  
Government of India



BILL & MELINDA  
GATES foundation



# Proceedings

## National Capacity Building Workshop for Safe Sanitation

23-24  
November, 2023

Chennai  
Tamil Nadu

Accelerating  
Change for  
Safe Sanitation



## **ABBREVIATIONS**

<b>MLD</b>	Million litres per day
<b>CAPEX</b>	Capital Expenditure
<b>OPEX</b>	Operational Expenditure
<b>PPP</b>	Public Private Partnership
<b>CSR</b>	Corporate Social Responsibility
<b>O&amp;M</b>	Operations and Maintenance
<b>SoR</b>	Schedule of Rates
<b>PT</b>	Public Toilet
<b>CT</b>	Community Toilet
<b>CSC</b>	Community Sanitary Complex
<b>JJM</b>	Jal Jeevan Mission
<b>AMRUT</b>	Atal Mission for Rejuvenation and Urban Transformation
<b>IHHL</b>	Individual Household Latrines
<b>SHG</b>	Self Help Groups
<b>NGO</b>	Non-Governmental Organisation
<b>ULB</b>	Urban Local Bodies
<b>SBMU</b>	Swachh Bharat Mission – Urban

## **ACKNOWLEDGEMENTS**

We at WASH Institute extend our sincere gratitude to the Government of Tamil Nadu for hosting the National Capacity Building Workshop for SBM 2.0 on the occasion of World Toilet Day 2023.

The Workshop owes much of its success to the presence and direction of Smt. Roopa Mishra, Mission Director SBM 2.0, Joint Secretary – MoHUA; Shri. J. Radhakrishnan, Additional Chief Secretary – GoTN; Shri. D. Karthikeyan, Principal Secretary, Municipal Administration and Water Supply – GoTN; Shri. V. K. Chaurasia, Joint Advisor – CPHEEO; and their respective teams. We thank their involvement in the successful conduct of the Workshop held in Chennai on the 23<sup>rd</sup> and 24<sup>th</sup> of November 2023.

We also thank donor entities – USAID and Bill & Melinda Gates foundation – for their continued support in mobilizing efforts towards organizing the workshop. Our heartfelt thanks also go out to the various State representatives who enriched the Workshop with their presence, contextual perspective, and learnings.

The smooth planning and execution of the entire event is a culmination of the WASH Institute team's active collaboration and effort. The National Capacity Building Workshop for SBM 2.0 adds momentum to these efforts, first set in motion by the SBM-U 2.0 – National Capacity Building Workshop held at Bengaluru in 2022.

## CONTENTS

<b>I. Brief on the workshop.....</b>	<b>8</b>
<b>Agenda of the Workshop.....</b>	<b>10</b>
<b>II. Session wise Proceedings .....</b>	<b>12</b>
<b>Opening ceremony and Inaugural Sessions.....</b>	<b>12</b>
<b>Day 1: Accelerating Change for Safe Sanitation .....</b>	<b>21</b>
<b>Session 1: Access and O&amp;M of Toilets.....</b>	<b>21</b>
Session 1.1: Suvidha –CSR Model of community toilets in slums.....	21
Session 1.2: Experience sharing on CT PT maintenance .....	23
Session 1.3: Increased accessibility toilets and Building models for sustainable operations.....	26
Session 1.4: SHG involvement in maintenance of Toilets.....	28
Session 1.5: Insights from survey of PTs and public urinals in 14 towns .....	30
Session 1.6: Innovative aspirational CT/PT models under Toilets 2.0: Design Toilets.....	33
Session 1.7: App based monitoring of CT, PT - Pattana Pragati.....	36
Session 1.8: Toilet Construction Technologies .....	38
Session 1.9: SBM-U 2.0 – Saturation of toilet facilities in urban areas.....	39
Session 1.10: Delhi Urban Shelter Improvement Board-Inclusive Urban Development (not presented).....	40
<b>Session 2: Mechanised Cleaning of Sewer and Septic Tanks .....</b>	<b>44</b>
Session 2.1: Strengthening the sanitation sector: Industry snapshot and constraints .....	44
Session 2.2: Promoting safety to sanitation workers – Initiatives of MoSJE including NAMASTE guidelines .....	45
Session 2.3: Experience sharing on operationalising RSA and ERSU .....	47
Session 2.4: Experience sharing on mechanized cleaning .....	49
Session 2.5: Garima Scheme Experience .....	50
Session 2.6: Tirupati model on Mechanised Cleaning of Sewer and Septic Tanks .....	52
Session 2.7: Efforts of MoHUA to Promote Mechanized Cleaning of Sewers and Septic Tanks ..	53
<b>Day 2: Accelerating Used Waster Management Initiatives .....</b>	<b>55</b>
<b>Session 1: Implementation: States’ Experience.....</b>	<b>55</b>
Session 1.1. Punjab .....	55
Session 1.2. Himachal Pradesh .....	57
Session 1.3. Maharashtra.....	58
Session 1.4. Odisha .....	59
Session 1.5. Andhra Pradesh.....	60

Session 2: Implementation approach & technology selection .....	62
Session 2.1: Technology selection & STP designs for small & medium towns- Telangana.....	62
Session 2.2: Technology selection for small and medium size STPs: Telangana experience.....	64
Session 2.3: Gujarat experience in DPR preparation & implementation approach .....	67
Session 2.4: SBM-U 2.0: UWM Implementation approach and strategy.....	68
Session 3: Experience sharing on Procurement.....	71
Session 3.1. GEM Procurement – Equipment machinery & services.....	71
Session 3.2. Model tender document for Used Water Management (STP & Sewer laying) .....	72
Session 3.3. Maharashtra FSTP design & Implementation experience .....	74
Session 4: Approach & FSTP Design for Faecal sludge & Septage management in small & medium towns .....	75
Closing session of the Workshop .....	77
Annexure:.....	79

## LIST OF FIGURES

Figure 1: Number of participants in the workshop from various states of India .....	9
Figure 2: Agenda and session plan for the workshop.....	11
Figure 3: State of STPs with current capacity utilization and projected capacity requirements.....	12
Figure 4: State wise CSR investment in 2021-22 .....	13
Figure 5: Guiding Principles for safe and sustainable operations in Public & Community Toilets .....	14
Figure 6: Public and Community Toilets with best practices and design.....	15
Figure 7: Snapshots of The lightbox public toilets and Woloo ap .....	15
Figure 8:Administrative Map representing the zones and respetive wards.....	17
Figure 9: Model structure for Operations and Maintenance of Public Toilet infrastructure .....	18
Figure 10: Toilet toolkit representing an approach that adopts multi-aspect considerations for public toilet infrastrcutre; created and employed by the Greater Chennai Corporation .....	19
Figure 11: The Suvidha Complex coverage and indicative Charges for various services.....	21
Figure 12: The Implementation process for a Suvidha Centre .....	23
Figure 13: Challenges against Community and public Toilet operations and maintenance, GoTN .....	24
Figure 14: Design Approach for Public/Community Toilets, GoTN.....	25
Figure 15: Overall O&M equipments and activities under a typical PT-CT operations contract.....	25
Figure 16: Project Financing and Execution Model for sustainable infrastructure and operations through faster response to issues with a Quick Reaction Team, Noida .....	26
Figure 17: Glimpse of Pink Toilets by Noida Authority .....	27
Figure 18: Odisha's O&M model for Public & Community Toilets.....	29
Figure 19: Survey Sample for the study on the operations and maintenance of various public and community toilets across India .....	30
Figure 20: Service Area Coverage- Analysis of Spatial distribution of PT and CT infrastructure within the local body boundaries .....	30
Figure 21: Containment Typology in the across the various town of the survey sample.....	31
Figure 22: Footfall and User charges with respcet to the O&M costs of PT-CT survey sample .....	32
Figure 23: Inauguration of Toilets 2.0 Compendium .....	33
Figure 24: Entries from Public & Community Toilet Design competition organised by Council of Architecture-Touristic .....	34
Figure 25: Entries from Public & Community Toilet Design competition organised by Council of Architecture-Low space availability .....	34
Figure 26: Entries from Public & Community Toilet Design competition organised by Council of Architecture-Specially Challenging Areas .....	35
Figure 27:Models for Aspirational Public Toilets and their monitoring in Telangana .....	36
Figure 28: Additional mobile toilets for occassions/festivals attracting large floating/tourist population.....	37
Figure 29: Innovative Construction Implementation Technologies adopted by NBCC .....	38
Figure 30: ODF Sustainability +Monitoring across India and the required human resource-related interventions.....	39
Figure 31: Upgradation of existing shared toilet Infrastructure under the Delhi Urban Shelter Improvement Board.....	40
Figure 32: Various Toilet complex initiatives by DUSIB .....	41
Figure 33: Longevity of Manufacturers since 1980 based on a study by Kam Avida Enviro Engineers Pvt Ltd .....	44

Figure 34: Question of Accountability for Sewerage vs Septic tank based systems.....	45
Figure 35: Features of the NAMASTE Scheme for Safaimitra Karmachari.....	46
Figure 36: Swachhta Udyami Yojana providing easier loans and financial assistance for aspirational Swachhakarmis .....	46
Figure 37: Safety is one of the most critical and urgent aspects for Sanitation Workers .....	47
Figure 38: Capacity Building and Training workshops to be more active to sensitise and improve users of the correct safety practices and PPE.....	48
Figure 39: Achieving a 100% mechanized O&M for toilet-associated infrastructure not a distant dream .....	49
Figure 40: Timeline for Odisha’s Garima scheme for the safety and dignity of sanitation workers ....	50
Figure 41: Achievements so far under the Garima Scheme .....	51
Figure 42: Mechanization of O&M in Sewerage and containment systems, Tirupati .....	52
Figure 43: Mechanization of sewerage and septage management at national scale .....	54
Figure 44: Progress and Timelines for 100% ULBs to adopt mechanization completely .....	54
Figure 45: Progress in Used water Management initiatives for the state of Punjab.....	56
Figure 46: Completed and upcoming STPs of Himachal Pradesh .....	57
Figure 47: Maximizing reuse for treated water from STPs in Himachal Pradesh .....	57
Figure 48: Progress in various stages of Used water Management initiatives across ULBs of Maharashtra.....	58
Figure 49: Progress in Greywater Management initiatives across the state of Odisha.....	59
Figure 50: Status of STPs under various schemes in Andhra Pradesh .....	60
Figure 51: Funding and technical approvals for used water management initiatives.....	61
Figure 52: Comparison of per MLD Costs of STP implementation according the Schedule of Rates of various States.....	62
Figure 53: Hybrid Annuity Model example for contracts including O&M along with construction ....	63
Figure 54: Comparison of Costs wrt Total costs of STP implementation in various States .....	63
Figure 55: Life Cycle Cost Analysis of STPs of various capacities and technologies as a decision-making parameter .....	64
Figure 56: Comparison of land requirement by Capacity of multiple technologies across the capacities of 1,5 and 20 MLD capacities .....	65
Figure 57: Status of STPs and typical project structures in Gujarat.....	67
Figure 58: Statistics for Waste Management & Water Supply related services at the GeM portal ....	71
Figure 59: Guidance through model tender documents for Used Water Management projects under SBM 2.0 .....	72
Figure 60: Fastrack implementation model for FSTP implementation in Maharashtra .....	74
Figure 61: Incremental Approach for Used water management: Planning a combination of centralized sewer based and decentralized solutions .....	75
Figure 62: Approach to Designing FSTP solutions.....	76

## LIST OF TABLES

Table 1: UWM Approaches for prescribed by CPHEEO for Class II to Class VI towns.....	68
--	----

## **I. Brief on the workshop**

The second iteration of the National Capacity Building Workshop on Used Water Management (UWM) under Swachh Bharat Mission – Urban 2.0 aimed at assembling sector experts and state-level functionaries on a single platform, in a bid to share experiences and ensure cross-learning. The Workshop intended to catalyse the SBM-U 2.0 Used Water Management Initiatives across all ULBs; appreciate the progress made by various states thus far; and share lessons with those ULBs catching up on the Mission’s objectives.

The Workshop delved into themes such as:

- (a) Access and O&M of toilets;
- (b) Mechanized cleaning of sewer and septic systems;
- (c) Procurement and implementation: States Experience;
- (d) Implementation Approach and technology selection;
- (d) Procurement options and experiences; and,
- (f) FSM Design & Approach for Small and Medium towns.

Each curated session intended to equip decision-makers with knowledge of possible approaches; technologies under SBM-U 2.0; and case studies of successful UWM models to inspire momentum toward ODF++ and Water+ milestones. The initiative of establishing SafaiMitra Surakshit Shehar (Safe workplaces/cities for sanitation workers) has been garnering the attention and effort of several states, in turn leading to schemes and initiatives that aid the lives and livelihoods of sanitary workers. Experiences shared during the Workshop have illuminated pathways for all ULBs to follow and improve upon, bringing them closer to: ‘Safe Sanitation for All.’



The National Capacity Building Workshop for SBM 2.0 (2023) registered participation from various states across India



Figure 1: Number of participants in the workshop from various states of India

## Agenda of the Workshop

### National Capacity Building Workshop 2023 Swachh Bharat Mission - Accelerating Change for Safe Sanitation

Date: 23<sup>rd</sup> – 24<sup>th</sup> November, 2023

Venue – Le Royal Meridian, Chennai, Tamil Nadu

#### Day 1: – Accelerating Change for Safe Sanitation

#	Agenda	Speakers	Duration (in mins)
	<b>Registration</b>		<b>75</b>
	<b>Inauguration Session [1000 – 1115 Hrs]</b>		
	Lamp lighting		5
	Welcome Address	Dr. Madhu Rani Teotia, Director, SBM-U	5
	Livelihood opportunities in sanitation sector – a perspective	Rajesh Gupta, NITI Aayog	10
1	Financing in sanitation sector	Prof. Srinivas Chary, ASCI	10
	Compendium on various CT/PT models	Sasanka, WASHi	10
	Experience sharing - Greater Chennai Corporation	Dr. J Radhakrishnan, GCC, TN	10
	Toilet Journey under SBM 2.0 – National perspective	JS, SBM-U	10
	State Strategy for Sanitation in TN	Principal Secretary, GoTN	10
	Vote of Thanks	Dr. V K Chaurasia, Jt. Adviser (PHEE), CPHEEO	5
	<b>Tea</b>		
	<b>30</b>		
	<b>Session I – Access and O&amp;M of Toilets [1145 – 1330 Hrs] (Moderator – Prof. Srinivas Chary )</b>		
	Suvidha – CSR Model of Community Toilets in slums	Sandeep Sheth, HUL	8
	Experience sharing on CT PT maintenance	B.V. Babu, SE, GCC, TN	8
	O&M model for CT/PT without fee	Gaurav Bansal, SBM Noida Authority	8
	SHG involvement in maintenance of Toilets	Mr Rabindra Kumar Sahoo, Odisha NULM	8
2	Night Shelters & Community Toilets Management in Delhi by	Mr. Jagat Pati, AE, DUSIB	8
	Insights from survey of CT/PTs in 14 towns	Sasanka, WASHi	10
	Innovative aspirational CT/PT models	Ar. P R Mehta, CoA	8
	App based monitoring of CT, PT - Pattana Pragati	Srinivas Reddy, Addl. MD SBM-U	8
	Toilet Construction Technologies	Amit NBCC representative	8
	SBM-U 2.0 – Saturation of toilet facilities in urban areas	Dr. V K Chaurasia, CPHEEO	15
	<b>Q&amp;A Session</b>		
	<b>15</b>		
	<b>Lunch [1330 -1430 Hrs]</b>		
3	<b>Session II – Mechanised Cleaning of Sewer and Septic Tanks [1430 – 1555 Hrs] (Moderator – P K Mahapatra)</b>		
	Private sector operator to share expectations and business models	Mr. M Krishna, Director, KamAvida	10
	Promoting safety to sanitation workers – Initiatives of MoSJE including NAMASTE guidelines	Prabhat Kumar Singh, MD, NSKFDC	15
	Experience sharing on operationalising SRA and ERSU	TN Simran; Jt CMA, Govt. TN	8
	Experience sharing on mechanized cleaning	Rajesh Narvekar, Navi Mumbai	10
	Garima Scheme Experience	P K Mahapatra, EnC, OWSSB	8
	Tirupati model on Mechanised Cleaning of Sewer and Septic Tanks	Chandramouliswar, Dy. Commissioner, Tirupati	9
	Efforts of MHUA to Promote Mechanized Cleaning Of Sewers And Septic Tanks	Dr. V K Chaurasia, Jt. Adviser (PHEE), CPHEEO	15
	<b>Q&amp;A</b>		
	<b>10</b>		
	<b>High-Tea</b>		
	<b>20</b>		
	<b>Solid Waste Management Facilities / City tour</b>		

## Day 2: – Accelerating UWM Implementation

#	Agenda	Speakers	Duration (in mins)
1	<b>Session III – Implementation : States' Experience [1000 – 1050 Hrs]</b> <b>(Moderator – Sh. Supriya Ghoshal, West Bengal State Mission Director)</b>		
	<ul style="list-style-type: none"> <li>• Punjab</li> <li>• Himachal Pradesh</li> <li>• Maharashtra</li> <li>• Odisha</li> <li>• Andhra Pradesh</li> </ul>	<ul style="list-style-type: none"> <li>• Harpreet Singh, XEN, PMIDC</li> <li>• Er. Mandeep Gupta. EE</li> <li>• Mahesh Chaudri, Maharashtra</li> <li>• Ravindra Kumar Sahu, AS</li> <li>• P. Anand Rao, CE</li> </ul>	40
	<b>Q&amp;A</b>		10
2	<b>Session IV - Implementation approach &amp; technology selection [1050 – 1155 Hrs]</b> <b>(Moderator – VKC, CPHEEO)</b>		
	Technology selection & STP designs for small & medium towns	Prof. Jafri & Mr. Subhani, NCPE	15
	Telangana experience in technology selection & design of STP	Naga Malleswar Rao, GoTS	10
	Gujarat experience in DPR preparation & implementation approach	Yashasvi Mahendrabhai, GUDC Representative	10
	SBM-U 2.0 : UWM Implementation approach and strategy	Dr. V K Chaurasia, Jt. Adviser CPHEEO	20
	<b>Q&amp;A</b>		10
3	<b>Session V – Experience sharing on Procurement [1155 – 1315 Hrs]</b> <b>(Moderator – SMD Maharashtra)</b>		
	GEM Procurement – Equipment machinery & services	Mr. A.V. Muralidharan, GeM	20
	Model tender document for Used Water Management (STP & Sewer laying)	Mr. R N Jindal, CPHEEO	5
	Maharashtra FSTP design & Implementation experience	Chirag Patel, CEPT	10
	Approach & FSTP Design for Faecal sludge & septage management in small & medium towns	Sathish Kumar, Asst. Adviser, CPHEEO	15
	<b>Q&amp;A</b>		10
4	Way forward by CPHEEO Closing remarks by DMA Vote of Thanks by WASHi		15
	<b>Lunch [1330-1430]</b>		60
	<b>Used Water Management Facilities / City tour /Departure</b>		

Figure 2: Agenda and session plan for the workshop

## II. Session wise Proceedings

### Opening ceremony and Inaugural Sessions

*Dr Madhu Rani Teotia, Director SBM-Urban (SBM-U)*

“Convergence is the essence of the second round of the National Capacity Building Workshop” on this World Toilet Day, 2023. It builds on the first iteration of the Workshop held in 2022 at Bengaluru, Karnataka, which emphasized that the aspirational sanitation outcomes targeted by SBM-U 2.0 require an exhaustive plan guided by envisioning principles and preparation guidelines. The second Workshop will equip and further strengthen participant knowledge through expert sessions that cover topics ranging from accessibility and inclusivity by implementing 100% toilet coverage, to adoption of technical upgrades for mechanizing operations and monitoring used water management.

*Mr. Rajesh Gupta, Niti Aayog on Livelihood Opportunities in Sanitation Sector across Urban India – a discussion paper*

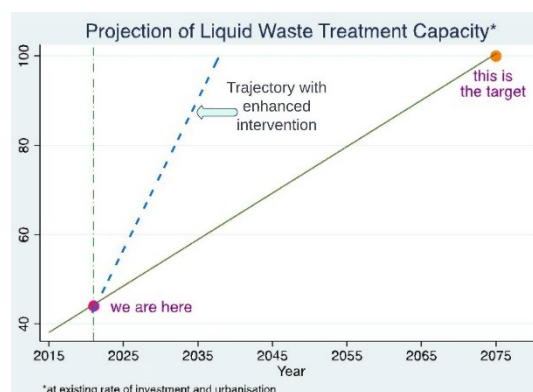
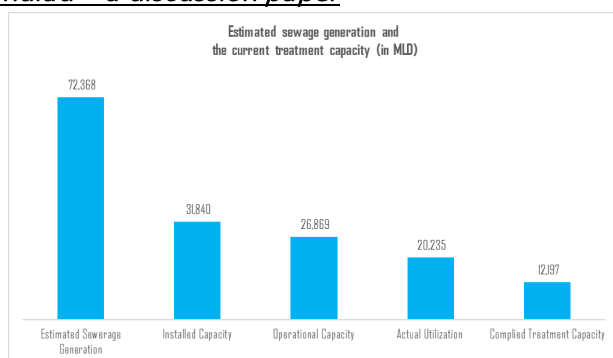


Figure 3: State of STPs with current capacity utilization and projected capacity requirements

A perspective on Gaps and Targets: As per a recent discussion paper prepared by NITI Aayog, the total sewage generation for Urban India is estimated to be ~73,000 MLD, a much higher number than the available operational treatment capacity of 27,000 MLD. Under business-as-usual scenarios, achieving 100% operational treatment capacity is a possibility only in 2075; achieving the same by 2030 would require two approaches: Decentralisation (coupled with centralized solutions), and Public-Private Partnerships (PPP).

Creating Job Opportunities: 100% operational treatment capacity can spawn direct and indirect employment opportunities. Direct employment options will engage human resources in Operations roles including as sanitation workers, managers/supervisors, kiosk operators, lab operators, community facilitators and supply chain workers. Indirect employment options will engage human resources in Implementation, Monitoring and Evaluation aspects; these include employees such as masons, plumbers, electricians, training experts, surveyors, design consultants, contractors, analysts, digital experts, etc.

Public-Private Partnerships will bring momentum and innovation to the Mission. Modular systems enable upgradeable solutions that accommodate growing populations. Partnering with entrepreneurs/private parties will only bring speed to the process.

**Mr Srinivas Chary, ASCI on Financial systems in safely managed sanitation**

While planning and implementing WASH solutions, facilitate well-operated public conveniences and ensure their mechanization to the largest extent possible. Alongside CAPEX (Capital Expenditure) and OPEX (Operation Expenditure) components, a component of CAPMANEX (Capital Maintenance Expenditure) has come to light. CAPMANEX refers to the cost of repairing/retrofitting an existing asset from a defunct state to a functional state.

Gaining priority (alongside healthcare, environment and sustainability strategies) in the CSR initiatives of many companies, WASH interventions are attracting considerable investment across several Indian states (as shown in the map below).

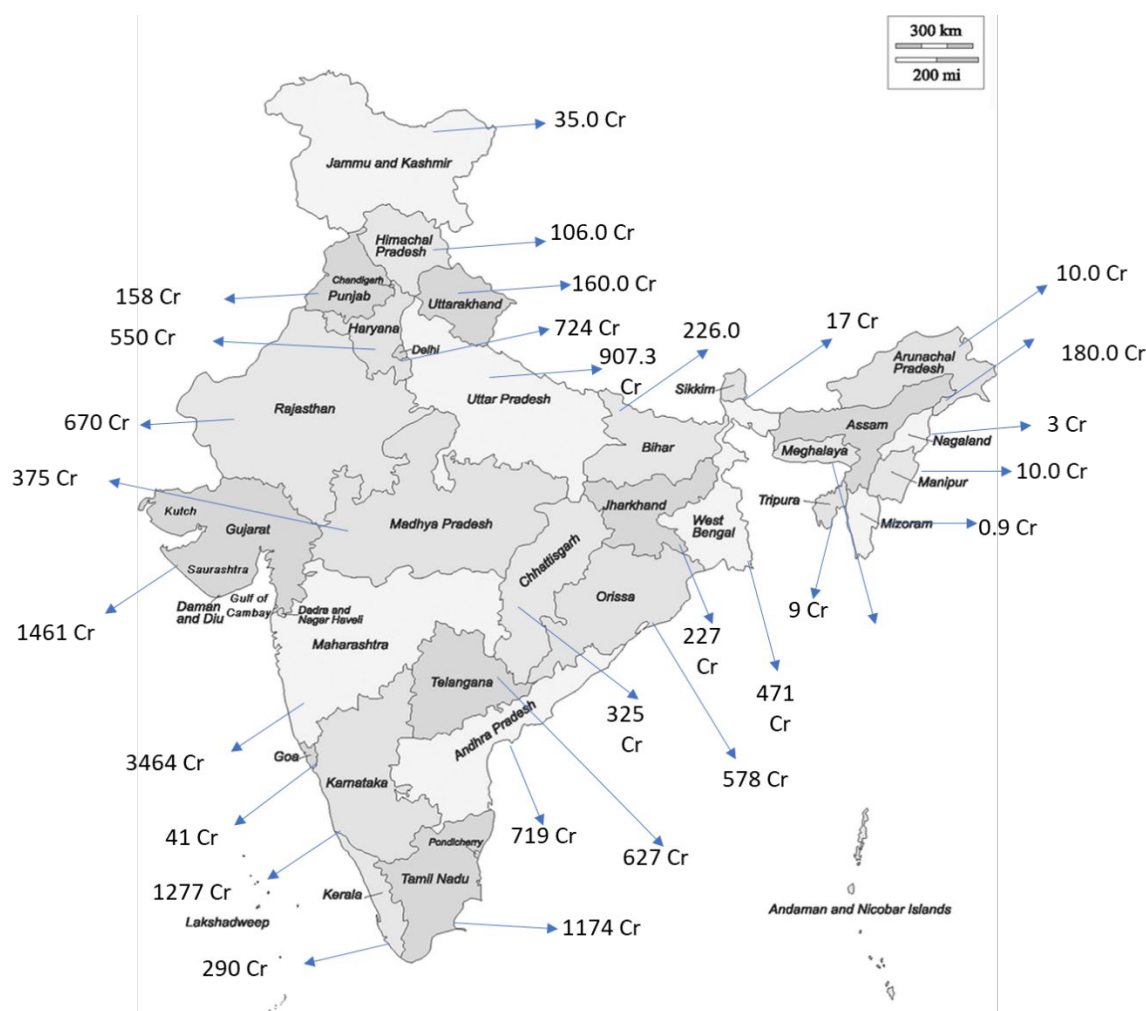


Figure 4: State wise CSR investment in 2021-22

**State wise CSR investment 2021-22 [National CSR portal, Ministry of Corporate affairs]**

In addition to CSR, there are many promising financing instruments and various proven case studies, that can help in materializing the Sanitation Plans envisioned by the states. These include:

- a. Public-Private Partnership (PPP);
- b. Local Government Funding through scheme convergence;
- c. Crowd-sourcing by engaging public investment for considerably quick fundraising;
- d. Philanthropic Funding; and,
- e. Carbon Financing with a Hybrid Annuity Model.

A significant example is the Telangana Social Impact Corporation that brought CSR and philanthropic investment into a single account, channelling sanitation funds through a well-distributed mechanism across the state. Similar models can be adapted in other states to cover respective funding gaps.

**Mr Sasanka Velidandla, Director-Government Advisory, WASH Institute on Toilets 2.0: A conceptual framework for Public Toilets and Community Toilets in India**

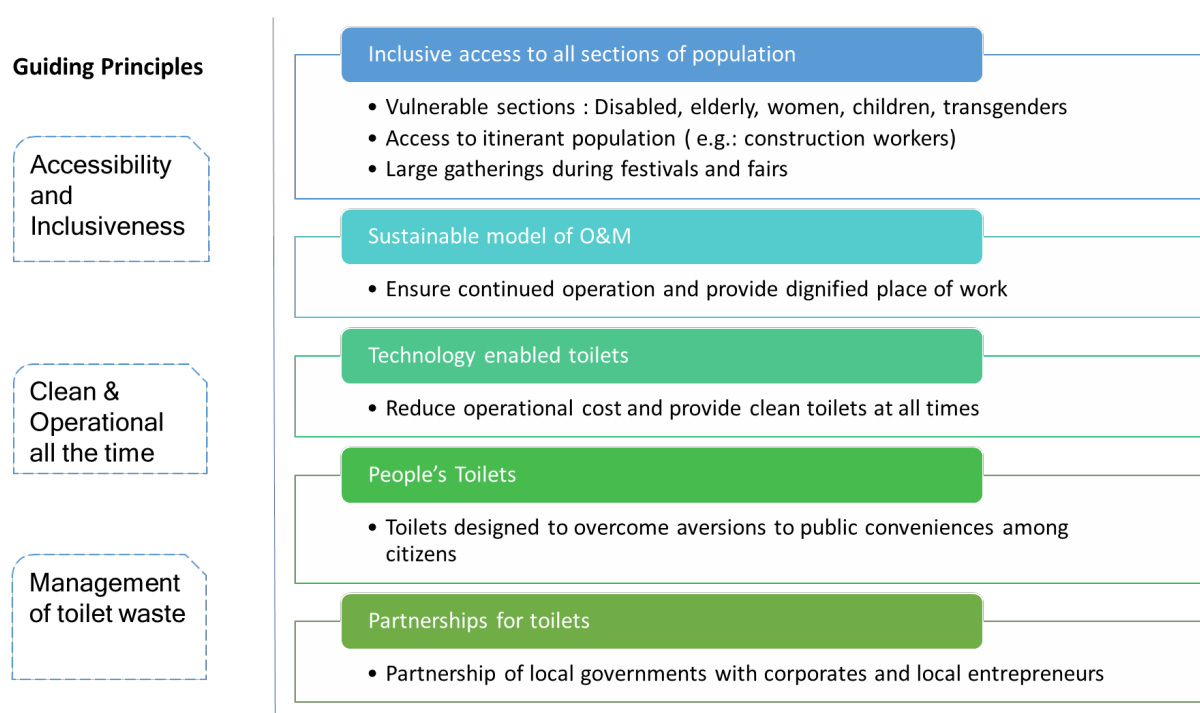


Figure 5: Guiding Principles for safe and sustainable operations in Public & Community Toilets

WASH Institute has developed a compendium of significant examples in Community and Public Toilet design across the country. The Compendium shall be released for public viewing in the near future, and will examine:

- Costs of inclusion:
  - Per seat cost of conventional vs precast SHE toilet implementation amounts to Rs. 2 lakh and Rs. 1.25 lakh, respectively (subject to change relatively with respect to local SoR);
  - Retrofitting existing toilet units (one male and one female) to disabled friendly units amounts to Rs. 2.2 lakh (subject to change relatively with respect to local SoR); and,
  - Costs of safe sanitation provisions to construction workers amounts to Rs. 200 – 250 per month
- Emerging models and challenges in Operations and Maintenance aspects:
  - Although user fees, advertisement rights, attached shops/cafes and ULB funds are typical revenue sources for public and community toilets, much depends on (highly varying

factors of) footfall and socio-economic background of the users. Optimizing O&M costs/activities through practices like resource sharing (personnel, equipment, etc.) between multiple toilet units can reduce financial burdens considerably.

- 
- Collaboration with private partners in design, implementation, operations, technology/digitisation, etc. can bring fresh ideas into the public and community toilet domain. By establishing more examples of people-centric toilets, PTs and CTs can exceed their purpose of being just a toilet. Partnerships with private agencies have materialized excellent examples including The Lightbox PTs, Suvidha Complex-CTs, and Woloop app. Though with their own limitations, such models succeed in bringing functional design principles and effective service delivery that can be improved in future iterations.



These toilets are a representation of the heritage and cultural characteristics of the city. To integrate public toilet buildings into a cultural aesthetic of a place require significant investment in planning and architectural design



Figure 6: Public and Community Toilets with best practices and design

**The Lightbox and a public toilet with local handicrafts shop attached in Leh: Public toilets that embed great ergonomic design and aesthetics to the conventional function of PTs.**

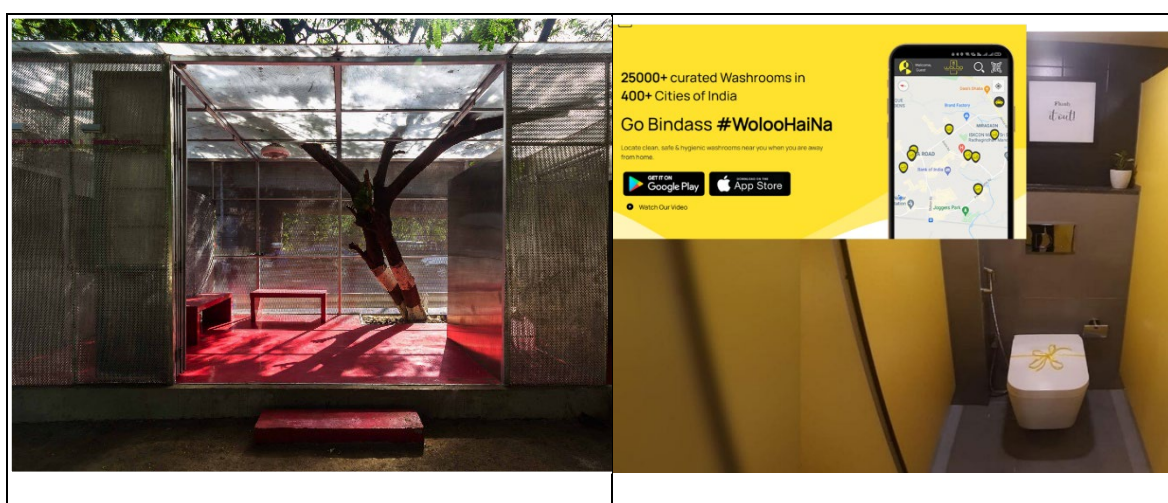


Figure 7: Snapshots of The lightbox public toilets and Woloop app

The Wolloo app is a tech enabled loo-discovery platform app that helps women to locate the nearest washroom. This attempts to meet part of the demand for PT infrastructure for the time being.



Dr. J. Radhakrishnan, IAS, Additional Chief Secretary, Commissioner, Greater Chennai Corporation, Tamil Nadu on Experience of O&M of (Public) toilets

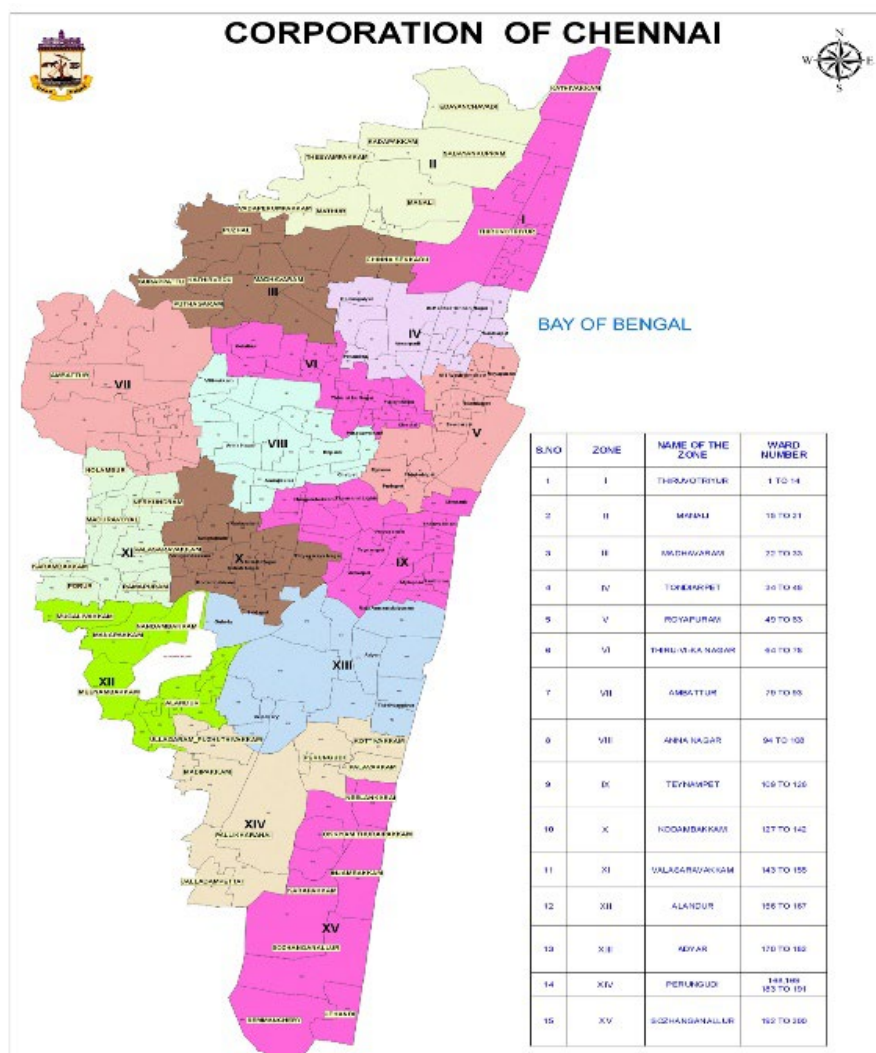


Figure 8: Administrative Map representing the zones and respective wards

- **The case of public toilets in Chennai:** Chennai’s urban area spreads 426 sq. km, with 15 administrative zones housing nearly 87 lakh people in 200 wards. Public Toilets are located across 1398 locations, providing a total of 9363 seats.
- **Current O&M scenario:** *Civil maintenance* is assigned to the Ward Engineer, while **Housekeeping Procurement** (human resources and consumables) are managed by respective Zonal Conservancy inspectors.

**Challenges:**

- **Public-related:** Open Defecation; Reluctance to use/own public toilets; Vandalism.
- **O&M-related:** Delays in civil maintenance; Inadequate water supply and human resources; Absence of performance-based payments
- **Monitoring-related:** Limited grievance redressal mechanism; Lack of real-time monitoring systems or third-party compliance audits.

- **Solutions Employed:**

- Four packages (each covering multiple zones) were prepared (1 allocated, 3 under tendering) and structured as Hybrid Annuity Models with PPP.
- The broad scope of work for these packages include:
  - Design and construction: New construction, major retrofitting and minor retrofitting;
  - Operation and maintenance of toilets; and,
  - Build and operate centralised control and monitoring systems.

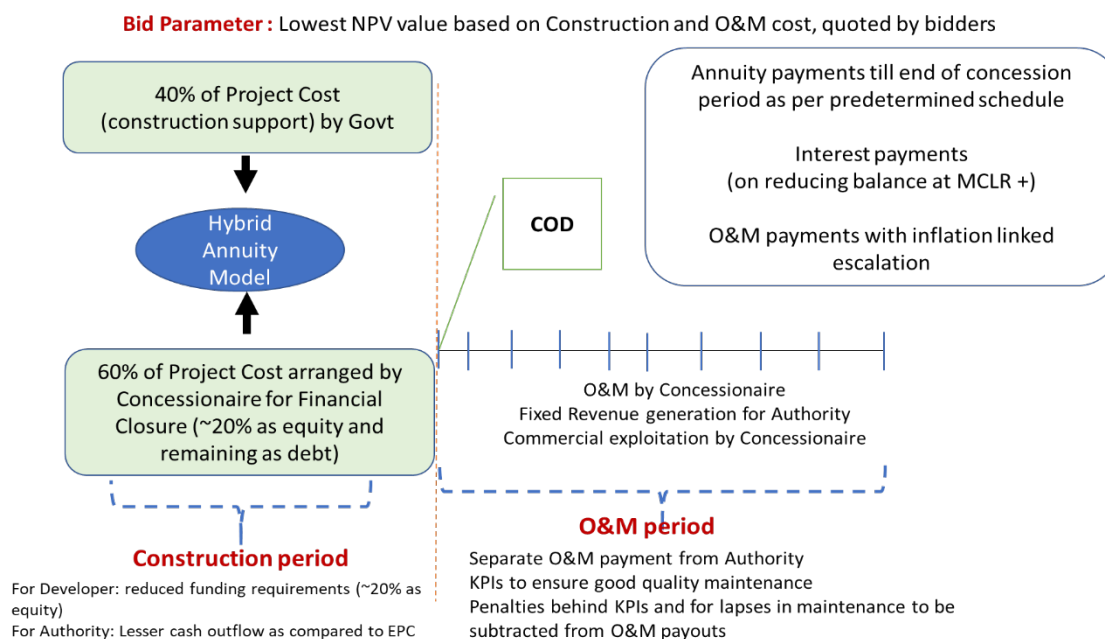


Figure 9: Model structure for Operations and Maintenance of Public Toilet infrastructure

A team of independent engineers was engaged to monitor construction, operation and maintenance, while also formulating 26 KPIs as factors for performance-based payments to selected concessionaires/vendors.

- **Learnings and Way Forward:** 'It's better to prepare a proper response than to react to adversity, especially in context of toilet services during emergencies like floods.'
  - **Toilet toolkit:** An approach adopted by the Greater Chennai Corporation that designs based on context-based typology and adopts guidelines on inclusivity and accessibility.
    - Design aspects involve factors like usage, location, site conditions, O&M, materials to be used, etc.
    - Public ownership is the need of the hour; Due priority should be directed towards design improvements that make the existing apps and toilets, friendlier and more accessible for all public.
    - Learning from well-established examples and grassroots-level experts can aid momentum.

# TOILET TOOL KIT

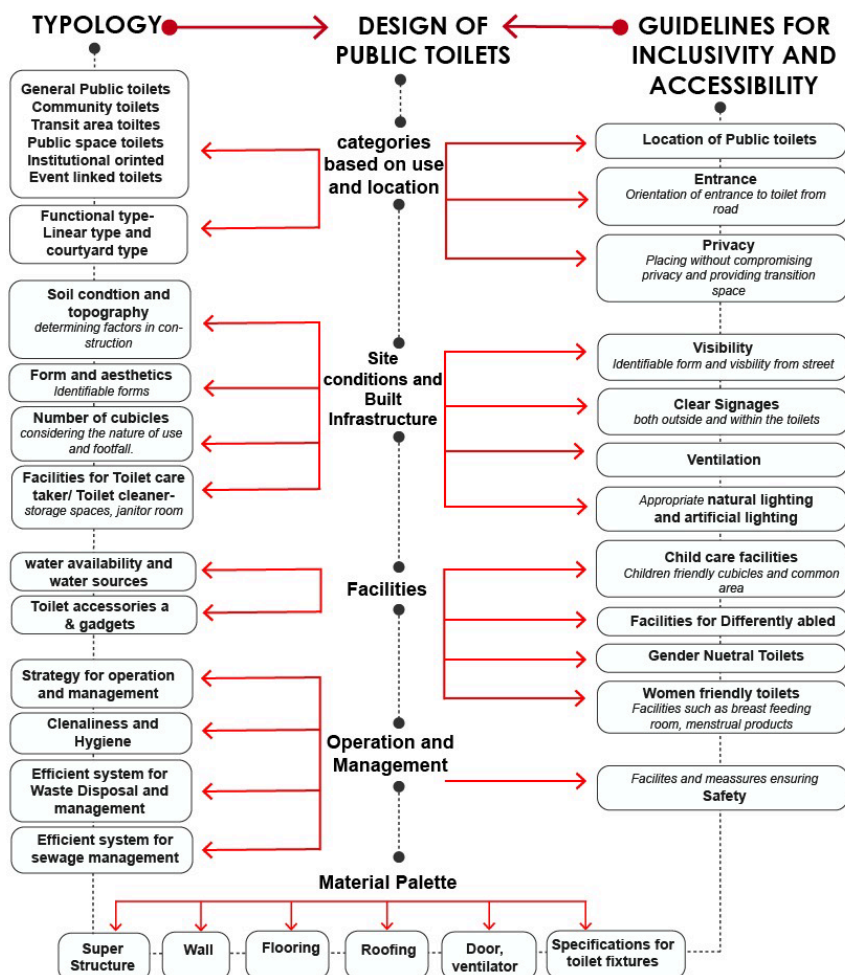


Figure 10: Toilet toolkit representing an approach that adopts multi-aspect considerations for public toilet infrastructure; created and employed by the Greater Chennai Corporation

***Roopa Mishra, Joint Secretary, National Mission Director SBM, MoHUA, GoI***

Three key principles to approach sanitation mission objectives:

- Preparation of saturation Master Plans that are independent of program level contours: The building blocks of finance, procurement, operations, etc. can be assembled through convergence of various pre-existing and future programs.
- Partner with entities outside government paradigms to improve existing capacities. Expertise required for successful execution can only be amalgamated through mindful partnerships ranging from vendors, consultants, institutions, etc. This makes the Mission essentially a government-facilitated programme.

- Maximize technology and citizen connect: Successful solutions are also socially engineered solutions; ensuring usage and operations is an essential aspect of planning sanitation infrastructure.

Smt. Mishra went on to highlight the importance of attending field visits curated for the Workshop; she said they would help gain a nuanced learning of operation-and-management perspectives across different scales and waste streams and offer valuable lessons on systems-based advantages and limitations. She also raised the importance of engaging various institutions to strengthen informed decision making and monitoring, thereby improving the WASH value chain itself.

*D Kartikeyan, IAS, Principal Secretary, Government Municipal Administration and Water Supply, GoTN*

Performance-wise, Tamil Nadu is ranking well in programs like Jal Jeevan Mission (JJM) and AMRUT; the State is now trying to catch up with SBM-U 2.0 targets, thanks to a healthy institutional presence. Tamil Nadu ambitiously envisions provision of sewerage services to the entire state, and targets used water management (UWM) through sewers and STPs in Municipalities, and FSTP-cum-STPs in other local bodies. 140 sites have been identified for infrastructure; work has commenced at twenty sites – the remaining 120 sites are being pursued for the implementation at the earliest.

- **Sanitary workers Development scheme**: An inclusive scheme to aid the livelihood of core sanitation workers working with government or commercial establishments. Seed money of nearly Rs. 50 Crore (Rs. 10 Crore from State and Rs. 40 Crore from all ULBs cumulatively) has been committed, informed by pilot surveys in five ULBs, and creating a model that can be emulated by other states.

*VK Chaurasiya Jt. Adviser (PHEE), CPHEEO extended vote of thanks to speakers, dignitaries, staff and welcomed the presenters to begin the first session on Access and O&M of Toilets.*

## Day 1: Accelerating Change for Safe Sanitation

### Session 1: Access and O&M of Toilets

MODERATED BY PROF SRINIVAS CHARY, ASCI

Prof. Chary laid the context with two key perspectives:

- i. The efforts for safe sanitation are comparable to that of coming up with a Super Vaccine. As experienced recently, private sector engagement is integral to its timely success;
- ii. The largely ignored (and much required) SDG –17 – ‘Partnerships for the Goals’ reiterates the need for enabling and establishing partnerships, even in the mission of making safe sanitation available, accessible and sustainable.

### Session 1.1: Suvidha -CSR Model of community toilets in slums

SPEAKER: SANDEEP SHETH, HINDUSTAN UNILEVER LIMITED

- **Suvidha health and hygiene centres**, are facilities that embrace the conventional Community Sanitary Complex model. It provides a one-stop solution for day-to-day domestic water usage [for toilet, laundry, bathing purposes] to the communities with a dearth of space and no possibility for an Individual Household Latrine (IHHL). In addition to bathing, washing and ablution facilities at nominal charges (that fund facility maintenance and upkeep), these Complexes also target behaviour change and IEC activities in areas of water, sanitation, hygiene and nutrition.

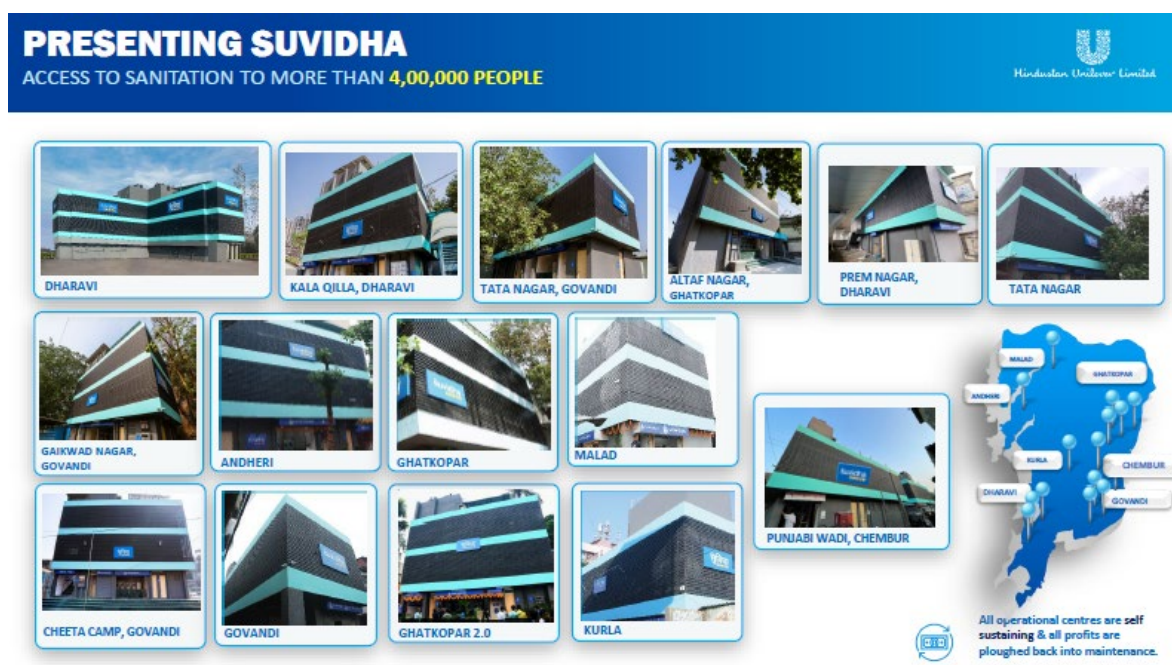


Figure 11: The Suvidha Complex coverage and indicative Charges for various services



- Since 2016, 15 Suidha Centres have been made operational, catering to a cumulative 4 lakh beneficiaries. These centres ensure that engaged caretakers receive timely payments; they also generate much of their revenue from laundromats to cover operational costs. Suidha Centres have also introduced monthly passes for users at nominal rates.
- Suidha Centres are a demonstration of effective partnership, ranging from funding partners JSW Group and HSBC, to NGOs and SHGs like *Pratha* and *United Way Mumbai* for IEC-BCC and O&M activities. Moreover, organisations like Waterlife, CDD-India, BePURE and EY have also been technical partners for various projects.
- **Challenges that Suidha centres address:**
  - Unavailability of clean toilet of infrastructure;
  - Low Customer satisfaction;
  - Underutilization of existing infrastructure;
  - Unavailable/Inadequate business model; and,
  - Inadequate O&M.

Furthermore, target audiences include population groups most vulnerable to climate change impacts.

- **Pillars of success:**
  - a. Affordability;
  - b. Community Ownership and Behaviour Change;
  - c. Self-sustaining Operations model;
  - d. Sustainability aspects in terms of energy conservation and usage and at the same time reuse of used water within the premises in many of the centres; and,
  - e. Job creation, standardisation and Digitisation in Suidha complexes.



Figure 12: The Implementation process for a Suvidha Centre

The average implementation period of a Suvidha Centre project takes up to about 16 months.

**Discussion:**

**Q.** Which costs are met by the revenue generated?

**A.** Capital cost is met by CSR; revenue generation is targeted to meet O&M expenses as far as possible.

**Session 1.2: Experience sharing on CT PT maintenance**

SPEAKER: MR SRINIVASAN EXECUTIVE ENGINEER & MR. BV BABU, SENIOR ENGINEER, GCC, GOTN

- There are about 1400 public convenience units (including CTs, PTs, SBM toilets and urinals, e-toilets, etc.) holding 9300 seats. Operations and maintenance is managed by outsourced human resource monitored by the respective Ward Engineers and Conservancy Inspectors.
- Key challenges (as also highlighted by Dr. Radhkrishnan, IAS, GCC earlier) fall within areas of:
  - Public perception and practices;
  - O&M bottlenecks; and,
  - Monitoring bottlenecks as shown below:

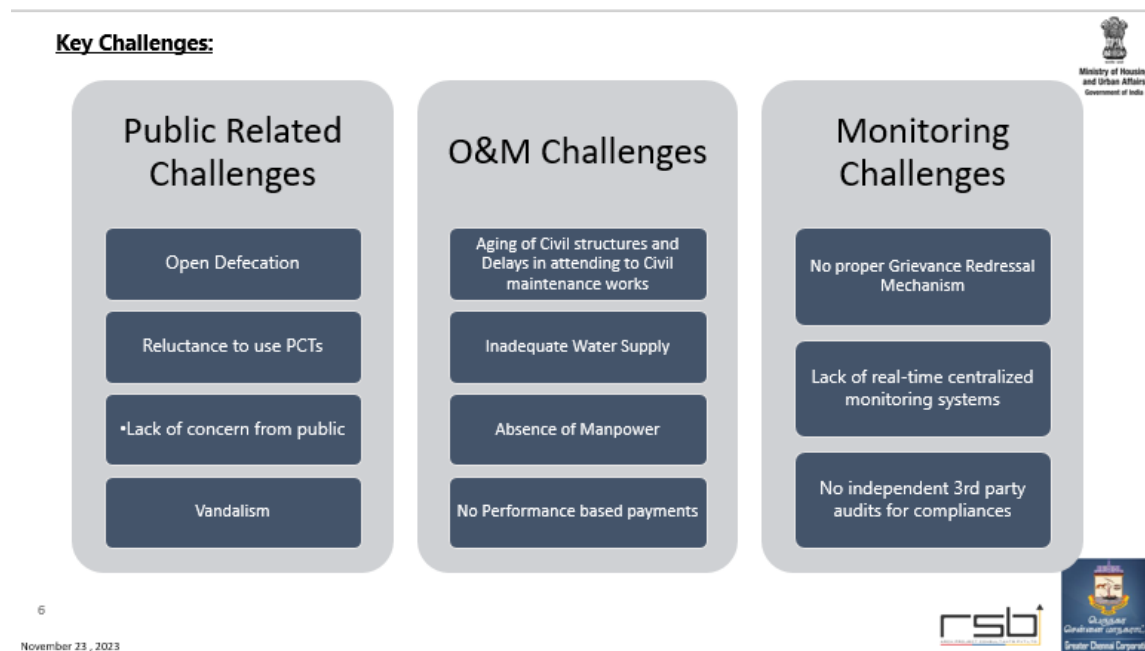
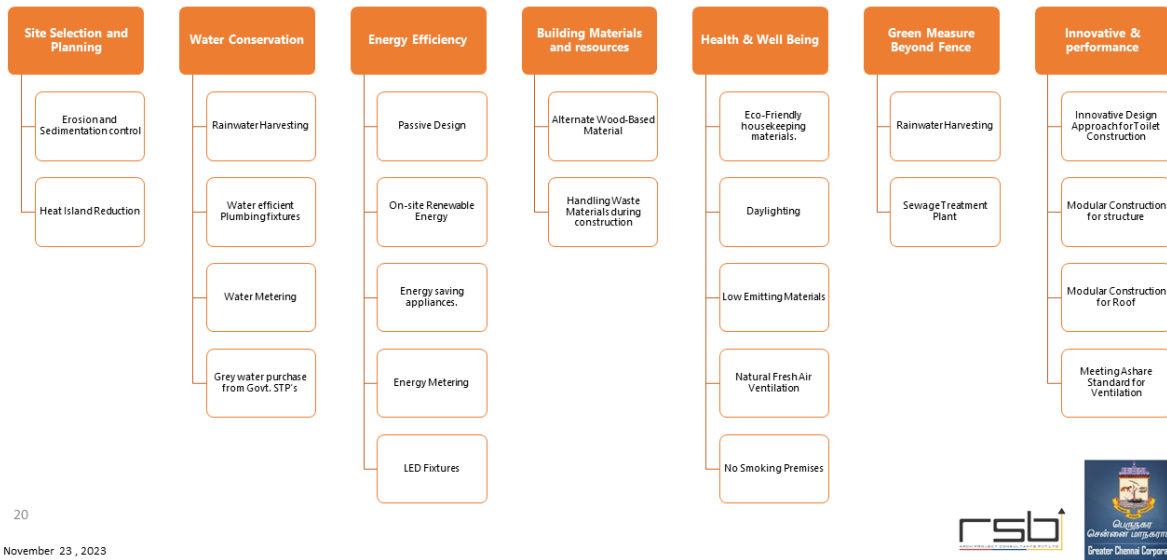


Figure 13: Challenges against Community and public Toilet operations and maintenance, GoTN

- **Solution initiative:**
  - Tendering using Hybrid Annuity Model;
  - 26 KPIs identified to measure performance – payments based on KPI scoring; and,
  - Negative scoring for continued bad performance translates to reduced pay (since toilets can make or break the tourism experience).
- **Corrective design measures to improve inclusivity and sustainability of conventional PT-CT blueprints, especially based on feedback from various NGOs. Some corrective measures are as indicated below:**
  - **Features for wheelchair users:** Adequate cubicle size, ramps and grab-bars, anti-skid flooring, lightweight sliding doors, toilet occupant indicators, tactile path provision for visually impaired, barrier-free access with signage, low height washing area, etc.
  - **Features for non-wheelchair users:** Adequate cubicle size and urinal partition, ample natural glare-free lighting, natural ventilation, roof insulation, sanitary napkin dispenser and safe throw bins, ramps with adequate slope and grab-bars, occupancy indicator for cubicles, roofed entry, etc.
  - **Features for optimal maintenance:** Sloped roof to avoid water stagnation and leakage, vertical louvers to avoid dust accumulation, tiles and ceiling that require minimal or no repainting, epoxy coating on steel elements for longer durability, edge protection, floor- and wall-joint coving, etc.
- **Factors considered under the sustainability approach:**



**Key Factors of Design of Public Toilet's / Community Toilet's - Sustainable Approach – Summary**



20

November 23, 2023



Figure 14: Design Approach for Public/Community Toilets, GoTN

This approach secured a 45-pointer Gold Status of National Excellence as per IGBC's Green Service Building Rating System; it serves as a reminder and constant motivation for the GCC to target a platinum rating in future.

- **Detailed SoPs, administrative structure and monitoring mechanism regarding O&M** of public convenience structures are employed to ensure a positive transformation from the current scenario.

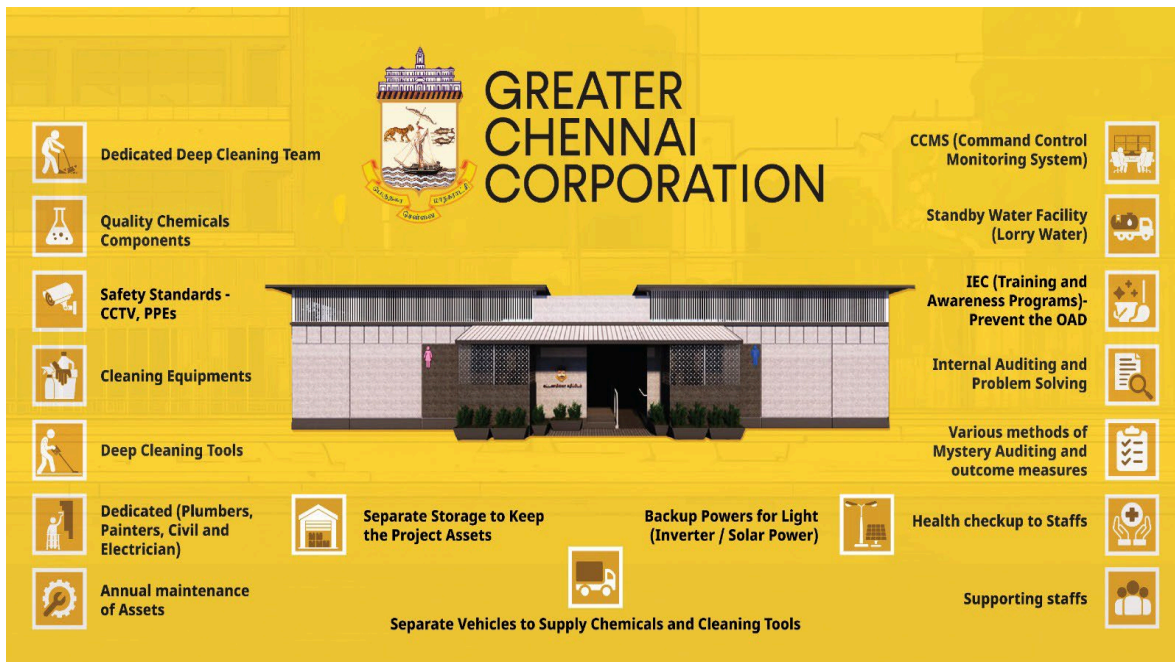


Figure 15: Overall O&M equipments and activities under a typical PT-CT operations contract

## Session 1.3: Increased accessibility toilets and Building models for sustainable operations

SPEAKER: MR. GAURAV BANSAL, PE (H&SWM), NOIDA AUTHORITY

- Noida has been performing exceptionally well in Swachh Survekshans between 2018 and 2022, achieving a 5-star Garbage Free certification in 2021. It has climbed up to the top ranks in Uttar Pradesh and has been recognized as the Best Self-Sustainable Medium City in 2022.
- **Challenges within the area of sanitation infrastructure:**
  - Adequacy: Floating population, in-migration and high population density;
  - Viability: CAPEX and OPEX management;
  - Design: Standardisation and inclusivity; and,
  - Sustainability: Achieving Aspirational Toilet standards with regular maintenance and monitoring of public conveniences.
- PPP mode is preferred as costs are recovered through revenue sources like advertisements. Accessibility and sustainability are maintained through feedback, monitoring and compliance.



### Project Financing and Execution Model

*Learning from past experiences in construction, operations & maintenance*

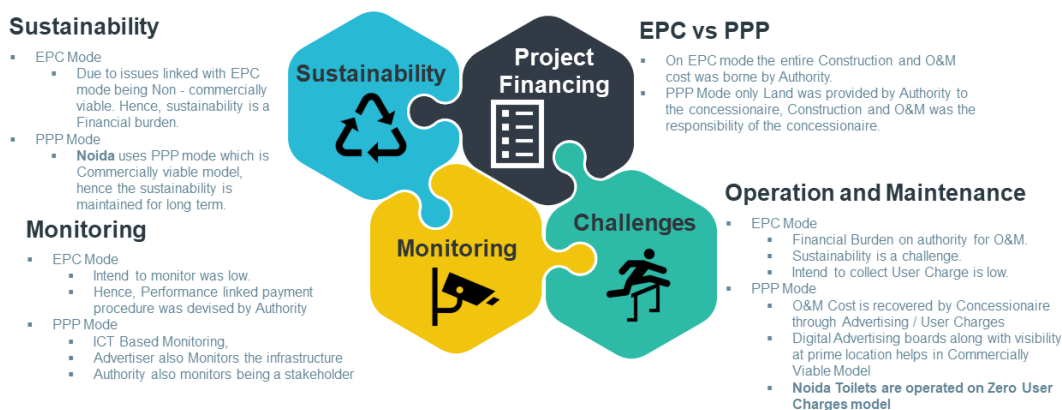


Figure 16: Project Financing and Execution Model for sustainable infrastructure and operations through faster response to issues with a Quick Reaction Team, Noida

## Sustainability



### Dedicated Quick Reaction Team (QRT) for the Cleaning and Maintenance

<p><b>Quick Reaction Team:</b></p> <ol style="list-style-type: none"> <li>1. Dedicated Vehicle with Jetting Machine, Plumbing and Electrical Spare parts, Consumables such as Soaps, Disinfectants, Cleaning equipment, Toilet papers etc.</li> <li>2. Team is monitored and mobilized by Integrated Command &amp; Control Center</li> <li>3. Staff allocated             <ul style="list-style-type: none"> <li>- Driver cum Supervisor</li> <li>- Technician (Plumber &amp; Electrical Repairs)</li> <li>- Sanitation Staff – Safaimitra</li> </ul> </li> </ol>		<p><b>Salient Feature:</b></p> <ul style="list-style-type: none"> <li>- Team remains Connected with Command Control Center with Walkie Talkie, GPS and web-based application.</li> <li>- This is full time staff of the NOIDA Authority.</li> <li>- Serviceability of the toilets is 100% due this team.</li> </ul>
---	--	---

- Quick Reaction Team (QRT) is a GPS-based web app, handled by Noida Authority staff, that acts as a grievance redressal system
- Existing toilet facilities are continuously improved to meet Aspirational Toilet criteria as per Water+ protocol. Support is sought from local NGOs and Voluntary Organisations to train caretakers, and for IEC and awareness about the upkeep and availability of toilet facilities.

## Some Glimpses Toilet Photographs

NOIDA Authority



Figure 17: Glimpse of Pink Toilets by Noida Authority

### Discussion:

**Q.** Is there a dedicated caretaker present at the PT-CT facilities?

**A.** Yes, the vendor usually has a caretaker allocated. However, in case of a grievance, the caretaker contacts the Quick Reaction Team for redressal.

## **Session 1.4: SHG involvement in maintenance of Toilets**

SPEAKER: RABINDRA KUMAR SAHOO, ODISHA NULM

- In 2019, the Honourable Chief Minister – Government of Odisha provisioned Rs. 5,000 Crore for Mission Shakti SHGs for 5 years.
- More than 13,000 CT/PTs were exempted from user fees and O&M and handed over to nearly 300 Mission Shakti SHGs. Due capacity-building and handholding support was enabled by immediate release of approximately Rs. 10 Crore.
- Mission Shakti SHGs were engaged through strict eligibility criteria, contracts were signed with them, and further capacity building & handholding was ensured.
  - The scope of work included timely working hours, minor repairs, monitoring and record-keeping, reporting grievances for redressal, etc.
  - The selection transfer process starts with an Expression of interest from the ULBs. The EoI invites applications from Mission Shakti SHGs, followed by transparent selection, contract execution, capacity building, and finally handover of the CT/PT to the Mission Shakti SHG.
  - Appropriate PPE equipment and timely payments to SHGs are ensured under the scheme.



Figure 18: Odisha's O&M model for Public & Community Toilets

### USER FEE EXEMPTION:

- User fee have been exempted in all Public Toilets in Odisha since 2020;
- The expenditure is being met from ULB's own fund;
- Has helped in substantial increase of use by citizens;
- Public can lodge complaint with 'Mo Sahar Sarkar' Helpline number if they are asked to pay;
- IEC has been displayed at Public Toilets and other places in the cities for creating awareness among the users that, no "USER FEE" is required to be paid for use of the public toilet.

- The outcomes include 24x7 cleanliness, immediate and consistent repair and maintenance by the SHGs reducing the burden on ULBs.

**Discussion:**

**Q.** How has the government ensured timely payments to engaged SHGs?

**A.** Timely payments were ensured through strong payment mechanisms embedded in the system in general, as well as direct monitoring by the State in this regard.

### Session 1.5: Insights from survey of PTs and public urinals in 14 towns

SPEAKER: SASANKA VELIDANDLA, DIRECTOR- GOVERNMENT ADVISORY, WASH INSTITUTE

A survey was conducted to better assess the conditions of the existing public conveniences and learn the reasons for their respective success and limitations from various perspectives. The first tranche of findings was presented in this session, covering observations gained from ten municipalities and four municipal corporations, and a coverage of 1100+ PTs and urinals in different Indian states.

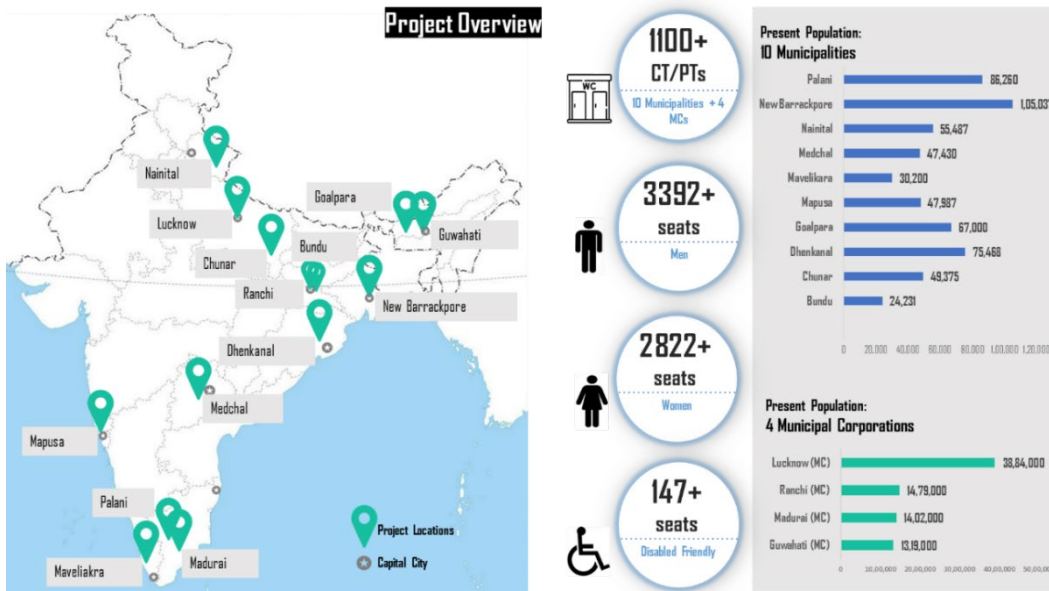


Figure 19: Survey Sample for the study on the operations and maintenance of various public and community toilets across India

- Some key inferences derived from the study are listed below:
  - Scale and Coverage:** Even where PTs and urinals exceed the number of seats (from norm), the problem remains unsolved. The location and geographic distribution of public facilities across the urban region is essential to ensure complete coverage.

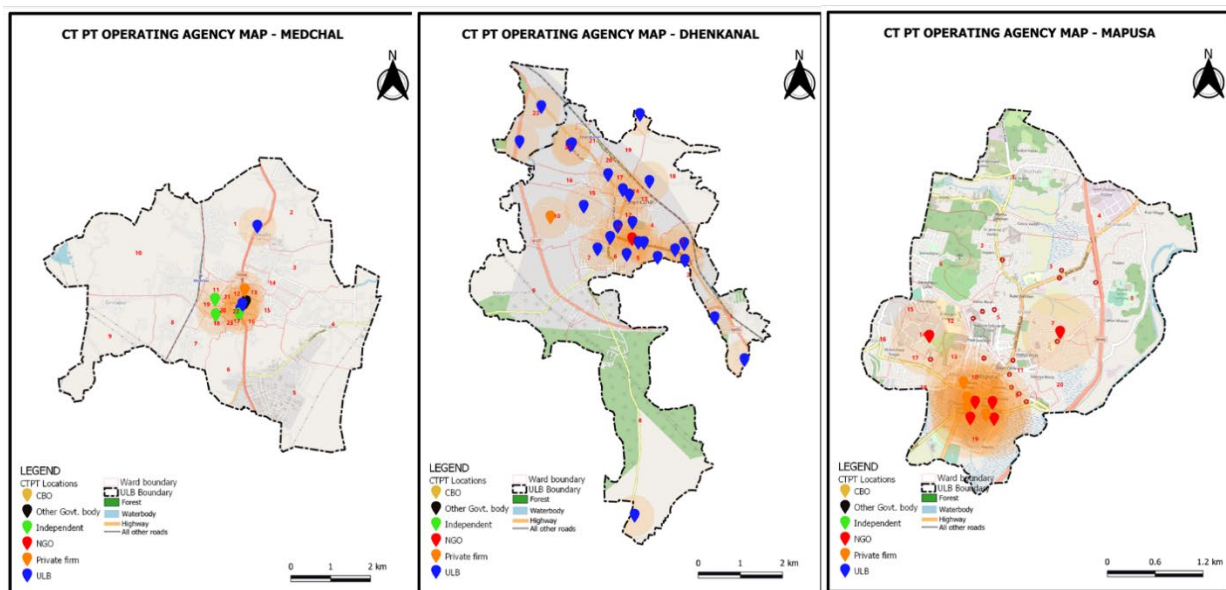


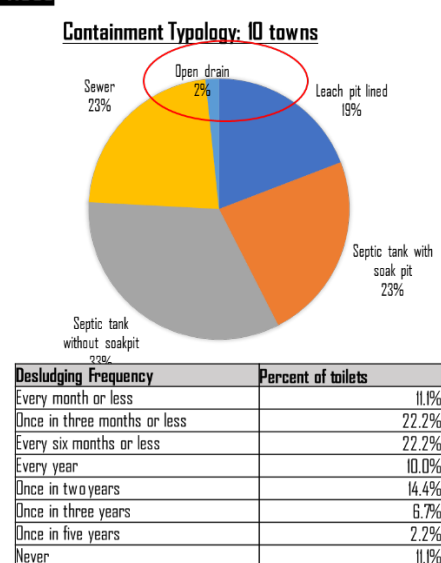
Figure 20: Service Area Coverage- Analysis of Spatial distribution of PT and CT infrastructure within the local body boundaries

(b) **Inclusivity:** 60-80% public facilities had separate entrances, however only 23–33% facilities had women caretakers. The number of disabled-friendly toilets ranged between 4–27% in the surveyed sample. The number of toilets equipped with child friendly features were found to be below 14%. It was inferred that Madurai must address inclusivity urgently.

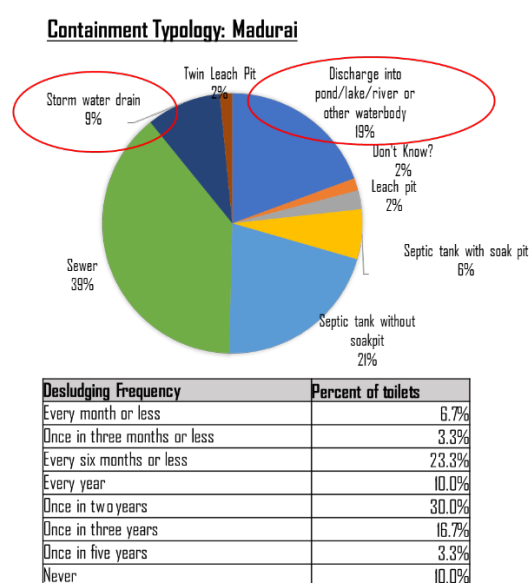
(c) **Operations & Maintenance:** Of the ten towns surveyed, on average, a majority of facilities maintained by municipalities were found dirty or unusable, when compared to toilets where O&M was outsourced to private firms or NGOs.

(d) **Services:** In terms of water supply source, a majority of public toilets relied on their own source; 25%–30% were reliant on municipal water supply. The average monthly cost of O&M per seat was found to be Rs. 1,927 (ranging from Rs. 405 – Rs. 3,462)

## Services



Analysis based on 114 PT/CTs and 772 seats across 10 towns



Analysis based on 126 PT/CTs and 1221 seats across Madurai

Figure 21: Containment Typology in the across the various town of the survey sample

Although a good margin (>90%) of facilities have some form of on-site treatment, a considerable amount of untreated/partially treated discharge ends up in waterbodies or stormwater drains. Furthermore, it was also noticed that higher quality services involve higher costs of operation.

### (e) Operations Model:

- In the surveyed sample, O&M responsibility for most CT/PT facilities was allocated to the ULBs (55%), followed by private agencies (37%) and lastly to SHGs (7%), though nearly 50% of these were funded through SBM-U.
- Approximately 52% of surveyed toilets levied user fees; the remaining relied on alternative cost recovery measures like pooling maintenance fees from the local shop owners (in case of PTs serving a commercial area), employing caretakers as ULB sanitation staff, attaching another business/shop to the facility, etc.
- Male caretakers predominated the surveyed sample. The average monthly salary range for female and male caretakers was found to be Rs. 1,500 – Rs. 7,000 and Rs. 4,000–Rs. 15,000, respectively.

- A considerable number of facilities did not have a well-defined contract engaged for operations and maintenance, which can be one of likely causes of uneven payments to staff employed for the O&M activities.
- 61% of facilities did not have a complaint/feedback mechanism.

(f) **ULB monitoring frequency was directly proportional to cleanliness and hygiene** maintained in the facilities.

(g) Case studies of business integration with PT facilities indicate that a mindful integration of any kind of business can prove to be fruitful. Examples included cloth-pressing and utensil shops/businesses.

Case Stories - Synergistic Ventures: Public Toilet Management and Utensil Shop Integration, Madurai	
Aspect	Details
Year of Operation	12 years ( Constructed in 2011, retrofitted in 2021)
Daily Average Footfall	100-150
Role of ULB	Support during festivals by deploying additional staff for cleaning Providing desludging services
Role of Operator	Regular cleaning, inventory management and coordination with the ULB (Operator is SHG member)
Monthly Revenue from user fee	₹12,000-₹14,000
Monthly Revenue from Utensil shop	₹2000-₹3000
Monthly Cost incurred for O&M of PT	₹3000

Figure 22: Footfall and User charges with respect to the O&M costs of PT-CT survey sample

- Of fourteen ULBs surveyed, seven have been declared as Safaimitra Surakshit Shehars, i.e., they meet safety requirements for sanitation workers. The remaining seven are working on ‘manhole-to-machine hole’ transitions. The way forward for the manhole-to-machine hole transition was described as below:

#### Manhole to Machine hole: Way Forward

- Machine & Workforce**
  - Database of sanitation workers & licensing of desludging operators
  - Make 14 cities/towns Safai Mitra Surakshit Sheher
  - Analyse equipment sufficiency for each sanitation service
  - Support to cities/towns for PPE kits provided to sanitation workers
- Policy and legal frameworks (Ecosystem Parameters)**
  - Setting up of RSA and ERSUs
  - Notification regarding Standardization of Septic Tank and hazardous sewer entry ban
  - 14420 complaints resolution
- IEC and Capacity Building: Professionalise sanitation service delivery and address the gaps in training**
  - Regular training and capacity building of sanitation service providers at different levels
  - Training of master trainers on sanitation workers and training sanitation workers
  - Training of desludging operators
  - State level training of RSA & ERSU team
  - Training of sewer entry professionals
  - Skill training to STP operators
  - Training on UWM approach to state and ULB officials
  - Training on aspirational toilets and training of CT/PT operators



- Detailed survey findings on aspects of infrastructure design, safe sanitation service-provision, and effective business models suggest that public health and sanitation institutions need to be accountable toward CT/PTs. A clear methodology to conduct footfall assessment for toilet and seat demand must be developed at the planning stage of these facilities to minimize the clear mismatch found between demand and supply.

A compendium with detailed survey results and inferences will be released soon for public viewing; The compendium was inaugurated at the event.

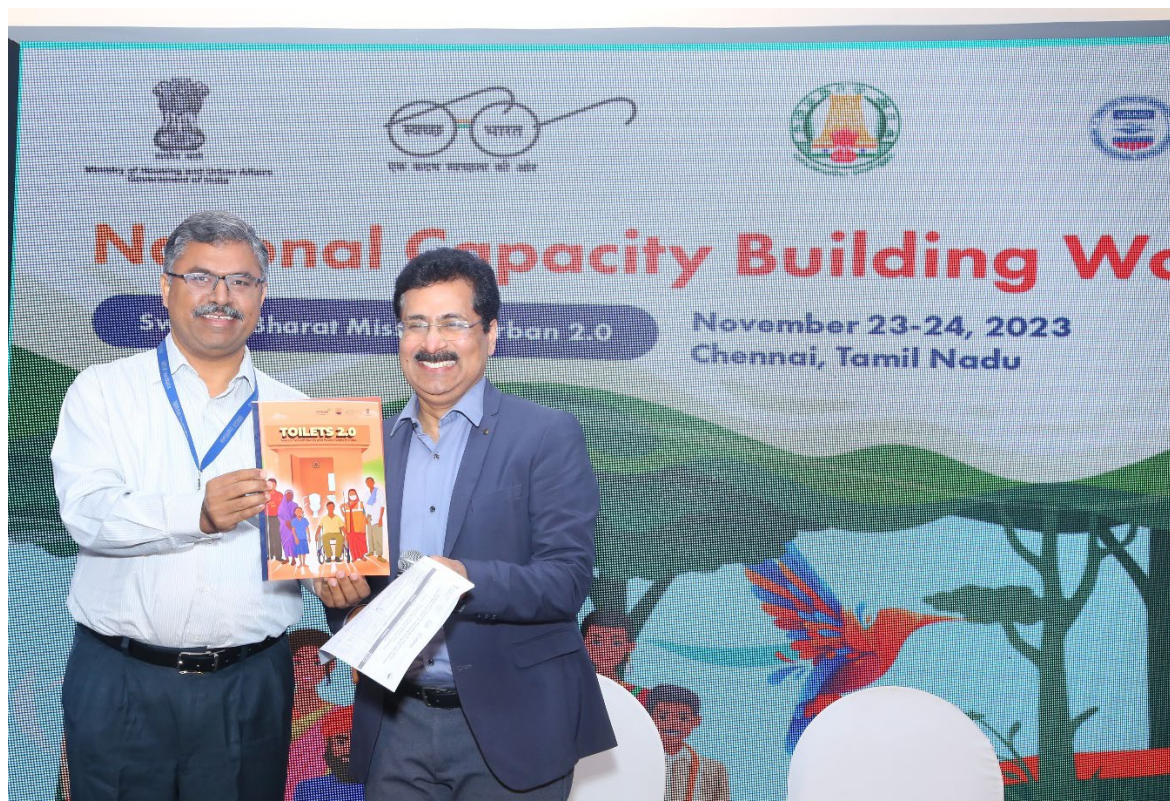


Figure 23: Inauguration of Toilets 2.0 Compendium

**Discussion:**

**Q.** There has been phenomenal improvement in terms of majority of public facilities being connected to an on-site sanitation system. What would be the next priority area?

**A.** O&M sustained by associated business models would be the next step.

### Session 1.6: Innovative aspirational CT/PT models under Toilets 2.0: Design Toilets

SPEAKER: MR PR MEHTA, COUNCIL OF ARCHITECTURE

- This session discussed design ideas and principles received through entries to the Toilets 2.0: Design Toilets competition. Presented entries captured local aspirations while ensuring both visual and functional comfort.

Pilgrim and Tourist Locations

05 | 20

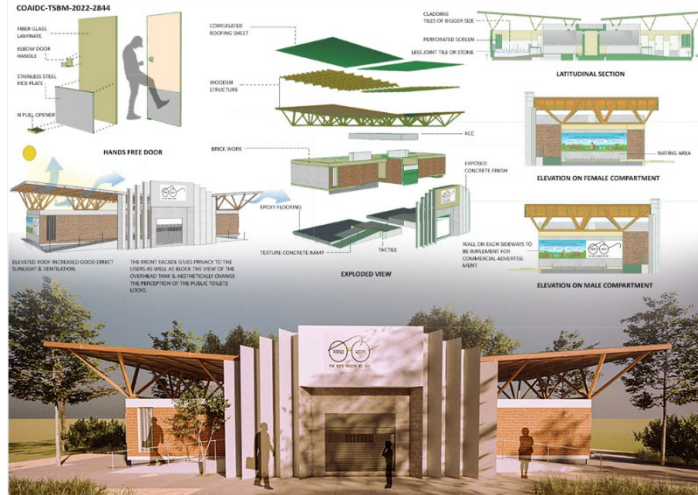


Figure 24: Entries from Public & Community Toilet Design competition organised by Council of Architecture-Touristic

- Even with a fixed constructed area, a good design can embrace the prevailing local usage or context and can enhance it further. The winning entries, placed within the context of a limited space available within an urban area of tourist importance, were displayed to indicated how design can convey a unique visual identity and functionality.

Old/Big Cities with Land Constraints

Entry Number-  
**COAIDC-  
TSBM-2022-  
3054**

2<sup>nd</sup> Prize

15 | 20

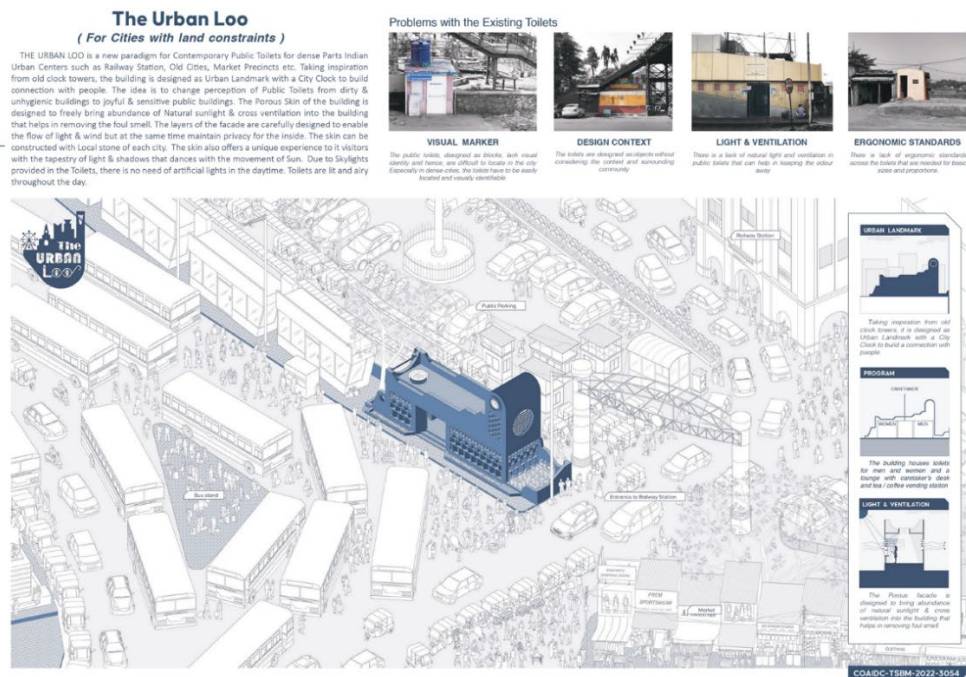


Figure 25: Entries from Public & Community Toilet Design competition organised by Council of Architecture-Low space availability



The Urban Loo is an ideal model for Railway Station precincts & site harmoniously within its context i.e. Railway Station, City Bus Stands, Parking Lot, Rickshaw stand & Market.



The idea is to change perception of Public Toilets from dirty, smelly & unhygienic buildings to memorable, joyful & airy public buildings



The Building edges are integrated to make seating for Public



Porous facade made up of local natural Slate Stone from Telangana that enables Natural Light & Cross Ventilation throughout the day.



The Corner is released as a small Flowering Garden



The lobby enables a transition space & can accommodate ATM & Tea Vending machine



The porous facade along with Skylights enable natural sunlight & cross ventilation



The slanted wooden doors allow flow of Light, Air & maintains privacy for the interior



The Exterior Skeleton of the Building forms experience & language of Interior as well

COAIDC-TSBM-2022-5054

- Toilets are an essential public service infrastructure; considering the huge demand for the same they need to be designed well.
- The entries are publicly available; the preparation of model DPRs for such well-designed PTs is welcome, so that these prototypes serve their purpose, albeit in a contextualized manner.

Specially Challenging Areas



Figure 26: Entries from Public & Community Toilet Design competition organised by Council of Architecture-Specially Challenging Areas

## Session 1.7: App based monitoring of CT, PT - Pattana Pragati

SPEAKER: MR SRINIVAS REDDY, ADDL. MANAGING DIRECTOR, SBM-U

- Pattana Pragathi took toilet access provision in a mission mode – targeting PTs per 1000 population. The total population of the State is nearly 1.42 Crore (Greater Hyderabad Municipal Corporation with a population of 65 lakh + 141 ULBs with 77 Lakhs population).
- Constructed toilets were not receiving desired usage and open defecation persisted. In collaboration with the knowledge partner ASCI, an app was created to introduce two monitoring systems for caretakers and citizens.

### Aspirational and inclusive PTs/CTs, with ICT based monitoring in Urban Telangana- Snapshots



Figure 27: Models for Aspirational Public Toilets and their monitoring in Telangana

## Public Toilet Monitoring System

Public toilets | Community toilets | She toilets | Mobile toilets

Launch on 2nd October 2020 by Shri K.T. Rama Rao garu  
Minister of Municipal Administration and Urban Development (MA&UD), Industries, and IT&C, Government of Telangana.

**Government of Telangana is introducing a 3-part monitoring system to ensure that the 8000+ public sanitation facilities in urban areas are well-designed and well-maintained.**

**Part 1: Data Input field** for detailed information on the infrastructure

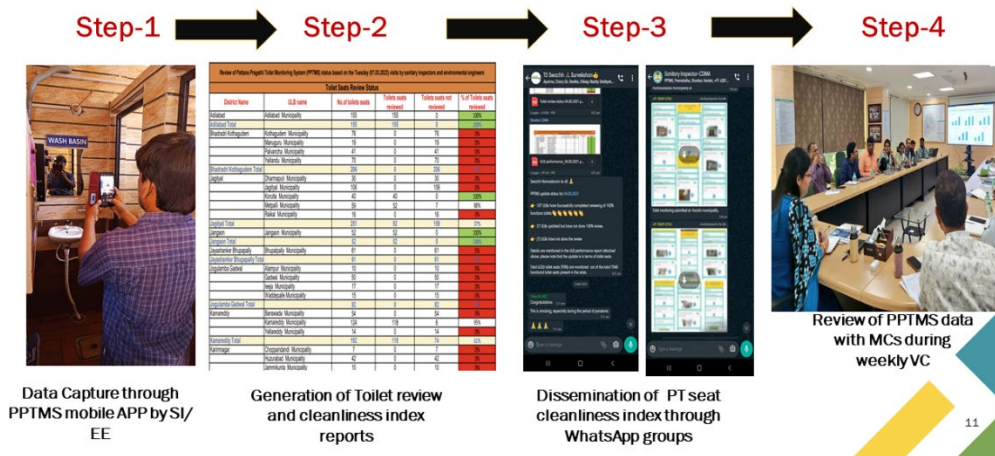
**Part 2: Mobile app** for weekly monitoring of the facilities

**Part 3: Real Time Data Analytics Dashboard** on status of infrastructure, maintenance and usage to support decision making.

Knowledge Partner: Administrative Staff College of India

- Pattana Pragathi Toilet Monitoring System (PPTMS) and Pattana Pragathi Citizen Monitoring System (PPCMS) were introduced in 2020. These ICT-based monitoring systems use geotagged photos as mode of inspection, twice every week (Tuesday and Friday).

## PPTMS- Capturing the data & Monitoring



- Mobile toilets for special occasions and high floating population areas are available in adequate numbers and actively used.

## Mobile Toilets For Floating Population/ Fairs/ Festivals/ Religious Congregation- Snapshots



Figure 28: Additional mobile toilets for occasions/festivals attracting large floating/tourist population

With plenty examples, Government of Telangana targeted adequacy of toilets for different needs through stationary and mobile toilet provision, and has introduced a user friendly monitoring system to improve usage of PT-CTs and curb Open defecation practices and at the same time monitor the maintenance, cleanliness and hygiene for these facilities.

## Session 1.8: Toilet Construction Technologies

SPEAKER: MR AMIT NBCC REPRESENTATIVE

- New-age technology is currently available for toilet block construction using:
  - (a) 3D printable toilet blocks;
  - (b) Light Gauge Steel Framing;
  - (c) Precast toilet blocks; and,
  - (d) Tunnel form technology.
- These provide quick and standardised implementation, and are efficient, cost-effective, flexible options.
- Green toilets are a welcome option in the CT/PT landscape, because their features enable water conservation using low flow faucets, rainwater harvesting, energy conservation, lighting fixtures, low VOC paint, and usage of local materials.

### 3D PRINTING CONSTRUCTION



	TRADITIONAL CONSTRUCTION	3D PRINTING CONSTRUCTION
<b>Design</b>	<ul style="list-style-type: none"> <li>❖ Difficult to achieve complex designs</li> <li>❖ High investments in formworks</li> </ul>	<ul style="list-style-type: none"> <li>❖ Mass customization</li> <li>❖ Formwork-free construction</li> </ul>
<b>Speed</b>	<ul style="list-style-type: none"> <li>❖ Slow and a low productivity process</li> <li>❖ Frequent cost overruns and delays</li> </ul>	<ul style="list-style-type: none"> <li>❖ 10-20X times faster than traditional construction</li> </ul>
<b>Quality</b>	<ul style="list-style-type: none"> <li>❖ No transparency in construction practices</li> <li>❖ Poor quality of structures</li> </ul>	<ul style="list-style-type: none"> <li>❖ Easy integration with IoT, BIM, PMC, and other monitoring software - <b>improved control and transparency</b></li> </ul>
<b>Workforce</b>	<ul style="list-style-type: none"> <li>❖ Acute shortage of skilled labor</li> </ul>	<ul style="list-style-type: none"> <li>❖ Operational requirement of fewer people</li> </ul>
<b>Environmental</b>	<ul style="list-style-type: none"> <li>❖ 30% of global greenhouse gas emissions due to construction and use of our built environment</li> <li>❖ Ambient air pollution due to the construction activities</li> </ul>	<ul style="list-style-type: none"> <li>❖ Reduction in embodied carbon and operational emissions</li> <li>❖ Controlled construction - reduced ambient air pollution</li> </ul>

(source- Tvasta)

Figure 29: Innovative Construction Implementation Technologies adopted by NBCC

### TUNNEL FORM TECHNOLOGY



#### TUNNEL FORMWORK SYSTEM

•The tunnel formwork system is a type of formwork in which RCC slab and walls are casted in continuous pour and form a cell.

•Consist 2 Half cell (L-shaped) made of steel. The tunnel form work system is very useful for repetitive room design.

#### STEP INVOLVED

- Wall shuttering & Slab shuttering
- Levelling & Line and plumb
- Wall reinforcement & lab reinforcement
- Electrical fitting
- Casting of slab
- De shuttering wall & De shuttering slab



#### LIMITATIONS OF TUNNEL FORMWORK

- Not suitable for small projects
- High initial investment of formwork and other machineries.
- High Transportation cost if used at Multiple location for the same prototype building
- Due to speedy construction, high cash flow management required.
- Skilled labour force is needed compared to traditional systems

## Session 1.9: SBM-U 2.0 – Saturation of toilet facilities in urban areas

SPEAKER: MR VK CHAURASIA, JT. ADVISER (PHEE), CPHEEO

- Saturation of toilets needs to be a priority; top level commitment already exists – the same needs to be spread to remaining areas.
- Upgradation of existing PTs – with 10%–30% additional seats and retrofitting dilapidated toilets – should be planned. An official announcement shall soon be made by the Ministry.

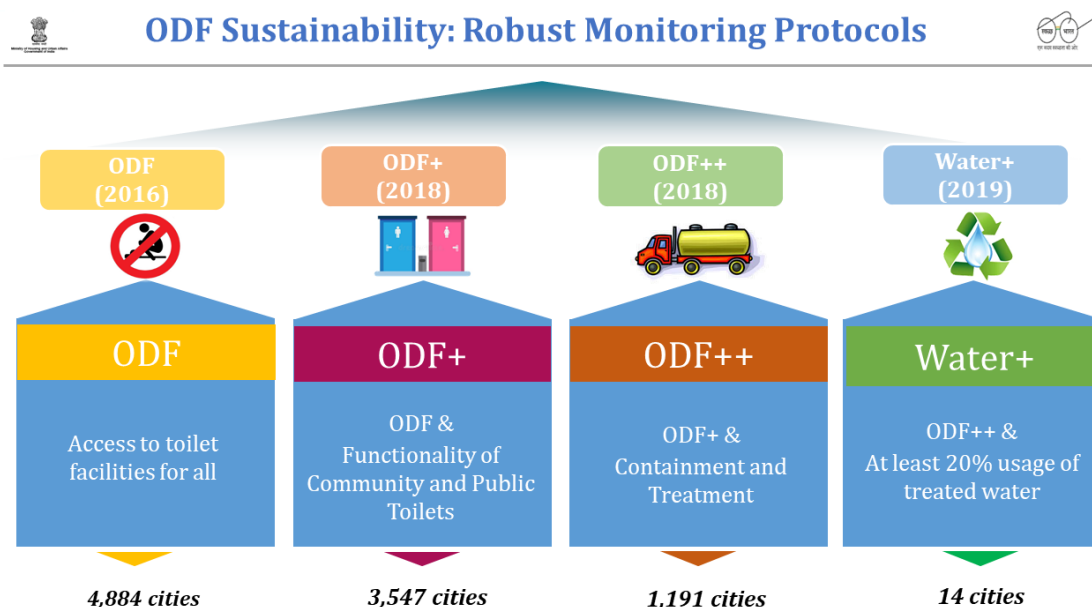
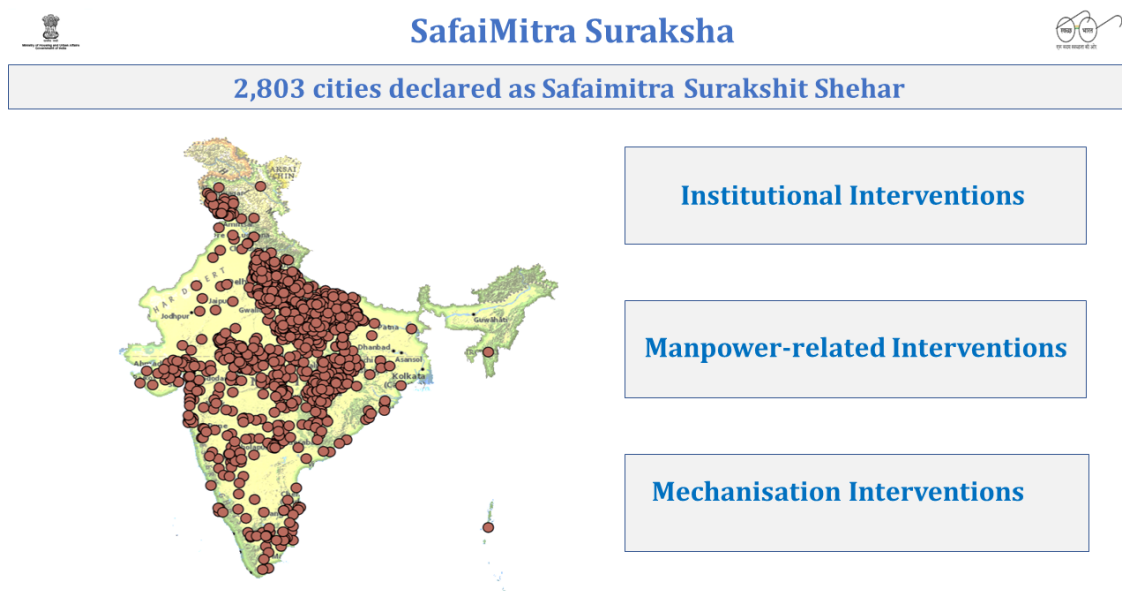


Figure 30: ODF Sustainability +Monitoring across India and the required human resource-related interventions



- ODF sustainability can be ensured through robust monitoring protocols. However, achieving outcomes is much more important than certification/ranking. The plan must be comprehensive and effective so that initiatives ready as per availability of funding.

- **Way forward:**

- (a) Localise and contextualise solutions and partnership;
- (b) Guidelines present to help the local bodies that are lagging;
- (c) Survey informed mechanism to engage partners in sanitation;
- (d) Plan aspirational toilet infrastructure esp. in high footfall/tourism areas; and,
- (e) Expedite sanctioned fund usage

### Session 1.10: Delhi Urban Shelter Improvement Board-Inclusive Urban Development (not presented)

- Delhi Urban Shelter Improvement Board (DUSIB), created under Delhi Urban Shelter Improvement Board Act 2010, was passed by the Legislative Assembly of the National Capital Territory of Delhi. It came into effect on July 2010.
- Delhi holds 675 slum clusters; nearly 1.7 million slum dwellers reside in 3.07 slum households, spread across a total area of 800 ha of land, owned by 30+ government agencies. This population serves many industrial/service organisations; nearly 80% are migrants.
- Environmental Improvement in Urban Slums (EIUS) Scheme provides basic amenities in the Jhuggi Jhopdi (JJ) clusters, that include features such as:
  - Internal lanes and CC pavement & drains;
  - Community toilets or Jan Suvidha Complexes(1 WC seat for every 25 women and 1 seat for every 35 men),;
  - Shishu vatika (playfields for children); and,
  - Electric poles at 30 m intervals.





- Jan Suvidha Complexes (JSC) are Community Sanitary Complexes that target WASH provision to JJ clusters. Their key features include:
  - Free access 24x7;
  - Real-time monitoring through online application;
  - Toilets designed for male, female, children and Divyang population;
  - Dedicated caretaker and Safai Karmachari for each complex;
  - Taps and flushing system for each toilet seat;
  - Periodic inspections by SBM team on regular functioning, water, lighting, cleanliness, signs, drainage, O&M, etc; and,
  - Treatment and recycling of used water generated within the complex (currently only in select complexes).

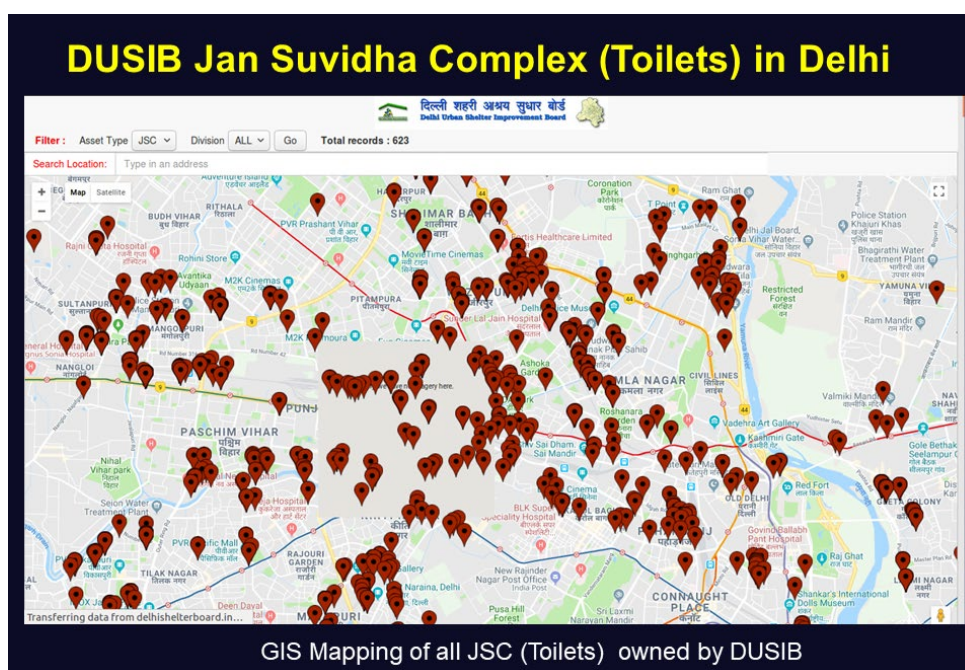


Figure 32: Various Toilet complex initiatives by DUSIB

- DUSIB assures to provide potential beneficiaries, especially JJ-clusters, access to well-maintained Community Sanitary Complexes. Some of DUSIB's approaches to WASH provisions are as follows:
  - Old, dilapidated toilets have been completely renovated;
  - Existing toilet facilities have been upgraded and equipped with better O&M;
  - Cycle Rickshaw Toilet complexes for inaccessible areas;
  - Adopt-A-Toilet complex program, taken up by educational and private healthcare institutions; and,
  - JSC Monitoring app to monitor and report grievances relating to basic functions, operations and maintenance of facilities.

Through providing access and awareness on safe sanitary practices and infrastructure, this initiative has made remarkable contribution towards making Delhi Open defecation free.

Involvement of youth/students, public and private institutions has catalysed many of the outcomes; similarly, integrating a rapid-action app and toll-free helpline with the system has ensured sustained operations, maintenance, monitoring and grievance response.

---

Esteemed moderator Prof. Chary invited queries from the participants after closing the first session with reiterating the following key takeaways:

- a. Toilet access is a right for every human being;
  - b. Equal focus must be on superstructure and substructure;
  - c. Only human-centric design can ensure sustained usage; and,
  - d. Adoption of best O&M models and monitoring mechanisms is required.
- 

**Discussion:**

**Q.** Q. With saturation of toilets as priority, what kind of criteria for location and footfall measurement for PTs?

**A.** Representatives from GCC: Location based on demand for IHHL, and high footfall population density for CT and PTs. As land availability is a considerable limitation in site selection, the sizing and number of seats is decided based on space availability.

Representatives from Noida: Survey inputs from target area and community groups; adopting feedback from target groups, especially from the OD practicing population transitioning to CT/PT usage.

**Q.** Request further elaboration on the number of Suvidha Centers so far, land requirements and the management of grey and black water generated in the facility?

**A.** Mr. Sheth, HUL: Fifteen Suvidha Centres are operational so far; permissions have been taken for eight more. The minimum area used by a Suvidha complex is 600 sq. ft, the largest being about 3000 sq. ft. The model is adapted to the site, subject to demand and site availability. A robust and capable treatment system, in partnership with CDD India, has been designed to manage the generated used water. The output quality is good and being reused within the facility.

Mr. Chaurasia, CPHEEO: Guidance on seat per floating population units can be found in Building Code and Tourist Information Centers can be used to find footfalls in an area; both these measures can aid the design process for PTs. Furthermore, instead of separate treatment systems for grey and blackwater, combined treatment systems are advised; they are effective and cost-efficient.

**Q.** Are any negative impacts observed in the usage of incinerators installed in the PTs-CTs?

**A.** The exhaust stacks are installed on the rooftop. Standards prescribed by UNICEF and WHO have been followed to the extent possible for such systems.

**Q.** Any efforts to optimise the water footprint of the PT facilities presented?

**A.** Mr Chaurasia: Low-volume flushing and other water-efficient fixtures are already being adopted to optimise water usage within facilities. Mr Chary added that this suggestion is valuable and can be included in the guidelines and policies.

Dr. MadhuRani closed the first session by appreciating efforts made in maximising access to toilets in all states and inviting continued involvement from existing and potential partners. She stated that Odisha is a pioneer in such initiatives, and that other States need to take similar ownership and lead, now that they are equipped with learnings gathered from the experience.

---

## Session 2: Mechanised Cleaning of Sewer and Septic Tanks

MODERATED BY PK MAHAPATRA, ENGINEER IN CHIEF, ODISHA WATER SUPPLY AND SEWERAGE BOARD (OWSSB)

### Session 2.1: Strengthening the sanitation sector: Industry snapshot and constraints

SPEAKER: MR. M KRISHNA, DIRECTOR, KAM AVIDA ENVIRO ENGINEERS PVT LTD

- There is high demand and adequate supply in the domain of mechanized O&M for used water management (UWM); however, the growth in this industry has not yet met its potential due to many constraints. These constraints are as discussed below.
- Constraints can be summarised into the following:
  - a. Working capital cycle;
  - b. non-standardization of products;
  - c. Bid and contract design; and.
  - d. O&M and PPP.

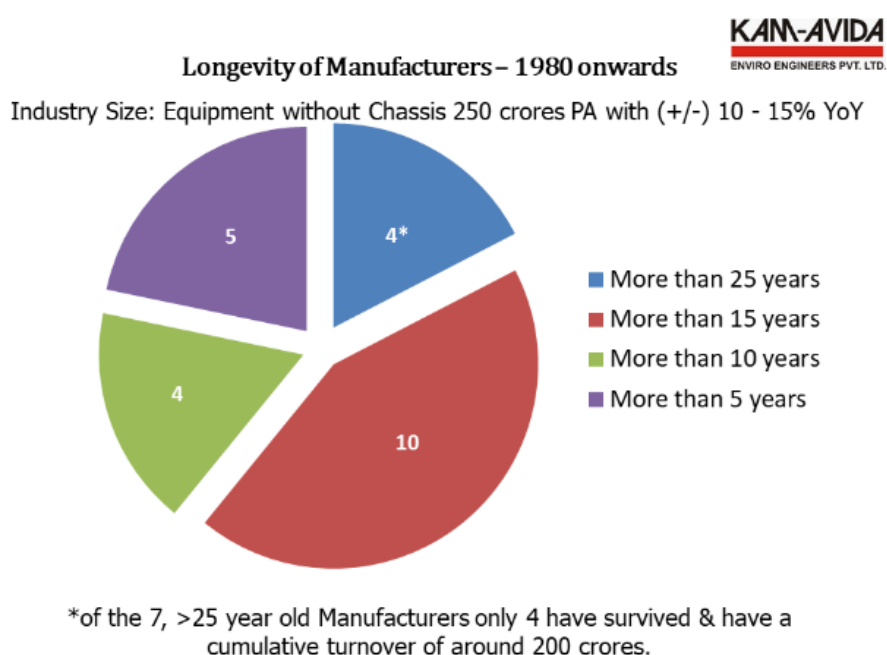
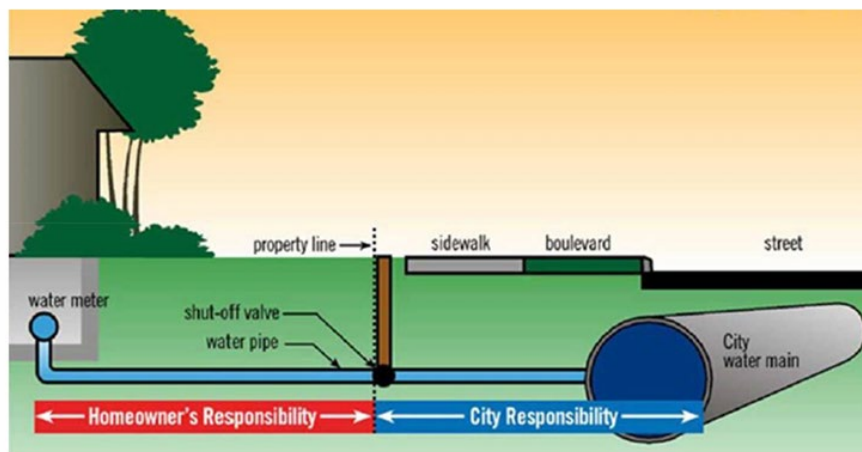


Figure 33: Longevity of Manufacturers since 1980 based on a study by Kam Avida Enviro Engineers Pvt Ltd

It was emphasized that timely payments encourage business, and that the current system hinders potential vendors and service providers. Mobilisation advance; timely payments; part-shipment and pro-rata payments; smoother RTO and insurance mechanism; fines against delays, etc. are some of the suggestions that might improve the PPP landscape and encourage a thriving ecosystem.

## Just another Question



Is desludging of Septic Tank within a Private Property a ULB's obligation?

Figure 34: Question of Accountability for Sewerage vs Septic tank based systems

- O&M of the infrastructure and equipment must be included, as ULBs do not always carry out regular maintenance. The right service providers are often willing to take it up for the initial period; this would ensure longevity of procurement.

## Session 2.2: Promoting safety to sanitation workers - Initiatives of MoSJE including NAMASTE guidelines

SPEAKER: MR PRABHAT KUMAR SINGH, MD, NSKFDC

- Clean air, water and sanitation is an essential need and concern for everyone. Although consistently facilitating the same is very demanding with its own risk and hazards, it is not adequately rewarding for the human resources directly and indirectly involved.
- Across India, there are about 13 lakh sanitary workers engaged in urban areas, and about 5 lakh ragpickers in urban and rural areas combined.

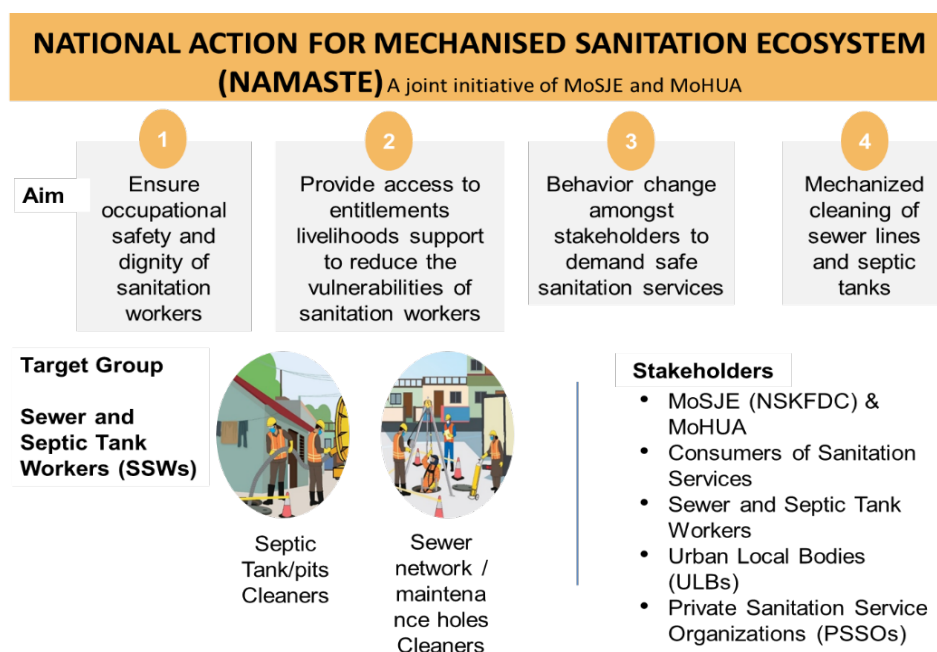


Figure 35: Features of the NAMASTE Scheme for Safaimitra Karmachari

- Sanitation Worker Development Scheme and NAMASTE Scheme target improvements in the current state of core sanitation workers through instruments like low interest easy loans (3% – 4%). Since 2014, nearly 275 health camps and 1177 workshops have been conducted for improving conditions of sanitation workers, especially those previously engaged in manual scavenging.
- NAMASTE (National Action for Mechanised Sanitation Ecosystem) envisages convergence between multiple ministries (MoSJE, MoHUA, MoHFW, DPIIT, DoDWS, MSDE); surveys for the same are intended to begin in the first week of December 2023. This scheme will cover Sewer and Septic Tank Workers (SSWs) engaged by ULBs, parastatal agencies, PSSOs, State-level departments and private contractors.

## SWACHHTA UDYAMI YOJANA (SUY)

The objective of the SUY scheme is to promote mechanised cleaning and to provide related livelihood opportunities to the target group of NSKFDC.

NSKFDC under its Swachhta Udyami Yojana (SUY) provides financial assistance for procurement and operation of sanitation related equipments/vehicles with a view to promote mechanised cleaning and for municipal solid waste management activities. The broad implementation models of SUY are as under:

Target Group	ULB (Sanitation Equipments/Vehicles)	ULB (Solid Waste Management)	Private Agencies/ Contractors
<ul style="list-style-type: none"> <li>Loans for mechanised cleaning equipments vehicles costing upto Rs.15.00 lacs for individuals/ upto Rs. 50 Lakhs for group projects.</li> <li>4% rate of interest with upto 7 years repayment period.</li> <li>1% interest rebate for women and 0.5% for timely repayment.</li> <li>Provision of Capital Subsidy upto Rs.5.00 lacs per person.</li> </ul>	<ul style="list-style-type: none"> <li>Direct loans to ULBs for mechanised cleaning equipments costing upto Rs.50.00 lacs per unit (No. of units could be more than 1).</li> <li>4% rate of interest with 1% rebate for timely repayment.</li> <li>Repayment period of up to 7 years.</li> </ul>	<ul style="list-style-type: none"> <li>Loans to ULBs for various sanitation activities like Municipal Solid Waste Management, Construction of Pay &amp; Use Community/Public Toilets, etc.</li> <li>Gap funding other than the assistance available from Centre/State under SBM.</li> </ul>	<ul style="list-style-type: none"> <li>Loans for procurement of mechanised cleaning equipments costing upto Rs.50.00 lacs per unit (No. of units could be more than 1).</li> <li>6% rate of interest with 1% rebate for timely repayment.</li> <li>Repayment period of up to 7 years</li> </ul>

Figure 36: Swachhta Udyami Yojana providing easier loans and financial assistance for aspirational Swachhakarmis

- NAMSTE aims to provide safe and mechanised cleaning of sewer/septic tanks, while restoring occupational safety and dignity of the existing SSWs and providing livelihood support to reduce vulnerability. Concurrently, it targets awareness and behavioural change in citizens towards demanding for safe sanitation services.
- Details of various loan schemes and channel agencies are available at [www.nskfdc.nic.in](http://www.nskfdc.nic.in).

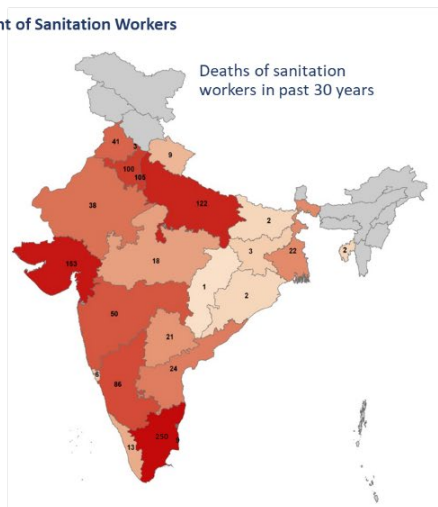
## Session 2.3: Experience sharing on operationalising RSA and ERSU

SPEAKER: MR TN SIMRAN, JT. CMA, GOVT. OF TN

### Need for sanitation worker's safety

Sanitation work is an essential public service that the world heavily relies on. Without sanitation work, cities can come to a standstill

#### Plight of Sanitation Workers



Source : Times of India, Indian Express, The Hindustan Times, NewsClick, The Print, TV9 Kannada, PTC News, India Today, DTNEXT, Thanthi TV, The Hindu, The News Minute, First Post, The Logical Indian, The Wire, NewsLaundry, The Tribune India, APN Live



There is an urgent need to-

Ensure dignity and safe working environment for sanitation workers by providing benefits to sanitation workers through convergence

Provide opportunities to enhance skills of sanitation workers for working safely

by

Acknowledging the ground reality

Creating an enabling environment

TSU – SWDS, UMC

3

Figure 37: Safety is one of the most critical and urgent aspects for Sanitation Workers

- Average lifespan of sanitation workers is lower than that of the general population; the work is demanding and poses health risks if adequate safety measures are not taken.
- Sanitation Worker Development Scheme (SWDS) by the Government of Tamil Nadu aims to register core sanitation worker beneficiaries through a State-coordinated ULB-level survey. This will be followed by capacity and awareness building towards best sanitation practices and stakeholder-wise SoPs with detailed literature. The key components of the SWDS include:

## SWDS COMPONENTS

1. **Regulating delivery of sanitation services**
2. **Creation of skilled sanitation workforce**
  - Survey and Registration of Sanitation Workers
  - Training Ecosystem for Skilling of Core Sanitation Workers
3. **Building eco-system for safe & dignified sanitation working environment**
  - Ensuring Availability of Appropriate Machinery/ Vehicles and Safety Devices for Safe Sanitation Work
  - Provision of Personal Protective Equipment for Sanitation Workers
  - Ensuring Fair and Standard Wages for Core Sanitation Workers
  - Issuance of Model Contracts and Standard Operating Protocols (SOPs)
  - Setting up of Emergency Response Sanitation Unit (ERSU)
4. **Ensuring social security of core sanitation workers**
  - Ensuring Access to Welfare Schemes, Better Occupational Health, Financial Security, Linkage with Livelihood support and Skill Development
5. **Sensitization of stakeholders**
6. **Grievance Redressal System**



TSU – SWDS, UMC 5

Figure 38: Capacity Building and Training workshops to be more active to sensitise and improve users of the correct safety practices and PPE

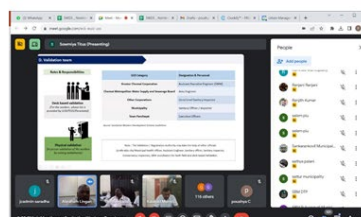
## Creating a State level training ecosystem for sanitation workers



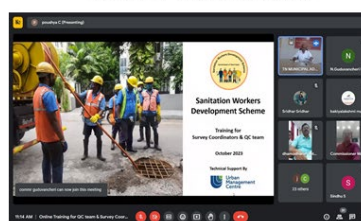
Training for Master Trainers



Training for desludging operators, drivers, and helpers



Online - Orientation Program for Zonal level Monitoring Personnel – RDMA and ADTPs



Online Training for Survey Personnel - Survey coordinators, Enumerators, Quality Check, Validation Team



TSU – SWDS, UMC 10

- RSA (Responsible Sanitation Authority) at district level, and ERSU (Emergency Response Sanitation Unit) within each ULB. These have been formed and constituted by CMWSSB – GCC.
- Call centres have been established and activated in 15 locations via the Directorate of Municipal Administration and Directorate of Town Panchayats. Following a cluster pattern, these call centres provide services to a total of 648 ULBs. Citizens from these ULBs can lodge a septic tank cleaning request via call centres; this connects the ULB to the Desludging Operator through a Duty Supervisor. The duty supervisor is responsible to share the location/route with the desludging operator and monitors safe emptying practices. Thus far there have been 10,854 calls through the 14420 helpline.



- The way forward:
  - Complete the registration with surveys and ID card provision;
  - Deliver due entitlements to the eligible families;
  - Provide PPE and its handbook; and,
  - Enable ERSU as per guidelines and respective SOPs.

## Session 2.4: Experience sharing on mechanized cleaning

SPEAKER: RAJESH NAVREKAR, MUNICIPAL COMMISSIONER, NAVI MUMBAI

- Navi Mumbai has a population of 18 lakhs; it is one of the largest planned cities (109 sq. km). It has 225 parks, 100% SWM, 60% vehicles are CNG/electric, and it is water rich.
- 99% population connected with either UGD network, or have signed up for regular and mechanized toilet O&M in case of toilets connected to septic tank based systems. This transfers the toilet waste management entirely to the ULB.
- Seven STPs are planned for 30 Lakh people.

## 3. Machineries for improved Sanitation



Combination Hydrovac Equipment	Number of Grabbers/ Desilting Machines	Number of standard desludging vehicles	Sewer Inspection Camera Apparatus	Power Rodding Apparatus	Hydraulic Sewer Root cutters
11	7	14	8	34	2
For Suctioning, Jetting and Recycling	Apparatus for removing choked up drains	Suctioning of Septic Tanks (NMMC owned vehicles)	To detect the cause of choking up of lines without compromising safety of Safaimitra	To remove choking caused by larger objects	To remove obstruction caused by tree roots in the sewer (no such instance observed yet)

## 4. Best Practices for Mechanized Cleaning

## Cleaning of Septic Tanks



Figure 39: Achieving a 100% mechanized O&M for toilet-associated infrastructure not a distant dream

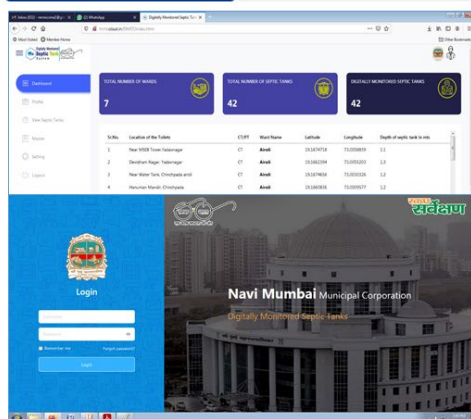
- 100% mechanised sewer cleaning infrastructure has been in use since 2019, with a cleaning frequency of 6 months. The city's 42 septic tank are about to switch to the sewerage system; these septic tanks have been geotagged and are cleaned monthly. About 242 CTs, 128 PTs and 11 Urinals utilize mechanised cleaning.

## 4. Best Practices for Mechanized Cleaning



### Monitoring of Level of each Septic Tank

- Digital intervention helps to avoid overflow of septic tank
- Real time Controlling and Monitoring
- It empowers corporation for Predictive Control
- Fosters confidence in staff



- Meters have been installed to monitor septic tank fill level; this helps avoid overflow and enable real-time monitoring. Training and other encouraging initiatives for the Safaimitras are organized at regular intervals.
- Way forward: The city aspires and is close to achieving 100% septic tank-free sewer network, while being a water secure city. At the same time, creation of potential entrepreneurial opportunities for the Urban Poor in the sanitation spectrum are ongoing.

### Session 2.5: Garima Scheme Experience

SPEAKER: P K MAHAPATRA, ENGINEER IN CHIEF, OWSSB

- The GARIMA scheme focuses on re-establishing and maintaining the safety and dignity of core sanitation workers in Odisha.

#### ODISHA'S GARIMA JOURNEY...

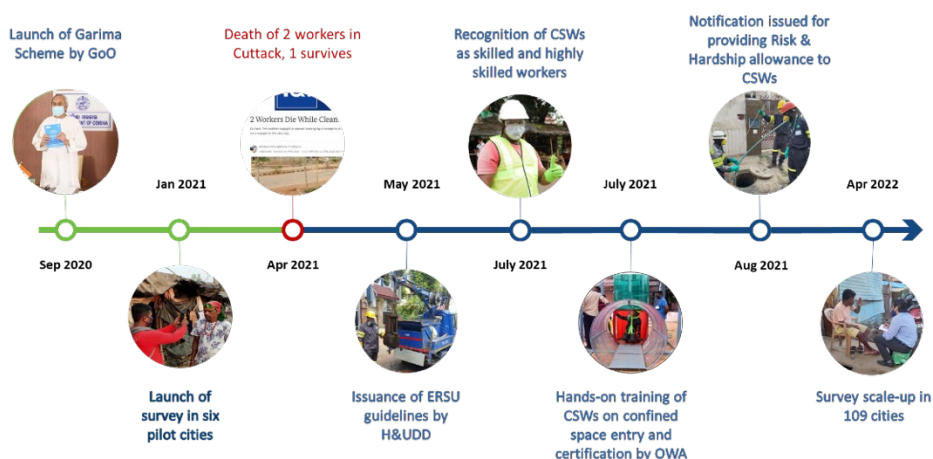
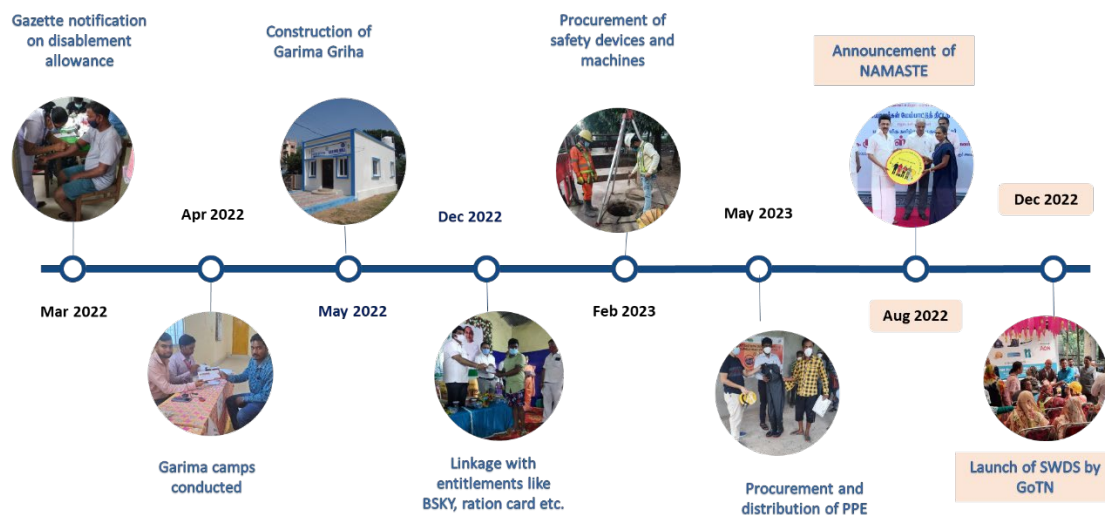


Figure 40: Timeline for Odisha's Garima scheme for the safety and dignity of sanitation workers

- This scheme identifies and registers the core sanitation workers through surveys across the State then equips them with due certified training, awareness and establishes entitlement linkages. The focus areas of the Garima scheme can be listed as:

- Invisibility;
- Occupational Hazards;
- Financial Insecurity;
- Weak Enforcement system; and,
- Lack of Social Safety Net.

## ODISHA'S GARIMA JOURNEY...



- From the launch of the scheme in 2020, the initiative has recognized skilled and highly skilled CSWs, trained them with certification by OWA, and scaled up to 109 cities. The scheme has conducted camps, provided benefits like ration cards, BSKY, PPE, and has gone ahead to inspire similar initiatives in other states.
- Among the highlights of the Garima scheme, we count that over 10,000 CSWs have been identified across 115 cities; work hours have been reduced; 100% mechanised cleaning and adequate PPEs has been plugged in; WRSU has been set up in 115 cities along with successful enforcement of model contract and FSSM regulations.

## ACHIEVEMENT IN GARIMA SO FAR.....

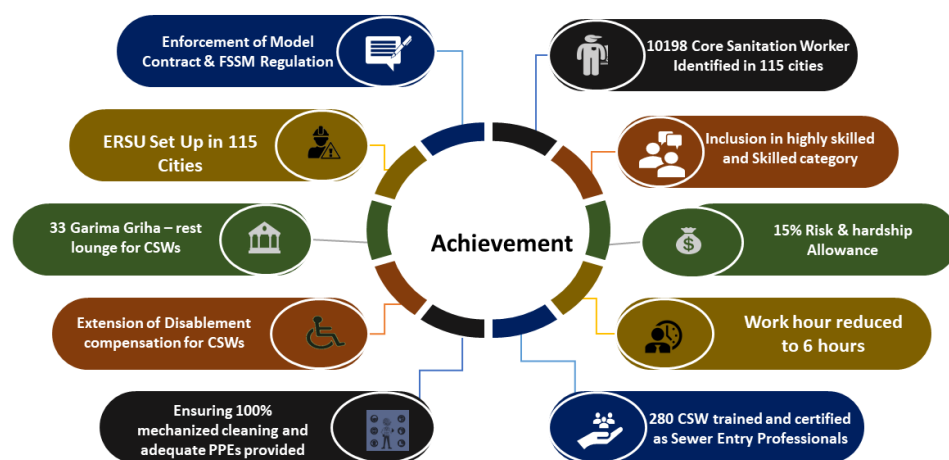


Figure 41: Achievements so far under the Garima Scheme

## Session 2.6: Tirupati model on Mechanised Cleaning of Sewer and Septic Tanks

SPEAKER: CHANDRAMOULISWAR, DY. COMMISSIONER, TIRUPATI

- Since the Prohibition of Employment as Manual Scavengers and their Rehabilitation Act, 2013 (PEMSR), Tirupati Municipal Corporation has achieved 90% sewer network connections from the earlier 60%, and manhole to machine-hole transition by January 2021.
- TMC uses five jetting suction machines, nine desludging vehicles, twelve power rodding and twelve desilting machines. This has made it essential to train existing sanitation workers on desludging operations and ensure awareness on correct and incorrect practices.

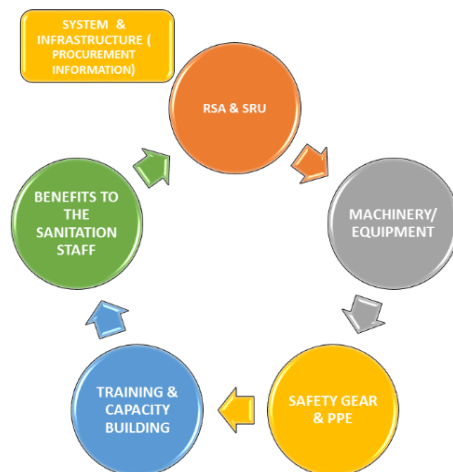
### MANHOLE TO MACHINE-HOLE TRANSFORMATION



SAFAIMITRA SURAKSHAIT SAHAR – BEFORE



SAFAIMITRA SURAKSHAIT SAHAR – AFTER TIRUPATI



#### MACHINERY

Jetting and Suction Vehicles	5
Desludging Vehicles	9
Sewer Inspection Camera Apparatus	1
Power Bucket Machines	2
Hydraulic Sewer Root cutters	2
Power Rodding Apparatus	12
<b>SAFETY GEAR</b>	
Safety Tripod Set	1
Nylon Rope Ladder	2
Blower with Air Compressor	1
Gas Monitor (4 Gases)	1
Full Body Wader Suit	2
Gas Mask	3
Breathing Apparatus	1
Safety Body Harness	2
Airline Breathing Apparatus	1

Figure 42:  
Mechanization of O&M  
in Sewerage and  
containment systems,  
Tirupati

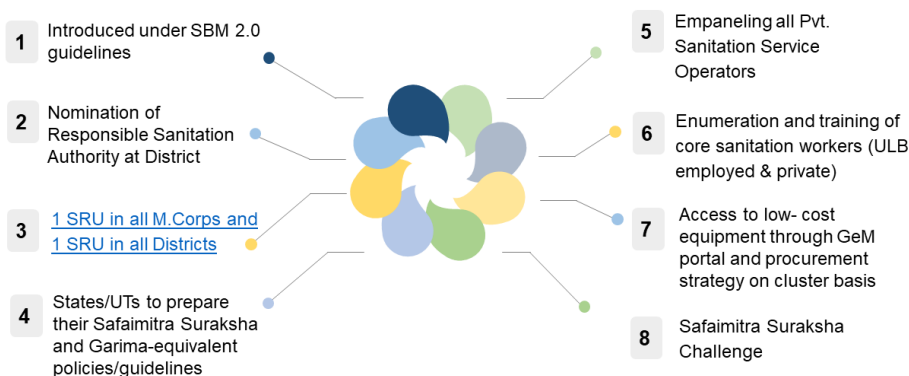
- Since 2020, TMC has an ESRU with 20 well trained members; 13,720 manholes converted to machine holes; very tight restriction for entry into machine holes/sewers, etc.; and apt tools and equipment have been made available.
- Extensive IEC initiatives have been conducted for all target beneficiaries and the public to spread awareness about sanitation – these trainings have focused on the 14420 Helpline, on safe cleaning of STs and sewers, and the penal actions for non-compliance have been conducted.

## Session 2.7: Efforts of MoHUA to Promote Mechanized Cleaning of Sewers and Septic Tanks

SPEAKER: DR. V K CHAURASIA, JT. ADVISER (PHEE), CPHEEO

- Manual scavenging has still not been eradicated, proven by the 376 deaths of the last five years. Various factors that define its nature include informal market surrounding sanitation; unstandardized infrastructure issues (for e.g., excessively deep septic tanks); inadequate prevention measures; inadequate mechanisation; exploitation of vulnerable workers; poor training and awareness; and inadequate safety infrastructure/equipment. Penalties are in place, but non-compliance is still at large in some areas.
- RSAs at District-level enforce safety through ESRUs at ULB level. Adequate support and guiding toolkits have been provided to the States to enhance the sanitation ecosystem and equip them with the right infrastructure that ensures *swachh* practices. About Rs. 300 Crore-worth machinery have been sanctioned across the nation, and even the Budget 2023-24 reiterates support towards this transition.

### Key Initiatives/directions under MoHUA



## Support to States and ULBs by MoHUA (1)

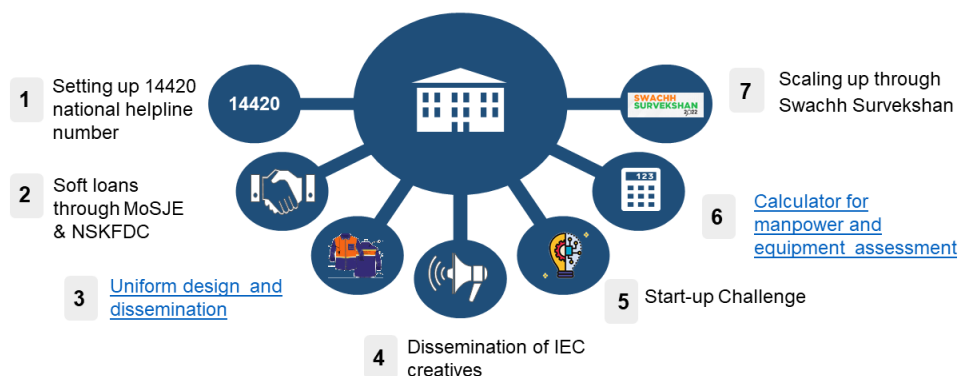


Figure 43: Mechanization of sewerage and septage management at national scale

- Certifications like Safaimitra Surakshit Shehar (SSS) declarations shouldn't only be on paper. It needs to be truly ensured on ground that the Safaimitras (Sanitation workers) really are Surakshit (Safe and Secure), only then occupational deaths can be prevented.
- Based on a recent study, out of total 4886 ULBs, 2803 are with SSS declarations; 1285 have appointed DC/DM as RSAs; 1702 ULBs have one or more core equipment; and, about 182 have one or more safety gears. Grounding of initiatives has higher importance than certification and paperwork, therefore the verification of these rankings and paperwork need to be strict. At the same time, the public also needs to be more aware and involved to act as local guardians of safe sanitation.

## Progress and Timelines

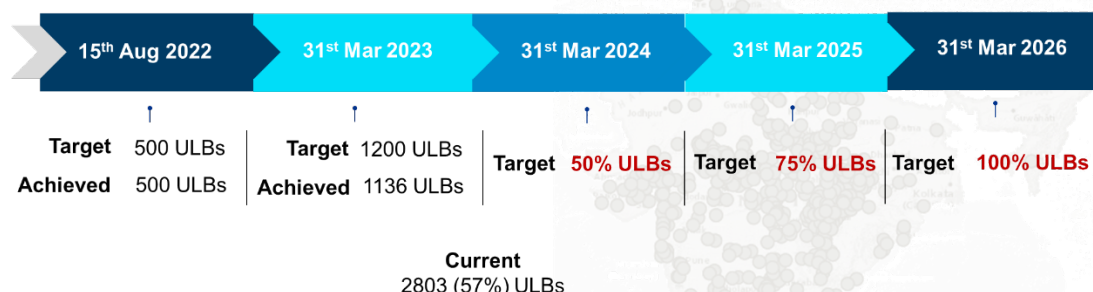


Figure 44: Progress and Timelines for 100% ULBs to adopt mechanization completely

- The closing remarks by Dr. MadhuRani, Director SBM-U reiterated that ensuring the achievement of targeted outcomes is much more than getting higher ranks or sanitation certifications. Solutions to sanitation problems need to be functional and sustainable, serving its due purpose. She reiterated the importance of field visits and the valuable insights that await participants at the local facilities. She also set the tone for Day 2 of the workshop which dealt with the topic of "Accelerating Used Water Management".

## **Day 2: Accelerating Used Waster Management Initiatives**

The session was opened by Dr V. K. Chaurasia; he stated that Day Two of the National Capacity Building Workshop will help states prepare for efficient planning of sanitation initiatives from planning, implementation, technology selection, tendering, and many more aspects of Used water Management. He reiterated the importance of proper planning so that infrastructure provisions resolve to become a solution instead of a liability.

- Dr Chaurasia announced that MoHUA is soon to release a detailed advisory with guidance on technology solutions along with drawings, checklists, estimates, etc. with as much contextualisation as possible to make it easier to adapt.
- The importance of each session was reiterated, and participants were encouraged to interact with expert speakers to maximize their learning and takeaway.

### **Session 1: Implementation: States' Experience**

MODERATOR: SHRI SUPRIYA GHOSHAL, WEST BENGAL STATE MISSION DIRECTOR

Shri Ghoshal started the session by stressing on the importance and challenging nature of UWM initiatives. He added that many good examples have been set, that need to be discussed in terms of how they can be adapted and implemented in similar/better ways. Cases from five States of Punjab, Himachal Pradesh, Maharashtra, Odisha and Andhra Pradesh were called on to be presented by the State representatives.

#### **Session 1.1. Punjab**

SPEAKER: SATWINDER SINGH DHILLON, PUNJAB WATER SUPPLY AND SEWERAGE BOARD

- A State of 23 districts with total population of nearly 3.16 crore, out of 1.15 crore are Urban.
- The approach for UWM:
  - PWSSB was designated as the implementing agency and a dedicated design cell was set up which utilized field surveys to assess gaps and prepare a thorough CSAP.
  - DPRs were prepared covering the I&D interventions, intermediate pumping, STP/FSTP design and Used water reuse aspects.

## Reuse of Treated Wastewater

- ❖ 304 MLD of treated waste water is being reused for irrigation purpose with a command area of 8300 Hectare. Further 4000 Hectare will be added to it shortly



Figure 45: Progress in Used water Management initiatives for the state of Punjab

## Positive Example

- ❖ Recently 225 MLD STP at Jamalpur, Ludhiana has been completed by PWSSB.
- ❖ The work was awarded to M/s Khilari Infrastructure on DBOT basis under AMRUT in December 2020. This project was completed in record time of 21 months.
- ❖ PWSSB also got International Book of Record for fastest construction and commissioning of 225 MLD STP including MPS, IPS award for this achievement.



- Target quality parameters were set to pH, BOD, TSS and FC primarily.
- Guidance and support were requested from Dr Chaurasia, CPHEEO over numerous VC meetings.
- As a result, 119 STPs have been installed, resulting in 304 MLD of treated water reuse and the numbers are only to get better in the future.
- Presently CSAPs for 56 ULBs have been prepared, out of which 54 have DPRs. Thirty-three of these projects have invited bids, against which ten were received and are undergoing due approval process with the SLTC.



## Session 1.2. Himachal Pradesh

SPEAKER: ER. MANDEEP GUPTA. EE

- Total operational STPs – 69 (61 Urban and 8 Non-Urban)
- CSAPs have been prepared with STP, I&D and desludging planned and budgeted as interventions
- SHPC (State High Power Committee) and SLTC (State Level Technical Committee) have been designated for due approvals



Figure 46: Completed and upcoming STPs of Himachal Pradesh

- **Key Challenge Areas:**
  - Finance (esp. O&M);
  - Land issues;
  - High O&M costs due to reasons like pumping requirement for high-altitude, high-energy charges, scattered habitations, etc.; and,
  - Temperature variations.
- Externally Aided Funding has been utilized for UWM implementation in 5 ULBs.

## CASE STUDY-REUSE TREATED WASTEWATER

- Due to public perception associated with sewerage, there is general social un-acceptance to the use of Treated Waste water for purposes like irrigation.
- Also because of mountainous topography and general location of STPs being at lower elevation to allow gravity flow in trunk sewers, limited scope exists for reuse of TWW for flow irrigation.
- Possibility to use TWW for industrial and other purposes like fire fighting is being explored.
- Piecemeal efforts have been made in this direction:
- A water body of 1.40 MLD capacity have been created of treated wastewater from 1.40 MLD STP at Gamru (Dharamshala)-meet out 0.80 MLD irrigation water demand and proposed a fire fighting system for Dharamshala Town.



Figure 47: Maximizing reuse for treated water from STPs in Himachal Pradesh

- Dharamshala’s 1.4 MLD STP utilises nearly 0.8 MLD treated water for irrigation. However, pumping costs are high, public perception towards reuse of treated water still needs work, and plans of using the treated water for firefighting have been made.

### Session 1.3. Maharashtra

SPEAKER: MAHESH CHAUDHARY, DY COMMISSIONER, URBAN DEVELOPMENT, MAHARASHTRA

- A total of 411 ULBs, out of which 368 ULBs have <1 Lakh population and 321 require an STP. Out of the 321 ULBs, 90 have site available and 45 DPRs have been prepared and submitted with the ULBs, however only 1 has been approved by the SLTC so far.

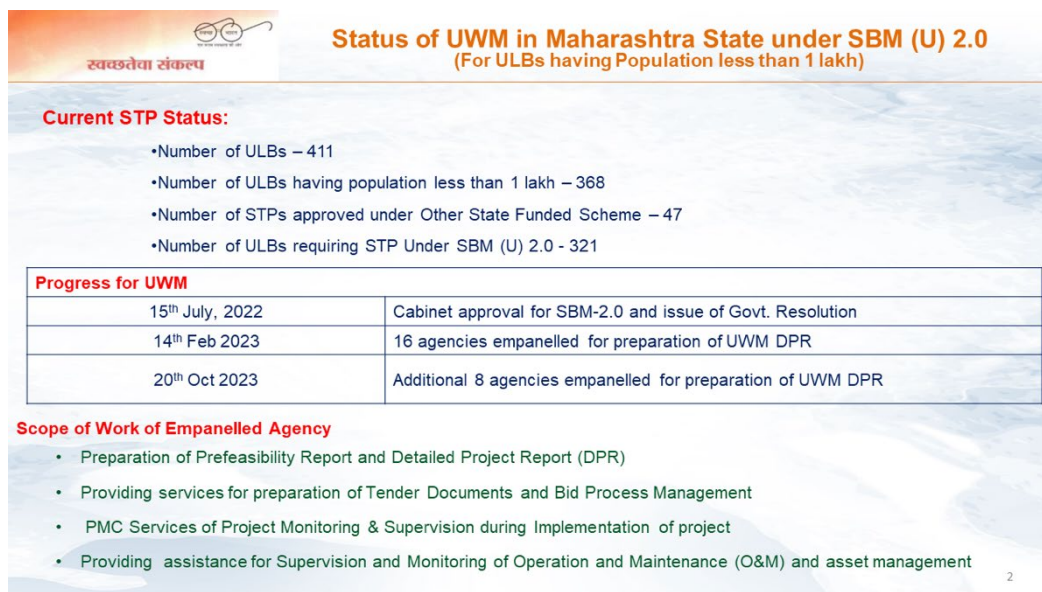
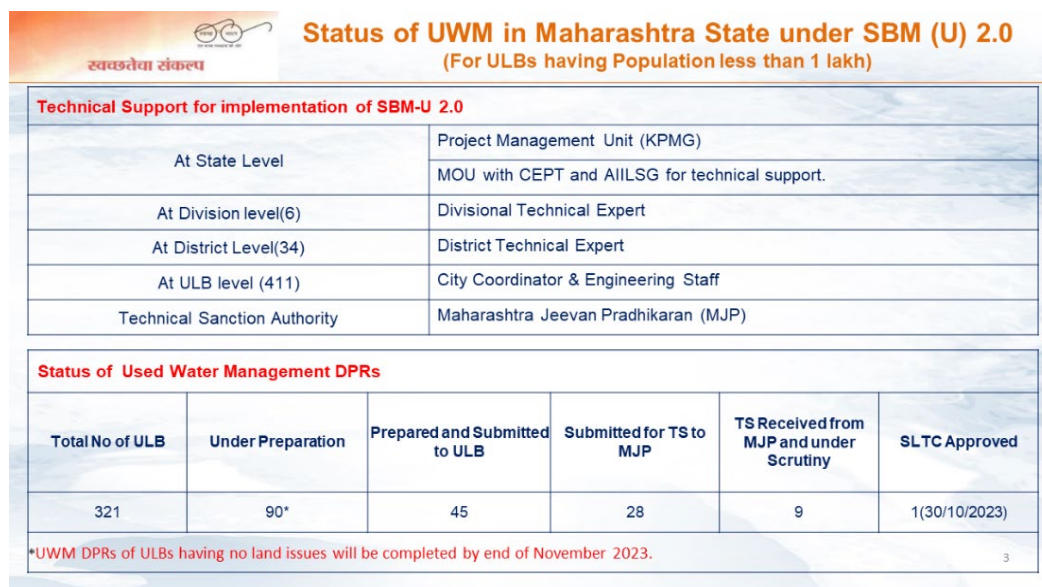


Figure 48: Progress in various stages of Used water Management initiatives across ULBs of Maharashtra



- A total of 24 empanelled agencies – to carry out pre-feasibility, DPR preparation, tendering and bid management support, Monitoring of implementation and O&M.
- Land issues are observed in 148 ULBs; the Principal Secretary is trying to resolve the same with the District Collectors and District Commissioners

## Session 1.4. Odisha

RAVINDRA KUMAR SAHU, ADDITIONAL SECRETARY, ODISHA

- Strategy adopted for greywater management solutions at various levels: Inception-Data Collection Analysis – Planning + Design – Construction and O&M.
- First, a few examples are piloted and then with the approval and support of the Expert Technical Committee, successful examples are scaled up.
- Standardised solutions including Magic Soak pits at household level, hybrid soak pit at lane level, constructed wetlands at community level, Waste Stabilisation Ponds with maturation ponds at the outfall/city level have been promoted, either in combination or stand-alone as per the local need. The SoPs were vetted by IIT Kharagpur before finalisation.

### Interventions in Greywater management

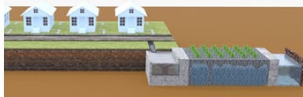
- Household level: Magic Soak Pits



- Lane level: Hybrid leach pit with absorption trenches



- Community level: Constructed Wetland



- Outfall Level: Waste stabilisation pond and maturation pond

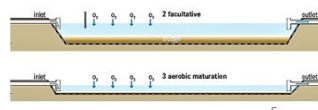


Figure 49: Progress in Greywater Management initiatives across the state of Odisha

## COMMUNITY PARTICIPATION



IEC by Swachh Sathis in ULB



IEC ACTIVITIES



Household Survey by Swachh Sathis in ULB



HOUSEHOLD SURVEY

- Relevant capacity building and IEC programmes for Orientation and Specialisation, along with field visits to Pilot ULBs. have been organised to imbibe preparedness and awareness.

- A good example of convergence with MUKTA scheme, to engage women-led SHGs for works amounting up to Rs. 15 Lakh – for implementation and maintenance of parks, gardens, etc. Another Rs. 800 Crore ear earmarked for similar and better future engagement.

### Session 1.5. Andhra Pradesh

P. ANAND RAO, CE, SWACHH ANDHRA CORPORATION

- 77 STPs have been proposed under various schemes
- Total capacity proposed is 699 MLD, with 194 MLD constructed (7 ULBs) and 505 MLD under construction (34 ULBs).
  - 32 Cities possess greater than 1Lakh population: 12 ULBs with functional STPs of 488 MLD capacity, while STPs of 445 MLD capacity for 27 ULBs are under construction.

## STPs Completed



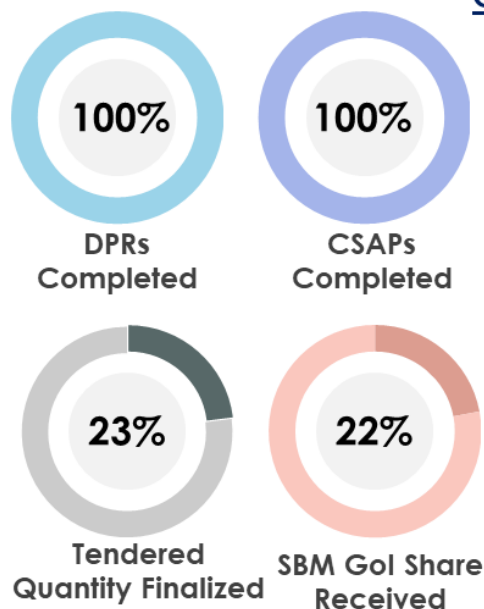
**10 MLD STP at Pulivendula under State Plan Funds**



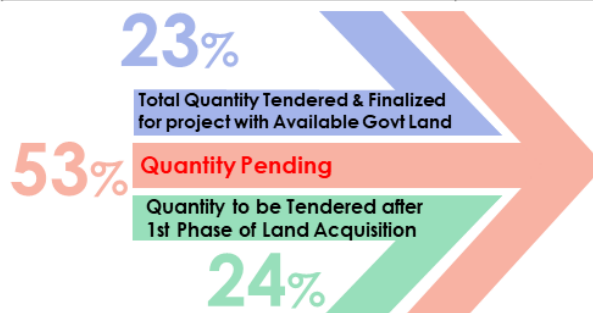
**15 MLD STP at Koppulu in Ongole under Amrut 1.0**

Figure 50: Status of STPs under various schemes in Andhra Pradesh

### Current Status



	Qty in MLD
Total Quantity Tendered & Finalized for project with Available Govt Land	131.37
Total Quantity in Tender stage after 1 <sup>st</sup> Phase of Land Acquisition	136.34
Quantity Pending where Land Acquisition to be done.	301.37
<b>Total Quantity to be Tendered</b>	<b>569.08</b>



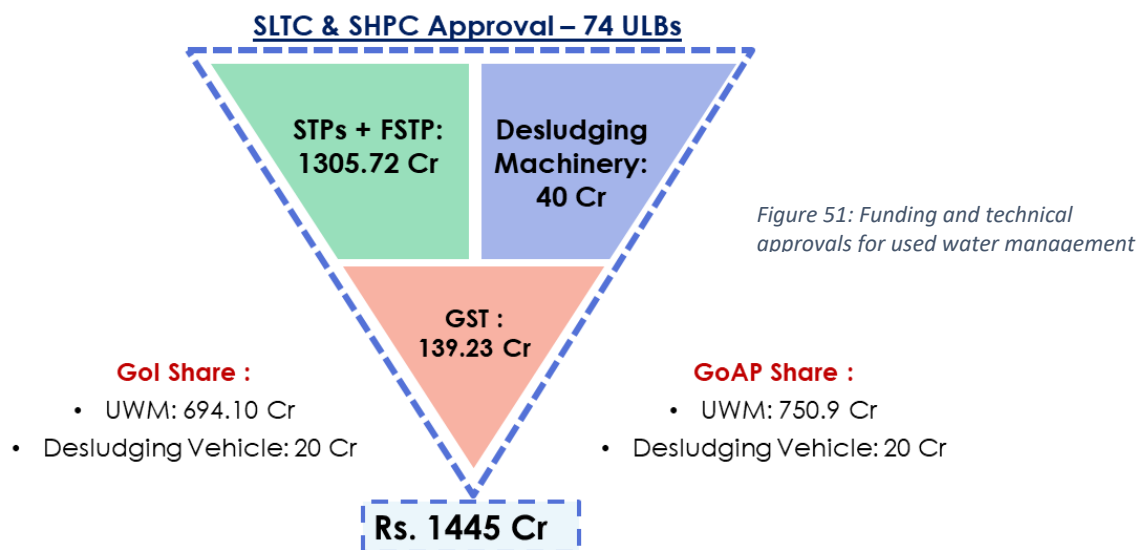


Figure 51: Funding and technical approvals for used water management

- 91 cities with <1Lakh population: 3ULBs have functional STPs with 14.3 MLD capacity and 33.6 MLD of STPs for 7 ULBs are under construction. Moreover 91 FSTPs awarded in 91 ULBs, out of which 4 have been completed and 87 under progress.
- Andhra Pradesh is already prepared with defined clusters to be tendered out. The respective capacities and costs have been planned in detail to be implemented under SBM 2.0 UWM. Interventions include STP+FSTP construction worth of Rs. 1,305.72 Crore, desludging machinery worth Rs. 40 Crore and GST worth Rs. 139.23 Cr. For 74 ULBs that have SLTC and SHPC approval. The combined share of GoAP (750.9) and GoI (694.1) being Rs. 1,445 Crore.
- 100% DPRs and CSAPs are completed, 23% of tenders finalized and 22% of GoI funding has been received. Desludging vehicle prototype was tested out, tendered and is currently procurement, leaving mostly logistics to push the UWM interventions to a 100% for Andhra Pradesh.

#### Discussion:

Mr. Rajesh Pai reiterated that UWM 2.0 initiatives must use the right combination of solutions in different contexts, and this workshop providing a great opportunity for exchange of experience and learning, thereby initiating a Q&A session relating the Session 1 presentations.

**Q.** How was the tendering and technology selection carried out in case of Punjab?

**A.** 33 DNITs (Notice inviting Tenders) were circulated for STP-cum FSTP facilities so that the entire sewage and septage generation can be managed with the implemented solutions. Along with it, 5 years of O&M was made a part of the scope of work. Land availability is crucial factor to technology selection, as every technology has a different footprint depending on the capacity.

**Q.** For the case of Andhra Pradesh, what technology was adopted for the 91 STPs in Andhra Pradesh? How was the capacity decided? Was accessibility to narrow lanes considered in the decision-making process?

**A.** Tenders were called in with Open Technology criteria, however final selection was considered depending on the treatment to cost efficiency, narrowing it down to Nature based solutions or SBR technology. The standard truck capacity of 3m<sup>3</sup> was adopted. Yes, accessibility to the narrower areas was checked.

**Q.** In case of Odisha, how was the greywater and blackwater channelled to the community level system?

**A.** 80-90% households already had containment for blackwater, and only the greywater was going into the drains, which was connected to the community level treatment system. However, household level solutions were prioritised and adopted with respect to the space available.

## Session 2: Implementation approach & technology selection

Moderator: Dr VK Chaurasia, Jt Advisor, CPHEEO

SBM-G came up with the strategy of greywater management and blackwater management solutions separately due to prevalent practices and availability of spaces, however in urban context the same cannot be applied everywhere, especially when there is much lack of space. This session would discuss the aspects of implementation approach and technology selection methodology of Telangana, followed by Gujarat's experience in DPR preparation and its implementation, and finally the SBM 2.0-UWM implementation approach and strategy.

### Session 2.1: Technology selection & STP designs for small & medium towns- Telangana

SPEAKER: NAGA MALLESWAR RAO, GOTS

- Telangana has a total population of 3.5 Cr, out of which 1.44 Cr is urban population.
- The State is constituted by a total of 141 ULBs out of which 11 are AMRUT towns, 26 are surrounding ULBs, and 104 are non-AMRUT ULBs. The population of the AMRUT and non-AMRUT towns are 95.8 and 28.5 lakhs respectively [as per Census 2011].

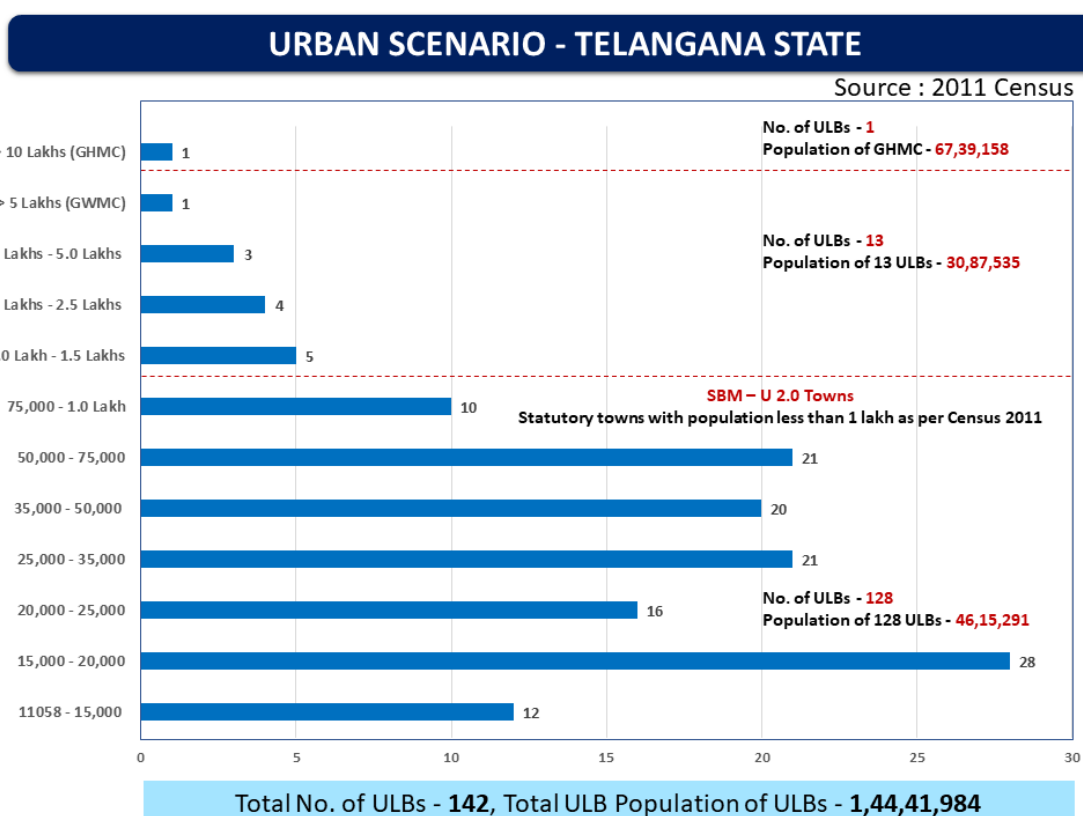


Figure 52: Comparison of per MLD Costs of STP implementation according the Schedule of Rates of various States

#### Comparison of STP costs by SoRs of various States and quotations from agencies, along with final per MLD cost adopted

- As per projections 2023 population of the 104 ULBs is about 50 lakhs, making the projected requirement of 344 STPs with 789 MLD capacity. Out of which number of STPs with <2MLD capacity is 226 STPs (166 MLD) and the same for >2MLD capacity is 118 (618 MLD).

- With due advice and support from CPHEEO, STP costs were arrived upon by learning from other states and adapting successful solutions with local SoRs. State Government decided to fund the projects by Hybrid Annuity Model (HAM) for Construction which included Annual Pay and O&M; it is yet to be finalised.

ENVIRONMENTAL MANAGEMENT PLAN FOR URBAN LOCAL BODIES IN TELANGANA  
(To ensure that no untreated waste water is released into nearby water bodies/River - Proposed to be implemented through GoTS & SBM 2.0 Funds)

#### TOTAL PROJECT COST

Sl. No	PH Division	No of ULBs	Population @2038	Proposed STP @2038		Grand Total in Crores According to adopted rates	O & M Cost for 10 years (based on CPHEEO manual)	Total Cost in Crores Including O&M
				No	Capacity			
1	Adilabad	11	975665	34	119.4	314.69	293.32	608.01
2	Karimnagar	14	1052056	51	106.2	322.07	320.53	642.60
3	Khammam	11	754835	27	94	254.31	255.89	510.20
4	Mahabubnagar	18	922993	69	106.8	342.19	412.81	755.00
5	Nalgonda	16	726929	57	86.8	286.18	325.50	611.68
6	Nizamabad	6	545372	18	65.8	163.69	142.72	306.41
7	Rangareddy	10	716855	28	74.4	203.68	215.26	418.94
8	Sangareddy	13	836274	47	94.9	281.25	313.98	595.23
9	Warangal	5	337260	13	40.9	111.77	101.97	213.74
<b>Total</b>		<b>104</b>	<b>6868239</b>	<b>344</b>	<b>789.2</b>	<b>2279.83</b>	<b>2381.98</b>	<b>4661.81</b>

Figure 54: Comparison of Costs wrt Total costs of STP implementation in various States

ENVIRONMENTAL MANAGEMENT PLAN FOR URBAN LOCAL BODIES IN TELANGANA  
(To ensure that no untreated waste water is released into nearby water bodies/River - Proposed to be implemented through GoTS & SBM 2.0 Funds)

#### HAM MODEL

<b>Project Capital Cost</b>	<b>1753.72</b>	<b>Cr</b>
O& M Cost for First Year	194.45	Cr
<b>HAM Ratio</b>	<b>Initial</b>	<b>40</b> % of capital
	<b>Deffered</b>	<b>60</b> % of Capital
<b>Repayment Period</b>	<b>10</b>	<b>Years</b>
Payments/Year	1	
Construction Period	2	years
Interest Rate	10.1	%
Annual Increase in O & M	5	%
IDC (Interest During Construction)	106.280	Cr
Repayment during Construction	701.488	Cr
Provisions towards Taxes and other Provisions	526.11	Cr
Deffered payment including IDC	1158.512	Cr
<b>Total Project cost</b>	<b>4661.809</b>	<b>Cr</b>
<b>Total Annual Payments (HAM, O&amp;M)</b>	<b>4275.509</b>	<b>Cr</b>
<b>Total Project Cost under HAM (During Construction + Annual Payment + O&amp;M)</b>	<b>5503.107</b>	<b>Cr</b>
<b>Project Cost Approved under SBM</b>	<b>934.600</b>	<b>Cr</b>
<b>Govt of India Share</b>	<b>463.100</b>	<b>Cr</b>
<b>Govt of Telangana Share</b>	<b>5040.007</b>	<b>Cr</b>

Figure 53: Hybrid Annuity Model example for contracts including O&M along with construction

The proposed HAM suggests 40% of CAPEX (including taxes) to be paid during construction period by Gol and GoTS, while the remaining 60% annuities including CAPEX and O&M payments are majorly covered by the GoTS and SBM-U 2.0.

Dr Chaurasia appreciated the fact that Telangana has factored out the cost repercussions of the interventions and strategies to tackle the same are prepared too.

## Session 2.2: Technology selection for small and medium size STPs: Telangana experience

PROF. ASHFAQUE JAFARI AND DR. SM SUBHANI, NCPE INFRASTRUCTURE INDIA (P) LIMITED, HYDERABAD

- As advised by CPHEEO, areas of decision making were (a) Sizing of the STP; (b) Design-Layout-Cost of technologies; (c) Small and medium STPs for SBMU 2.0; and (d) Life Cycle cost analysis.
- As per technology, both anaerobic and aerobic technology options were considered and evaluated with techno-economic analysis. The capacity and land availability were key constraints in selection of technology. The technology combinations considered in the study included:
  - Waste Stabilization Ponds (WSP) Consisting of Anaerobic Pond + Facultative Pond;
  - Anaerobic Baffled Reactor (ABR) + Constructed Wet Lands (CWL);
  - Upflow Anaerobic Sludge Blanket (UASB) Reactor + Waste Stabilization Ponds (WSP);
  - Upflow Anaerobic Sludge Blanket (UASB) Reactor + Activated Sludge Process (ASP);
  - Sequential Batch Reactor (SBR);
  - Extended Aeration (EA); and,
  - Moving Bed Biofilm Reactor (MBBR)

### Life Cycle Cost Analysis

STP Project Life Cycle Cost																
Sl. No	Technologies	Zero Land Cost (Rs. In Lakhs)			25 Lakhs Land Cost (Rs. In Lakhs)			50 Lakhs Land Cost (Rs. In Lakhs)			75 Lakhs Land Cost (Rs. In Lakhs)			100 Lakhs Land Cost (Rs. In Lakhs)		
		1 MLD	2 MLD	5 MLD	1 MLD	2 MLD	5 MLD	1 MLD	2 MLD	5 MLD	1 MLD	2 MLD	5 MLD	1 MLD	2 MLD	5 MLD
1	Waste Stabilization Ponds (WSP)	1424	1836	3397	1951	2753	5511	2477	3670	7626	3003	4587	9741	3530	5504	11856
2	Anaerobic Baffled Reactor (ABR) + Constructed Wet Lands (CWL)	1917	3110	6672	2446	4128	9159	2974	5146	11647	3502	6165	14134	4031	7183	16622
3	Upflow Aenarobic Sludge Bio Rect + WSP (UASB + WSP)	2597	3256	5719	2737	3470	6426	2877	3683	7133	3017	3896	7840	3157	4109	8547
4	Upflow Aenarobic Sludge Bio Rect + ASP (UASB + ASP)	2597	3361	5314	2650	3428	5401	2703	3495	5488	2757	3561	5574	2810	3628	5661
5	Sequence Batch Reactor (SBR)	2659	3362	5284	2711	3419	5374	2763	3477	5464	2815	3534	5554	2867	3591	5644
6	Extended Aeration Process (EAP)	2361	3191	5273	2416	3263	5391	2470	3335	5509	2524	3407	5627	2579	3479	5745
7	Moving Bed Bio Reactor (MBBR)	2387	3170	5390	2432	3229	5473	2477	3287	5557	2522	3346	5640	2567	3404	5724

Technology	Capacity	Land cost (Rs. / acre)
Waste Stabilization pond	1 MLD, 2 MLD, 5 MLD	Rs. 0
	1. MLD, 2 MLD	> 0 and ≤ Rs. 25 lakhs
SBR	5 MLD	≥ Rs. 25 lakhs
MBBR	1 MLD and 2 MLD	≥ Rs. 50 lakhs

**NOTE** The technology with lowest LCC for each combination of capacity and land cost is highlighted in yellow. In some instances the next lowest LCC may be close to the lowest LCC. In such a scenario, alternatives exist.

Figure 55: Life Cycle Cost Analysis of STPs of various capacities and technologies as a decision-making parameter

- Design principles were based on the CPHEEO manuals – Wherever land is available WSP proves to be the best solution. SBR and MBBR are close competitors in terms of high-quality treatment with low land footprint.



- Maturation ponds in the WSP systems were encouraged to be used to generate revenue through fishing. Desludging operations for WSP systems are scheduled at the frequency of 1-5 years as necessary.
- The Life cycle Costs is calculated for a 15-year period, with the CAPEX and OPEX estimations based on designs as per CPHEEO and SBM U 2.0 norms. The annual interest rates and O&M escalation rates were set at 10% for the study.
- **Key learnings:**
  - STP Technology should be based on Life Cycle Cost, rather than on the land cost, land availability or CAPEX. Thus, selection should be case specific instead of the same solution for the entire State/ULB.
  - As per the findings of the study, WSP is the first choice when government land is available. But when Government land is not available, SBR is the first choice in the 5 MLD category, and MBBR is the first choice in the 1 - 2 MLD category.
  - Financial sustainability a key factor for small and medium ULBs.
  - Actual generation must be assessed and prioritised over thumb rule-based estimations
  - There is a need to be careful about overtreatment as it can be expensive.
  - Reuse, especially in agriculture, can save considerable amount of freshwater resource.

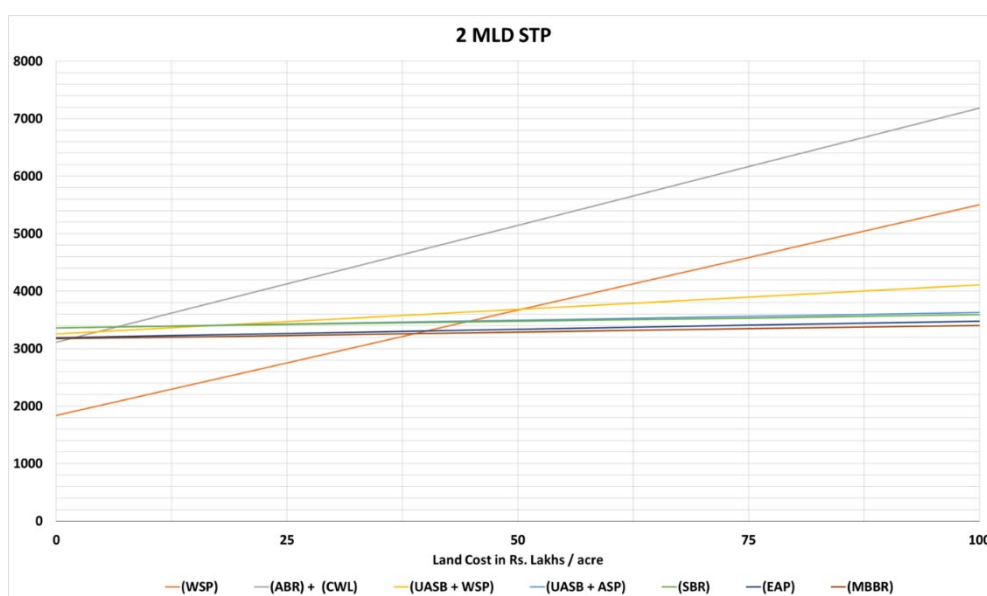
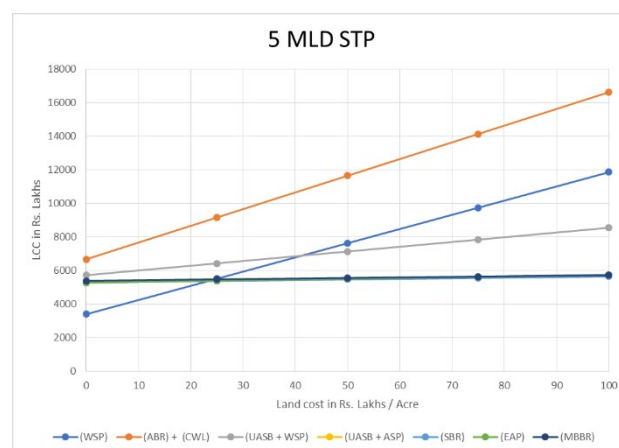
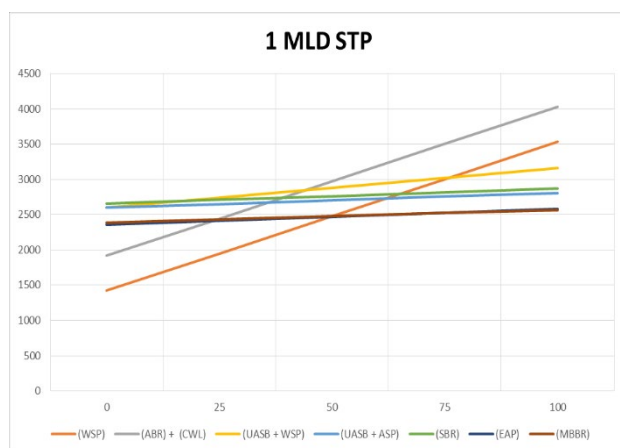


Figure 56: Comparison of land requirement by Capacity of multiple technologies across the capacities of 1,5 and 20 MLD capacities



Dr Chaurasia pointed out how many technology comparison studies presented interesting inferences; for example, low capacity (<5MLD) Nature-based solutions had almost half the life cycle cost than mechanized solutions.

## Session 2.3: Gujarat experience in DPR preparation & implementation approach

YASHASVI MAHENDRABHAI, GUDC

- The state of Gujarat consists of 33 districts, constituted by 165 ULBs and 23 million population, which generates sewage quantity of about 4450 MLD.  
About 170 STPs have been envisaged to meet the treatment requirements as per the scale of the ULBs, the capacities of each planned STP ranges from 0.5-275 MLD.

- Implementation Strategy:**

**a. Finance:** AMRUT 1.0 & 2.0, State funding (Swarnim Jayanti Mukhya Mantri Shaheri Vikas Yojana (SJMMSVY)) and ULB's own funds

The proposed works for Used water Management under SBM U 2.0 include:

(a) STP for 15 ULBs- with 106 MLD capacity (as per 2026 projected population)-Costing Rs.214.6 Cr

(b) I&D for 31 ULBs with a total length of -689 kms- Costing Rs.473.5 Cr

The funding pattern is considered as Centre-50%, State -33% and ULB-17%.

**b. Formulation and contractor on-board by tendering:** The appointed contractors are engaged for DPR preparation followed by due approvals from the SLTC and SHPC.

**c. Tendering Specifications:** Open technology tenders with power and land requirement considered key deciding factors on the received technology propositions. Technical and Financial evaluation with preference to well-experienced contractors providing at least 5 years of O&M.

**d. Incremental reuse targets:** An installed treatment capacity of about 5229 MLD, out of which 3,713 MLD is currently utilized. The targeted reuse is 1,207 MLD for irrigation.

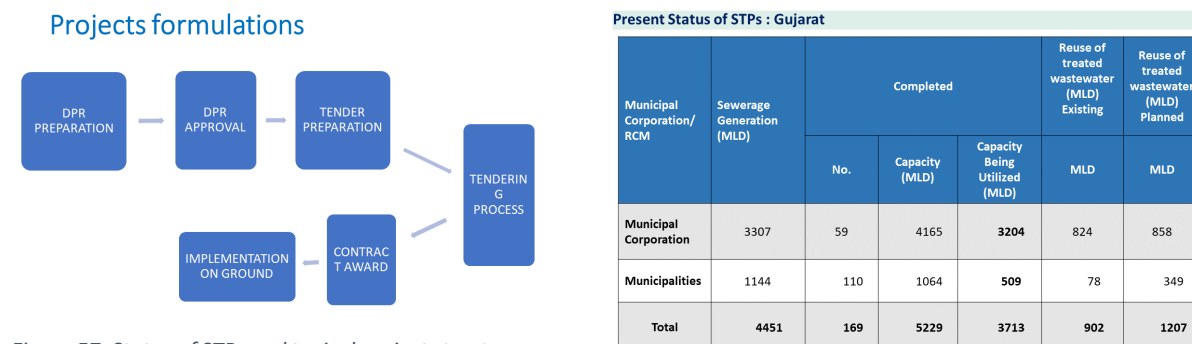


Figure 57: Status of STPs and typical project structures in Gujarat

- With outgrowths merging into municipal areas, growth in the demand for treatment capacity is inevitable, making this a continuous journey than a one-time solution.

Dr Chaurasia appreciated Gujarat's pursuit of achieving higher reuse potential and preparedness for the growing population. However, he added financial health of the ULBs is an additional factor alongside power and land availability while choosing a technology.

He added that successful examples shouldn't be followed blindly, but should be used to learn from, assessed and optimised to fit the target context before implementation. Proper plans need to be made for the future and for the public welfare.

## Session 2.4: SBM-U 2.0: UWM Implementation approach and strategy

DR. VK CHAURASIA, JT ADVISER, CPHEEO

- In alignment with, *SDG 6 – Clean water and sanitation, 6.2- Sanitation for all, 6.3 – Improvement in water quality, safe wastewater treatment and reuse*, the SBMU 2.0 objectives are safe collection, treatment, reuse of used water and faecal matter while using adequate number of safe desludging mechanism.
- Consultants should be engaged by the states to support implementation of UWM interventions, in alignment with the model DPRs that will soon be published by CPHEEO. States must ensure that the solutions do not become liability in the long run.
- Interventions need to be elevated beyond the local level and must engage the district and state level as the population and the associated used water generation is only going to increase with time.
- A general approach for Used water management for Class II to VI towns was prescribe as follows:

Table 1: UWM Approaches for prescribed by CPHEEO for Class II to Class VI towns

ULB Category	UW Conveyance	Treatment	Strengthening On site sanitation systems – Approach for FSM
Class V-VI	<p>Strengthening of existing municipal drains (if needed)</p> <p style="text-align: center;"><i>Cities aspiring for safely managed sanitation</i></p> <p>Incremental sewer network in a planned manner</p>	<p>Provision of Community Soak pits</p> <p style="text-align: center;"><i>In case of high ground water table</i></p> <p>Horizontal Gravel Filter + Soak pits</p>	<p>Co-treatment at the nearest STP</p> <p style="text-align: center;"><i>If no nearby STP</i></p> <p>Deep Row Entrenchment</p> <p style="text-align: center;"><i>If none of above is feasible</i></p> <p>Plan for cluster (Urban+ rural) based/ alone FSTP using simple technology like planted/unplanted drying beds</p>
Class IV	Same as for Class V and VI towns	<p>Waste Stabilization Pond Or Aerated Lagoon Or Anerobic baffled Reactor followed by planted gravel filter</p> <p style="text-align: center;"><i>If not feasible due to various reasons</i></p> <p>Same as for Class V towns</p>	Same as for Class V and VI towns

ULB Category	UW Conveyance	Treatment	Strengthening On site sanitation systems – Approach for FSM
<b>Class III</b>	At discretion of the State, 50% of towns may adopt the Class IV approach  & Rest 50% of towns may adopt the Class II approach	50 % of towns may adopt: -Waste Stabilization Pond, OR -Aerated Lagoon, OR -Anaerobic baffled Reactor + Planted gravel filter, OR -UASB + constructed Wetland, OR Trickling Filter/Bio Tower  & Remaining 50% of ULBs to follow as per Class II towns	<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;">Co-treatment at STP</div> <p style="text-align: center; font-size: small;">↓ <i>During implementation period of STP</i></p> <div style="border: 1px solid black; padding: 10px; width: fit-content; margin: 0 auto;">Plan for DRE or Sludge drying beds on the same proposed land for STP</div>
<b>Class II</b>	<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;">Adopt sewer network in a core area depending on finances with State/ULB/ 15<sup>th</sup> FC/ NGT EC/ savings from class IV/V/VI</div> <p style="text-align: center; font-size: small;">↓ <i>In case of financial constraint</i></p> <div style="border: 1px solid black; padding: 10px; width: fit-content; margin: 0 auto;">Adopt I&amp;D as an interim measure for major outfalls, network to be implemented incrementally</div>	<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;">Less mechanized/nature-based technologies like those mentioned in class III</div> <p style="text-align: center; font-size: small;">↓ <i>In case of land/any other constraint</i></p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;">Any STP technology as per CPHEEO manual/advisories</div>	<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;">Co-treatment at STP</div> <p style="text-align: center; font-size: small;">↓ <i>During implementation period of STP</i></p> <div style="border: 1px solid black; padding: 10px; width: fit-content; margin: 0 auto;">Plan for DRE or planted/unplanted drying beds on the same land proposed for STP</div>

**This rationalized approach has considerably reduced (>=50%) the per capita cost for UWM.**

#### Costing calculations for Used water management

The Central share (as per eligible funding pattern) for STPs and I&D drains, for each notified town in the State/UT, will be governed by the following maximum per capita allocations:

Class of town	Maximum limit of per capita allocation for STP and I&D (including Central share + State/UT/ULB share)
II	₹3,000
III	₹2,000
IV	₹2,000
V	₹2,000
VI	₹2,000
For NE & hilly States	Class II - ₹4,000
Class III and below - ₹3,000	

Cost consideration as per modified approach	
Class of cities	Per capita cost (approx.)
<b>Class II (50,000- 99,999)</b>	1500
<b>Class III (20,000- 49,999)</b>	1000
<b>Class IV (10,000- 19,999)</b>	800
<b>Class V (5,000- 9,999)</b>	400
<b>Class VI (&lt; 5,000)</b>	400

- While inviting tenders from technology solution providers, an open technology approach should be taken to find the most suitable option for the target area.
- Sewerage network component is not included in the SBMU funding, however support and guidance for the implementation of same is consistently being made available.

**Key challenges during implementation:**

- Lack of finances;
- Inconvenience to people;
- Meagre technical strength;
- Selection of treatment technologies; and,
- Quality/Uniformity of DPRs.

Overtreatment should be avoided, and instead safe reuse/discharge levels depending on the context must be attained. Some consultants try to charge higher charges by misinforming on stringent standards, State functionaries must maintain awareness regarding the same.

Advisory will inform on the per capita cost to UWM with respect to different population classes, and at the same time intermediate and final UWM infrastructure solutions for each class respectively.

• **Action Points**

For the Ministry:

- Preparation of DPR check list,
- Model DPRs,
- Model tender documents,
- Guidance on faecal sludge treatment facilities

For the States:

- Prioritisation of Implementation Agency selection,
- Expedite DPR preparation,
- Support to ULBs for UWM implementation including aspects of procurement

**Discussion:**

**Q.** Representative from Jammu and Kashmir posed the question of technologies suitable for very low temperatures? The growing O&M costs is bound to become unmanageable for many-can profit making agencies be encouraged/mandated to adopt such O&M activities like they have done with parks and gardens?

**A.** (Dr Chaurasia) The questions are pertinent, and will be covered with much more detail in the advisory. However anaerobic treatment solutions when implemented underground would be effective in such conditions. The issue of O&M is well-received, and the suggestion made will be considered, however due attention must be paid towards optimising the O&M from the beginning itself.

**Q.** (Prof. Chary) a. Nature based solutions are failing, so should it not be openly discouraged as they are unfit to treat used water?

b. Sludge production is already high and will continue to grow in future. Space and resource allocation must be made along with becoming an aspect in the scope of work for the DPRs being made now.

c. Handovers are generally difficult, institutional engagement has not been maximized, and O&M aspect of treatment facilities needs to be aggregated at a much larger scale than the current state.

d. Instead of I&D for all drains, only the major drains need to be tapped, as otherwise the number of STPs and O&M efforts required could potentially get too expensive.

e. Need for Deep row entrenchment vs STP?

**A.** (Dr Chaurasia)

- (a) Disagreed with the view given, NBS essentially require low maintenance, however it is confused as no maintenance which leads to the failures seen so far. The bare minimum O&M required by the system, if delivered can yield long term service out of the system.
- (b) Biosolids standardisation, management and reuse is already a priority for CPHEEO and MoHUA. The forthcoming advisory will attempt to address SOP for biosolids as well as possible.
- (d) Decentralisation is only useful when done mindfully, it is not prescribed to connect each drain to one STP even if the drains are in all different directions. Proper planning can optimise the solutions in terms of life cycle costs, thus must be practiced in such cases.
- (e) For low population and low groundwater table areas, DRE is only posed as an intermediate solution, which with due growth in population over time will have to be replaced with a more robust technology solution.
- Government of India is focused, flexible and supportive of the sanitation initiatives at the local level and working together can only accelerate the UWM mission.

### Session 3: Experience sharing on Procurement

#### Session 3.1. GEM Procurement - Equipment machinery & services

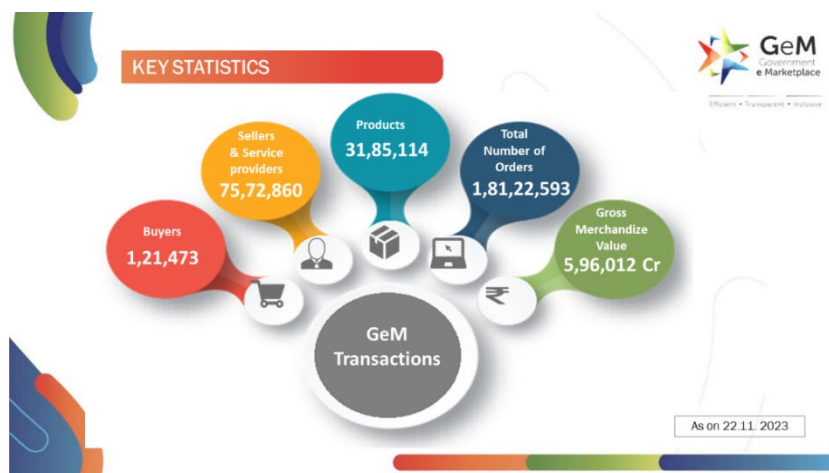
MR. A.V. MURALIDHARAN, GEM

- The GeM portal was established in 2016, to aid and expedite procurement, while enhancing efficiency, transparency, inclusiveness in public procurement – using instruments like e-bidding, revenue auction and direct procurement.
- GeM has been promoting partnerships and network improvement in the sector, through facilitating informed decision making and transparency and providing many buyer and seller advantages.
- Other features like Forward Auction for goods/materials/immovable assets; vendor assessment integrated with incident management; inclusion of SBM and Safai Suraksha items; inclusion of services validation, as well as waste management & water supply related services. Moreover, savings are ensured on most of these products and services to encourage more and more business on the platform.

WASTE MANAGEMENT & WATER SUPPLY RELATED SERVICES				
Category Name	Order Value	No. of Orders	No. of Service Providers Registered	Top Buyers
COLLECTION & DISPOSAL WASTE MANAGEMENT SERVICE	438.8	531	1530	1) Urban Development and Housing Department, Bihar 2) DG of Defence Estate, Department Of Defence 3) Rural Development Department, Bihar
OPERATION AND MAINTENANCE OF EFFLUENT/SEWAGE TREATMENT PLANT	26.4	98	847	1) Power Department Delhi 2) Indian Railways 3) U.P Rural Institute Of Medical Sciences and Research Saifai
E - WASTE MANAGEMENT SERVICE	24.2	12	417	1) Urban Development and Housing Department, Bihar 2) Admission Committee for Professional Medical Educational Courses B. J. Medical College Ahmedabad 3) Indian Institute of Technology (IIT)
OPERATION AND MAINTENANCE OF WATER SUPPLY SYSTEMS	18.7	58	813	1) Mangalore Refinery & Petrochemicals Limited 2) Northeastern Electric Power Corporation Limited 3) MOIL Limited
BIOMEDICAL WASTE MANAGEMENT SERVICE	6.7	68	114	1) Indian Army 2) Civil Hospital Amdavad 3) All India Institute of Medical Sciences (AIIMS)

Figure 58: Statistics for Waste Management & Water Supply related services at the GeM portal

- Transparency has been strengthened through measures like making contract data public, informing buyers and sellers on decision making parameters to ease choices.



Suggestion of conducting trainings and awareness on GeM portal was well received by the GeM Representative

### Session 3.2. Model tender document for Used Water Management (STP & Sewer laying)

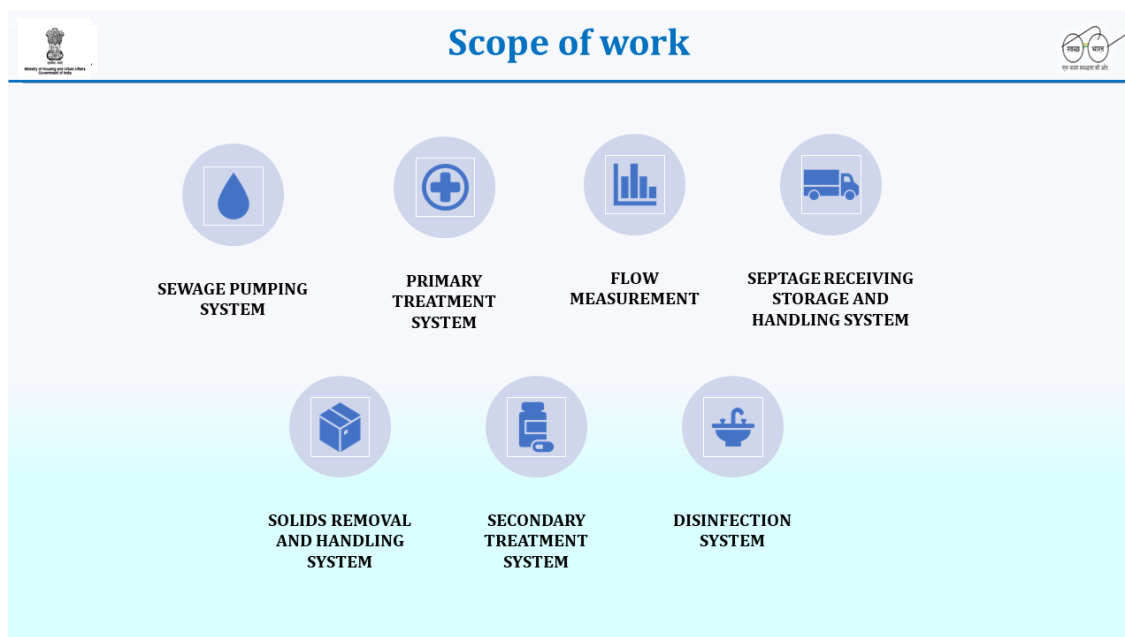
MR. R N JINDAL, CPHEEO

- Objectives of the initiative: Faster procurement, Standardised tender document, avoiding repetition of efforts.
- It will include checklists and summaries for bidders and buyers; at the same time inclusion of all components for planning STPs and implementer’s checklists, guidelines and tests for functionality.

Checklist & Summary for Bidders		
	<b>Defect Liability Period</b>	To start after commissioning
	<b>Communications</b>	E-Mail accepted mode
	<b>Max. Amount towards delay Damages of works</b>	5% of work contract price
	<b>Confidential Details of Bidder</b>	Bidder to list & inform
	<b>Max. Total Liability</b>	Equal to accepted works contract price

Figure 59: Guidance through model tender documents for Used Water Management projects under SBM 2.0





- A model contract with miscellaneous clauses including dispute resolution, confidentiality, publicity, etc. will be included along with guidance on selection of contractors/vendors with factors like bidding capacity, experience, affidavits, etc. and more detailed evaluation parameters.

S. No.	Pre-Qualification/Eligibility Criteria	Documents Required
1.	<b>Registered Entity:</b> to be allowed. Individuals or proprietorship firms not allowed	Incorporation certificate GST registration certificate
2.	<b>Bidding Capacity:</b> more than the value of bid	Certificate(s) from its Statutory Auditors and Engineer-in-Charge
3.	<b>Net Worth:</b> positive net-worth of at least <b>Rs. 2 Crore:</b> any two of the last three financial years	
4.	<b>Affidavit:</b> not blacklisted by any State Government or Central Government / Department / Agency/PSU	Affidavit on non-judicial Stamp Paper of Rs 100 ( <i>individually by each Bidder</i> )
5	<b>Litigation History#:</b> Accurate information on any litigation or arbitration over the last 10 years	Details of litigation to be provided

- The evaluation criteria would typically consist of the 3 aspects with respective scores to qualify:
  - **Past sectoral experience (45 marks):** Experience in Used Water Management Sector (30) and PHE sector (15)
  - **Experience of Key Personnel (25):** Team Leader, Engineers and Environmental Expert
  - **Financial Strength of the Applicant (30):** Turnover and Net Worth wise marks for the last 3 financial years
  - **Experience with technology-specific O&M of comparable capacity**

- The model tender documents will put on the CPHEEO/MoHUA website for the public very soon, after due government consultation.

### Session 3.3. Maharashtra FSTP design & Implementation experience

CHIRAG PATEL, CEPT

- Maharashtra has a total of 384 ULBs (2019), out of which 73 ULBs have access to sewage treatment facility and 311 ULBs have a requirement for FSTPs.
- Their TSU helped to identify 4 suitable FST solutions, which was further shortlisted to 1 cost effective and non-mechanised treatment solution after vetting from NEERI. Centralization of technical sanction and administrative approval made the process faster. DPRs, tender documents, and detailed estimates for different capacities of FSTPs were shared with the ULBs.
- Cost of FSTPs ranged from 1.31 Lakhs per KLD [ $>70,000$  population, 20KLD] and 3.09 Lakh per KLD [ $<15000$  population, 3KLD].  
14<sup>th</sup> FC grants were the main source of funding, for implementing 220 FSTPs between March 2020-2023.
- FSM Strategy of Urban Maharashtra:
  - (a) Co-Treatment at own (applicable to 35 category A ULBs) /nearby STPs (applicable to 38 Category B ULBs),
  - (b) Independent FSTPs: applicable to 311 Category C ULBs.
- Approval through a single window process to fast-track implementation of independent FSTPs at scale. FSTPs were co-located with existing SWM facilities, which eased processes like co composting.
- Monitoring of implementation and operations through daily photos and videos. Translation of IEC and SoPs to Marathi and over time, even monitoring was transferred from paper to digital through chatbot integration; this helped strengthen the grievance recording system. Integration with the State Dashboard linked the outcomes to ODF-rating system and aided the respective city profiles.

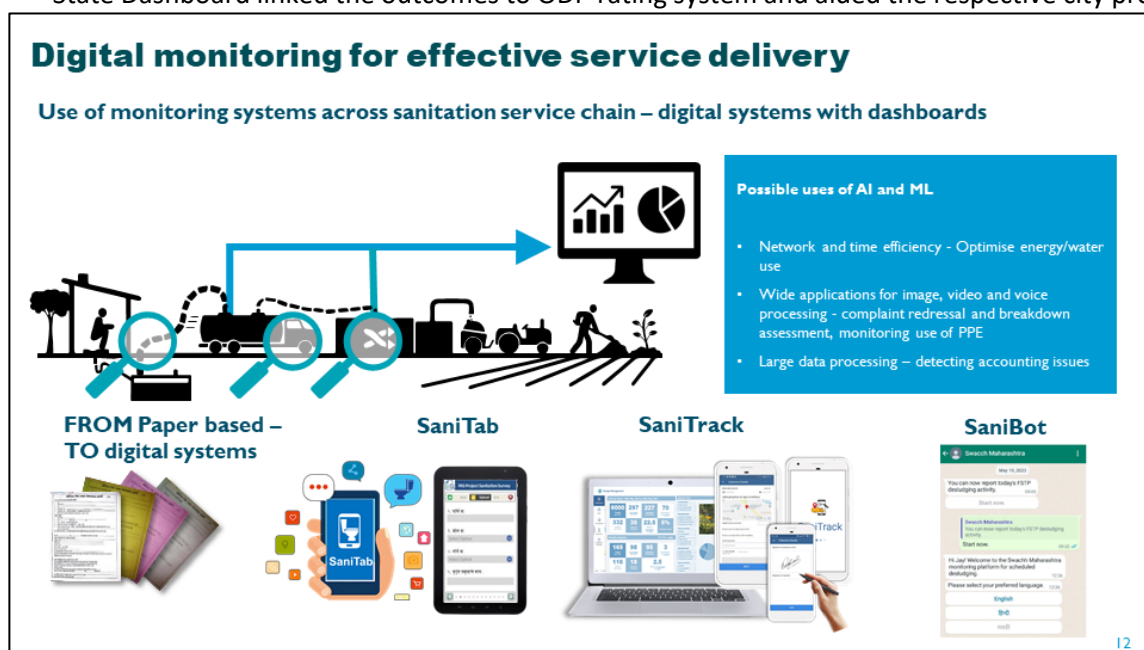


Figure 60: Fastrack implementation model for FSTP implementation in Maharashtra



Lessons learnt from the Maharashtra experience include:

- Urban-rural convergence and clustering can help optimize the project planning;
- Scheduled desludging can be beneficial and potentially maintain outcomes;
- FSM needs to be mainstreamed so that all OSS can be catered;
- Single window approval system for faster positive changes; and,
- Scalable/ replicable model for many potential beneficiary local bodies.

### Session 4: Approach & FSTP Design for Faecal sludge & Septage management in small & medium towns

SATISH KUMAR, ASSISTANT ADVISOR, CPHEEO

- Mr Satish reiterated two statements from Day 1: ‘No single solution will solve the variety of problems we have’, and the focus should be on ‘what people want to have, not what we want to do’.

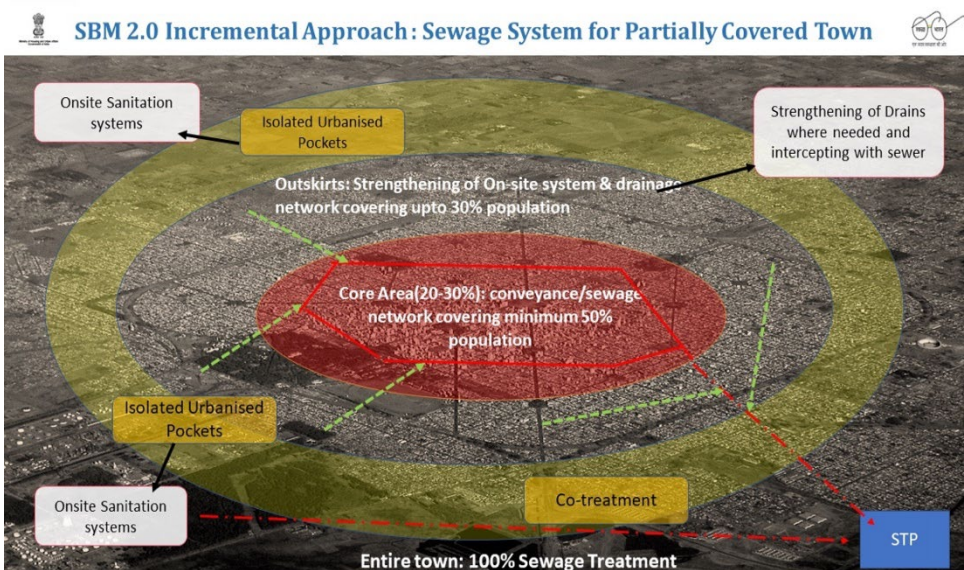


Figure 61 : Incremental Approach for Used water management: Planning a combination of centralized sewer based and decentralized solutions

- Single centralised solutions are going to be expensive, so mindful engagement of both centralised and OSS based solutions need to be carried out.



## Components of Unplanted/Planted Drying Beds

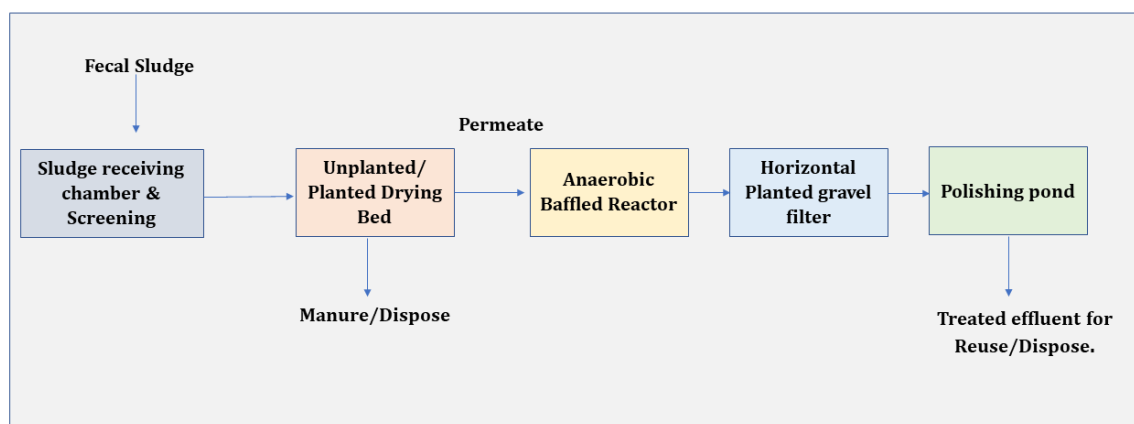


Figure 62: Approach to Designing FSTP solutions

- Issues with standalone FSTP:
  - Only 1-2 % of Used Water service chain is managed;
  - Scheduled desludging is not viable because of OSS being managed by individuals, noncompliance to IS code based septic tanks design and High desludging cost in the long run.
- OSS are suggested for fringe areas and co treatment is encouraged as much as possible.
- Each of the planning steps need to be followed to ensure the fruition of targeted outcome, as skipping steps can directly result in skipping aspects and even entire outputs that realize the intended outcomes.
- Key objectives when approaching FSTP design:
  - Safe sanitation Management;
  - Standardisation of size and design;
  - Ease the STP integration in the future; and,
  - Guidance on costing FSTPs.
- Nature-based technology options like unplanted and planted drying beds can be employed. While implementing solutions like deep row entrenchment, the lining is of the utmost importance and so is a safe distance from the groundwater table. It must not be forgotten that DRE is a temporary method for very small scale ULBs.
- Most nature-based solution designs utilise the parameter of Sludge Loading Rate and the FS characteristics. Due attention must be given to understand the local conditions and how they affect these important parameters.
- Different SoRs can be easily used along with the guidance notes/advisories to arrive at solutions and their realistic estimates.

### Discussion:

**Q.** How can GeM enhance the post purchase experience and support?

**A.** GeM already offers post purchase support like warranty obligation/support, at the same time taking feedback to continuously improve the experience of doing business.

**Q.** FSTPs are applicable to smaller cities, but smaller cities are quite unplanned, how can the sewer systems be planned for such areas?

**A.** Solutions like Deep row entrenchment are temporary or intermediate, while the region prepares itself for accommodating the growing population, and the used water so generated. The intermediate solutions need to be designed and implemented in a way that they later can easily get integrated to a longer term/permanent solution like STP. Moreover, future iterations still hold the potential of funding sewer networks too. At the same time, convergence of rural –urban infrastructure and grants are actively encouraged and formalised to ensure higher efficiency and usage of existing/shared infrastructure.

Dr V. K, Chaurasia added that the aim is to provide incremental access to safe sanitation solutions over time, while matching the availability of funds and key resources.

## Closing session of the Workshop

- Dr VK Chaurasia summarised some key ideas to be taken as way forward:
  - Land identification and acquisition for sanitation in the States;
  - Model tendering document and DPR guidance document;
  - Grey and Black water management to be judiciously planned and implemented;
  - GeM Portal improvement with due consideration of the feedback received;
  - Sewer network funding to be supported in due time; and,
  - Support to concerns raised by Jammu and Kashmir and other regions with hostile environmental conditions.
- Dr MadhuRani, extended thanks for the attention and engagement of the audience present. She went on to appreciate the quality of the presentations shown, encouraging to go through the PPT again and adopt.
  - Many Good examples like convergence of GARIMA, MUKTA schemes with sanitation initiatives in Odisha, Sanitation worker welfare scheme in Tamil Nadu, Mass approvals in case of Maharashtra are few of the cases that other states can learn from.
  - Participants praised the workshop for being articulate, inclusive of varying contexts. They appreciated the announcement of an Advisory Document which can catalyze UWM initiatives under SBM 2.0.

She went ahead to thank Govt. of TN, especially esteemed Commissioner, Hon'ble Secretary, Addl Chief Secretary, Joint commissioner for their participation and WASH Institute to organise and conduct the event well.

- Joint Commissioner appreciated the enriching experience provided by the workshop, offering variety of solutions to suit different contexts. Very dense and informative sessions and discussions were held, and feedback is very welcome to improve on the following such events. The Commissioner also extended thanks to WASH Institute for organising and conducting the programme to its successful conclusion.
- Mr Sasanka requested to exercise patience while listening to each other, as that will help clarifying the true nature of discussion and where each one is coming from. Even with inclinations and bias, everybody present here is trying to achieve the same outcome, thus we must be open to any method that brings us closer to realising and sustain our targeted outcome.  
Peer-to-peer learning is the best format, and the experience has been quite rewarding. While the previous iteration of the Workshop was more of an envisioning exercise, this iteration has seen a quantum jump to accelerating multi-faceted sanitation initiatives, which is commendable.  
Mr Sasanka appreciated the level of detail Dr Chaurasia brought in to the table that enhanced the overall experience of the workshop. He extended his thanks to Government of Tamil Nadu

and representatives/officials who have participated and supported many aspects of the workshop. All the senior officials and eminent speakers to conduct enriching presentations and discussions, NFSSM Alliance members, moderators, PMU team, back-end team of WASH institute.

Mr Sasanka added due gratitude to the donor agencies USAID and BMGF, as the program wouldn't be possible without their support through knowledge sharing and peer learning.

**Annexure:**

**A. Field Visits**

**BIO CNG – 100 TPD – GREATER CHENNAI CORPORATION SOLID WASTE MANAGEMENT**

India's journey towards achieving Net Zero Emissions necessitates robust innovations from Governments, Local Bodies, Industries, Institutions, and Citizens across diverse sectors. In alignment with this objective, the Greater Chennai Corporation (GCC) is actively pursuing various innovative ideas, and one standout initiative is the establishment of a circular economy for biodegradable organic waste.

In collaboration with M/s. Srinivas Waste Management Services Private Limited (SWMS) under a Public-Private Partnership (PPP) model, GCC has undertaken the collection of biodegradable organic waste from Bulk Waste Generators (BWG) to generate Bio-CNG. This transformative process not only addresses the waste management issue but also contributes to reducing carbon emissions associated with conventional fossil fuels.

**BIO CNG - 100 TPD**



SWMS has erected a state-of-the-art Waste to Energy (W2E) plant with a capacity to process 100 Tons Per Day (TPD) of Municipal Solid Waste. Operational since November 2021, this plant, located near Gengureddy subway, Chetpet in Zone VIII, efficiently converts waste from approximately 500 BWGs, including Restaurants, Markets, Kitchens, Apartments, Marriage Halls, and the prominent Koyambedu market.

Through its logistics arm, BIGBIN, SWMS ensures the daily collection of waste from these diverse sources. The resulting purified Bio-CNG, comprising more than 90-95% Methane (CH<sub>4</sub>), is compressed and reintroduced to key Restaurants via cylinders. This Bio-CNG serves as a sustainable alternative to LPG, offering both economic and operational efficiency.

In addition to catering to Restaurants, SWMS extends its Bio-CNG supply to major entities such as GAIL and AG&P Pratham for their automobile gas stations, further expanding the impact of this eco-friendly initiative.

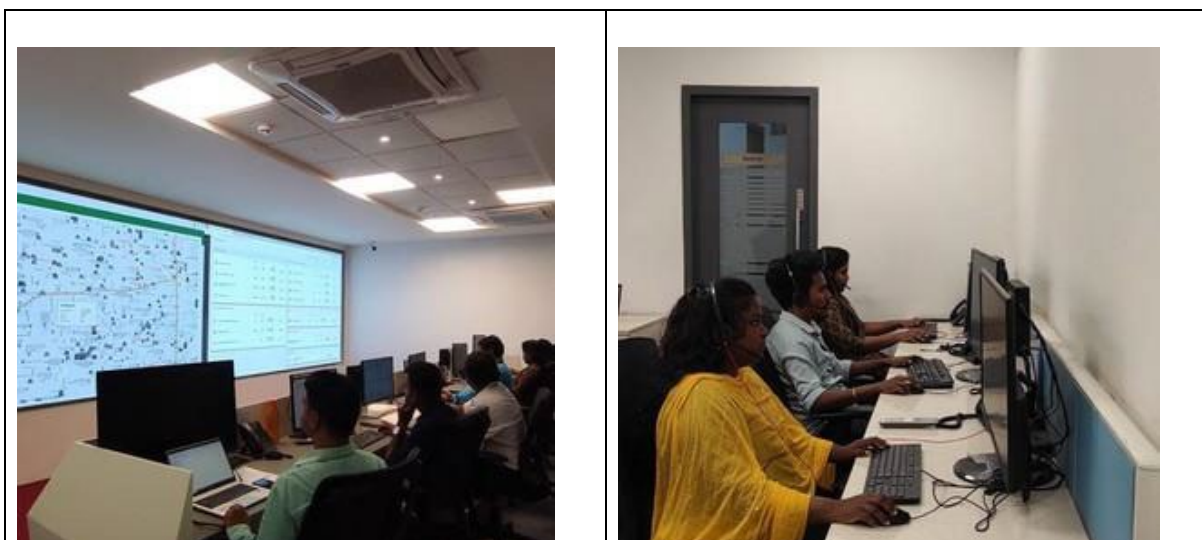
This commendable and unique undertaking by GCC not only facilitates the creation of a Circular Economy for Chennai's Restaurants but also actively contributes to the dual objectives of effective organic waste management and the reduction of carbon emissions traditionally associated with fossil fuels. This holistic approach underscores the GCC's commitment to environmental sustainability and innovative solutions for waste-to-energy conversion.

#### **URBASER SUMEET – CALL CENTER**

Urbaser Sumeet is dedicated to efficiently addressing public grievances received through various channels, including the Public Grievances Redressal Systems of Greater Chennai Corporation. Our multi-faceted approach involves monitoring complaints through call center phone numbers, citizen apps, newspapers, social media, and our diligent ground staff.

Upon receiving a complaint, our system records it, assigning a unique reference number for easy tracking. The complaint is then directed to Urbaser Sumeet's Zonal Operations team, who liaise with the relevant Ward/Division. Photographic evidence accompanies the complaint and is forwarded to the Conservancy Inspector for verification and closure. Our commitment is reflected in our impressive turnaround time, with complaints typically resolved in under 6 hours on average.

The call center team continually evaluates complaints, identifying recurring issues for escalation to the appropriate authorities to devise permanent solutions. Concurrently, our Information, Education, and Communication (IEC) team stays updated on the nature of complaints, enabling them to discern behavioral patterns and incorporate corrective measures into future awareness campaigns.





## **CALL CENTER WORK PROCESS**

**Mode of Complaints:** Complaints are received through various channels, including PGR, SBM, SUS APP, social media, newspapers, and phone calls.

**Complaint Screening Process:** Our agents meticulously review complaint details, ensuring they fall within our purview. Verification is done to confirm whether the complaint is within our operational limits.

**Escalation Process:** Once the complaint details are identified, they are forwarded to the relevant group. Agents initiate a follow-up call to supervisors to confirm receipt and discuss any challenges faced by the operations team.

**Follow-up Process:** Agents, based on predetermined timelines, follow up with supervisors. In cases where the operations team encounters challenges, agents provide guidance. If a complaint falls outside our scope, a photo is collected from the supervisor and forwarded to the relevant department.

## **GREATER CHENNAI CORPORATION: Biomining of Perungudi Dump Site**



The Perungudi Dump site, spanning 225.16 acres in the southern part of Chennai, has served as a landfill for over 35 years, receiving solid wastes from Zones 9 to 15. The cumulative volume of legacy waste on-site is approximately 30.62 lakhs cubic meters. In a proactive move towards sustainable waste management, the Greater Chennai Corporation has embarked on the reclamation of the Perungudi landfill through the bio-mining process.

Under the Swachh Bharat Mission scheme, the government granted administrative sanction for this ambitious project, allocating a budget of Rs. 350.64 crore (as per G.O (D) on 334 dt: 07/10/2020). The bio-mining process is currently underway and is slated for completion within three years. Remarkably, 76% of the legacy waste, equivalent to around 23.38 lakhs cubic meters, has already been processed. The anticipated completion date for the Bio-mining project is June 2024. The Centre for Environmental Science at Anna University serves as the Project Management Consultancy (PMC) for this transformative initiative.



Upon the project's completion, various cutting-edge processing facilities are planned, including a Bio-CNG plant with a capacity of 500 Tons Per Day (TPD), a Windrow compost yard capable of processing 500 TPD of wet waste, and an Automated Material Recovery Facility managing 1200 TPD of dry waste. These facilities will occupy a total of 44.00 acres of land. Additionally, an Eco-Park/Miyawaki Forest is proposed, covering 100 acres, further enhancing the sustainable utilization of the reclaimed area.

To ensure meticulous planning and execution, the Greater Chennai Corporation has engaged a consultant agency through TNUIFSL for the preparation of a detailed Project/Feasibility Report (DPR/DFR) for the comprehensive Solid Waste Management Projects outlined above. This strategic approach underscores the city's commitment to addressing environmental challenges, transforming a longstanding landfill into a model of sustainable waste management and eco-friendly urban development.

With a sprawling area of 426 sq.km and a population of 11,933,000, the Greater Chennai Corporation (GCC) grapples with the challenge of managing 6150 MT of municipal solid waste. In a visionary move towards achieving zero garbage at landfill sites, the GCC has undertaken projects to process the significant portion of wet waste, constituting 51% of the total waste generated. This wet waste is efficiently converted into manure and Bio-Gas, particularly focusing on food waste.

Among the components of wet waste, garden waste and tender coconuts present a unique opportunity for sustainable utilization. To meet the goal of sending zero waste to landfill sites, the GCC has implemented a strategy to process garden waste and tender coconuts, converting them into fuel for furnaces in the form of briquettes from garden waste and coir and manure from processed tender coconuts.

To execute this initiative, the GCC has partnered with M/s. Westart Communication India Pvt. Ltd., employing the Design – Built – Finance – Operate & Transfer (DBFOT) Model under a Public-Private Partnership (PPP) arrangement for a 20-year contract. Five designated locations in Chennai have been earmarked for the processing facilities, with each site covering an area of about 1500 sq.m. The Public-Private Partnership model involves the collection of land use charges at the rate of Rs. 10 per sq.m. from the Concessionaire. The GCC, in turn, has paid a processing fee of Rs. 660 per MT.

The processing of garden waste cum tender coconut at the designated facility, including the PDG site, commenced on December 20, 2021. The facility is tasked with efficiently processing garden waste and tender coconuts, subsequently disposing of the processed materials such as briquettes, coir, and pith for utilization as fuel and manure.

With a sprawling area of 426 sq.km and a population of 11,933,000, the Greater Chennai Corporation (GCC) grapples with the challenge of managing 6150 MT of municipal solid waste. In a visionary move towards achieving zero garbage at landfill sites, the GCC has undertaken projects to process the

significant portion of wet waste, constituting 51% of the total waste generated. This wet waste is efficiently converted into manure and Bio-Gas, particularly focusing on food waste.

Among the components of wet waste, garden waste and tender coconuts present a unique opportunity for sustainable utilization. To meet the goal of sending zero waste to landfill sites, the GCC has implemented a strategy to process garden waste and tender coconuts, converting them into fuel for furnaces in the form of briquettes from garden waste and coir and manure from processed tender coconuts.

To execute this initiative, the GCC has partnered with M/s. Westart Communication India Pvt. Ltd., employing the Design – Built – Finance – Operate & Transfer (DBFOT) Model under a Public-Private Partnership (PPP) arrangement for a 20-year contract. Five designated locations in Chennai have been earmarked for the processing facilities, with each site covering an area of about 1500 sq.m. The Public-Private Partnership model involves the collection of land use charges at the rate of Rs. 10 per sq.m. from the Concessionaire. The GCC, in turn, has paid a processing fee of Rs. 660 per MT.

The processing of garden waste cum tender coconut at the designated facility, including the PDG site, commenced on December 20, 2021. The facility is tasked with efficiently processing garden waste and tender coconuts, subsequently disposing of the processed materials such as briquettes, coir, and pith for utilization as fuel and manure.

#### NESAPAKKAM SEWAGE TREATMENT PLANT



The Nesapakkam Sewage Treatment Plant (STP) serves as a vital facility in managing the wastewater from the South West part of Chennai City, catering to the needs of approximately 16 lakhs people residing in areas like K.K.Nagar, Saidapet, Jafferakhanpet, M.G.R.Nagar, CIT Nagar, Ashok Nagar, Valasaravakkam, Ekkatuthangal, Jaibalaji Nagar, West Mambalam, and part of Kodampakkam. This integral component of Zone IV of the Chennai City Sewerage System responsibly discharges treated effluent into the Adyar River.

The Nesapakkam STP efficiently processes 95 to 100 Million Liters per Day (MLD) of raw sewage, facilitated by 36 Sewage Pump Stations strategically located across the serviced areas.

The current infrastructure at the Nesapakkam STP includes four Sewage Treatment Plants with capacities of 23MLD, 40MLD, 54MLD, and 50MLD, commissioned in 1974, 2006, 2014, and 2023, respectively. Additionally, a 10MLD Tertiary Treatment Plant (TTUF) became operational in 2022,

enhancing the overall treatment capabilities. These plants employ a variety of advanced processes, including the Activated Sludge Process, Moving Bed Biofilm Reactor, and Sequential Batch Reactor. Notably, the STP integrates a sustainable approach by generating power through a Biogas Engine.

The Nesapakkam STP spans an extensive area of 45 acres, reflecting its scale and significance in addressing the wastewater management needs of the densely populated South West part of Chennai City. The incorporation of state-of-the-art technologies and environmentally conscious practices aligns with the evolving demands of urban sewage treatment.

#### KOYAMBEDU SEWAGE TREATMENT PLANT



The Koyambedu Sewage Treatment Plant (STP) plays a pivotal role in processing raw sewage from the central part of Chennai City, serving a population of approximately 21 lakhs across key areas such as Anna Nagar-B, Mogappair, Korattur, Arumbakkam (East), Virugambakkam, Saligramam, Koyambedu Market, Kodambakkam-A, Tnagar, Gandhi Nagar, Ganga Nagar, Arumbakkam (West), and Kulasekarapuram. As part of Zone III of the Chennai City Sewerage System, the treated effluent is responsibly discharged into the Cooum River.

The Koyambedu STP receives a substantial flow of raw sewage, ranging from 125 to 135 Million Liters per Day (MLD), through 33 Sewage Pump Stations. These stations facilitate the effective servicing of densely populated areas.

As of the present configuration, the Koyambedu STP encompasses three distinct Sewage Treatment Plants, each with varying capacities - 34MLD, 60MLD, and 120MLD. These facilities were strategically constructed and commissioned in 1978, 2005, and 2015, respectively. Additionally, a 45MLD Tertiary Treatment Plant (TTRO) was added and commissioned in 2019 to further enhance the treatment processes.

The treatment methodologies employed at the Koyambedu STP involve sophisticated processes such as the Activated Sludge Process and Moving Bed Biofilm Reactor. Notably, the STP integrates a unique aspect of sustainability by incorporating power generation through a Biogas Engine.

The sprawling Koyambedu STP site covers an extensive area of 73 acres, reflecting its scale and importance in managing the wastewater generated by a significant portion of the city's population. The STP's commitment to advanced treatment processes and environmentally conscious practices aligns with the evolving needs of urban sewage management.

B. Photos from the Workshop



The Tamil Thai Vazhthu and the National Anthem conducted at the initiation program



Lamplighting ceremony lead by the honorable Smt Roop Mishra, JS, National Mission Director-SBM, MoHUA, Smt Madhu Rani Teotia, Director SBM U; Shri VK Chaurasia, Jt Adiser, CPHEEO; Shri TN Simran, Jt CMA, GoTN; Shri Rajesh Gupta, Director emobility infrastructure, NITI Ayog; Prof. Srinivas Chary, ASCI; Shri AK Pillai, Executive Director, WASH Institute;



Glimpses from the opening ceremony with initiation speeches from the opening chair of dignitaries



Smt Mishra, Joint Secretary and National Mission Director addressing the workshop



Smt Teotia, Director SBM U, addressing the workshop



J Radhakrishnan, IAS, Addl Chief Secretary, GCC and D Kartikeyan, IAS, Principal Secretary, Municipal Administration and Water Supply, GoTN



Dr Gupta, NITI Ayog and Prof Chary delivering sessions on Job creation in SBMU and Financing SBMU 2.0 implementation and O&M



Proceedings of  
National Capacity Building Workshop 2.0 on World Toilet Day-2023 in Chennai, Tamil Nadu  
ANNEXURES



Above: Mr Velidandla, WASH-I and Mr Babu, GCC presenting on findings from assessment of various PTs and CTs in 100+ULBs and managing public convenience in GCC.

Below: Mr Sahoo, NULM, Odisha; Ar. Mehta, CoA; Mr. Amit, NBCC representative; and Mr. Reddy, Addl MD, SBM-U, GoTelangana presenting on the theme of Access and O&M of toilets(Clockwise from top left)



Proceedings of  
National Capacity Building Workshop 2.0 on World Toilet Day-2023 in Chennai, Tamil Nadu  
ANNEXURES



Above: The workshop facilitated Q&A sessions inviting many more discussion with experts and dignitaries.

Below: Mr. Simran, JtCMA, GoTN; Mr. Krishna, Director KAM-AVIDA, Mr. Mahapatra, EnC, OWSSB(moderating the sessions); Mr. Singh, MD-NSKFDC on safe sanitation for All through mechanisation of septic system operations(Clockwise from top left)

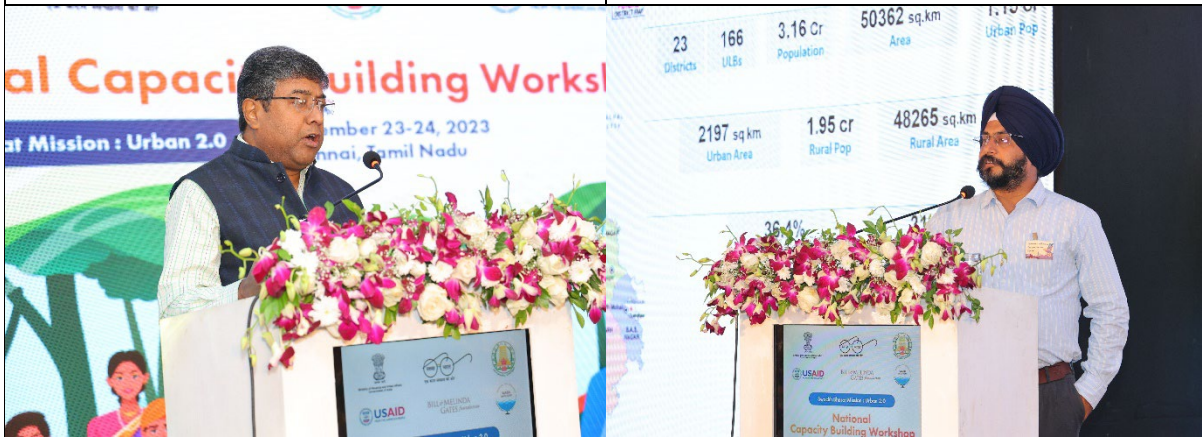


Proceedings of  
National Capacity Building Workshop 2.0 on World Toilet Day-2023 in Chennai, Tamil Nadu  
ANNEXURES



Mr. Chandramowliswar, Dy. Commissioner, Tirupati on Manhole to Machinehole transition

Mr N. A. Verkar, Municipal Commissioner, Navi Mumbai on Experience with mechanising Ops



Day 2 of the workshop initiated with experience sharing from the states of Punjab(Mr S Singh), Himachal Pradesh(Mr M Gupta), Odisha (Mr R Sahoo), Maharashtra(Mr M Chaudhary) and Andhra Pradesh(Mr PA Rao) presented by respective State representatives from various departments.

Proceedings of  
National Capacity Building Workshop 2.0 on World Toilet Day-2023 in Chennai, Tamil Nadu  
ANNEXURES



Proceedings of  
National Capacity Building Workshop 2.0 on World Toilet Day-2023 in Chennai, Tamil Nadu  
ANNEXURES



Proceedings of  
National Capacity Building Workshop 2.0 on World Toilet Day-2023 in Chennai, Tamil Nadu  
ANNEXURES



Mr Chirag Patel, Mission Director SBM U GoM

Mr Chirag Patel, CEPT University on technical aspects of Maharashtra FSM



Mr Satish on approach for planning and designing FSM based on the announced Advisory from CPHEEO, which invited discussions with participants



A short feedback from participants as encouraged by Smt. Teotia, Director SBMU, followed by closing with due acknowledgements by Shri Velidandla, Director (Govt. Advisory), WASH Institute.



Closing session with key takeaways on the way forward from Smt. Teotia, Director SBMU, followed by vote of thanks by DR Chaurasia, Jt Advisor, CPHEEO and finally, conclusion of the workshop by Shri Velidandla, Director(Govt. Advisory), WASH Institute



*Proceedings of  
National Capacity Building Workshop 2.0 on World Toilet Day-2023 in Chennai, Tamil Nadu  
ANNEXURES*



**C. List of Participants:**

<b>Participant Name</b>	<b>Gender</b>	<b>Participant Email ID:</b>	<b>Designation:</b>	<b>Department :</b>	<b>ULB/Town</b>
Prof. V Srinivas Chary	M	schary@asci.org.in	Director of the Centre for Urban Governance, Environment, Energy and Infrastructure Development	Administrative Staff College of India	-
Gaurav Bhansal	M	gaurav.bansal2012@gmail.com	Speaker	-	-
P. Anand Rao	M	encphed@yahoo.co.in	Engineer-in-Chief, Public Health	PHMED	Andhra Pradesh
M. Prabhakar Rao	M	cevmc@yahoo.com	Chief Engineer	ULB	Andhra Pradesh
N. Kiran Kumar	M		Chief Operating Officer	Swachha Andhra Corporation	Andhra Pradesh
S. Suhasini	F		EE	Swachha Andhra Corporation	Andhra Pradesh
Yo Talum	M	yotalum@gmail.com	Environmental Specialist	ULB	Arunachal Pradesh
Er. Juntum Potom	M	yotalum@gmail.com	AE	AE	Arunachal Pradesh
Anjan Kumar Chakrabarty	M	anjan.kashyap28@gmail.com	City Project Officer, SBM(U)	Swachh Bharat Mission (Urban), Assam	Jorhat Municipal Board
Priyam Neog	F	priyamneog23@gmail.com	Environmental engineer	Swachh Bharat Mission urban	Guwahati Municipal Corporation
Priyam Neog	F	priyamneog23@gmail.com	Environmental Engineer	GMC	Guwahati

*Proceedings of  
National Capacity Building Workshop 2.0 on World Toilet Day-2023 in Chennai, Tamil Nadu  
ANNEXURES*

Sri Shashi Bhushan Prasad	M		Additional Director Cum Nodal Officer (SBM)	Urban Development and Housing Department	Bihar
Sri Manish Kumar	M		Deputy Project Director cum Asst. Engineer, BUIDCo	Urban Development and Housing Department	Bihar
Sri Zahid Ahmad	M		Deputy Project Director cum Asst. Engineer, BUIDCo	Urban Development and Housing Department	Bihar
Sri Apurva Rai	M		Team Leader, SBM-PMU	Urban Development and Housing Department	Bihar
Harjit Singh	M	sephmcc-chd@nic.in	Superintending Engineer(Public Health), Municipal Corporation, Chandigarh	ULB	Chandigarh
Gaurav Pal	M	gpalenginner@gmail.com	SDE(Public Health), Municipal Corporation Chandigarh	ULB	Chandigarh
Ramesh Kumar Singh	M	rajparva@gmail.com	Project Manager cum Superintendent Engineer, State Urban Development Agency	State Urban Development Agency	Chattisgarh
Jatindra Singh	M	jatindra.civil@gmail.com	Deputy Project Manager, State Urban	State Urban Development Agency	Chattisgarh

*Proceedings of  
National Capacity Building Workshop 2.0 on World Toilet Day-2023 in Chennai, Tamil Nadu  
ANNEXURES*

			Development Agency		
Suryakiran Tiwari	F	aceo.sudacg@gmail.com	Additional Chief Executive Officer, State Urban Development Agency	Urban Development and Administration Department Govt. of Chhattisgarh	Chhattisgarh
Nitin Gupta	M	nitin@washinstitute.org	IT Officer	WASHi	Delhi
Anisha Dey	F	anisha@washinstitute.org	CB Specialist	US Aid Skill Building	WASH Institute
Gowthami Sai Dubagunta	F	gowthami@washinstitute.org	WASH Planning Specialist	WASH	Delhi
V.K. Chaurasia	M	vk.chaurasia@nic.in	Joint Advisor CPHEEO	CPHEEO	Delhi
Pooja Ravi	F		Consultant NPMU	NPMU	Delhi
Sirisha Darbha	F		Consultant NPMU	NPMU	Delhi
Praveen Chature	F	praveenchature@washinstitute.org	WW & FSSM Specialist	WASHi	Delhi
Ashish Sharma	M	ashish@washinstitute.org	Sanitation & FSSM Specialist	WASHi	Delhi
Ariun Sharma	M	arjun.s@washinstitute.org	WW Specialist	WASHi	Delhi
Sanjay Raut	M		Consultant RITES	RITES	Delhi
R.N. Jindal	M		Consultant RITES	RITES	Delhi
A.V. Muralidharan	M	dceo-avm@gem.gov.in	DCEO-GeM	GeM	Delhi
Vivek Pandey	M	vivek.pandey@skyquestt.com	BMGF	BMGF	Delhi

*Proceedings of  
National Capacity Building Workshop 2.0 on World Toilet Day-2023 in Chennai, Tamil Nadu  
ANNEXURES*

Kristy Saikia	F	kristy@washinstitute.org	Project Associate, MEL	WASH Institute	Delhi
Dr. Arumugam Kalimuthu	M	akalimuthu@washinstitute.org	Executive Director	WASH Institute	Delhi
Madhu Rani Teotia	F		Director SBM-IV	SBM Division	Delhi
Sathish Kumar	M		Assistant Advisor CPHEEO	CPHEEO	Delhi
Prabhat Kumar Singh	M		Managing Director	National Safai Karamcharis Finance and Development Corporation	Delhi
Rajesh Gupta	M		Director, NITI Aayog	NITI Aayog	Delhi
P R Mehta	M	prmehta@dag.com	Speaker	COA	Delhi
Premendra Raj Mehta	M	prmehta@dag.com	Representative of Council of Architecture	Program	Delhi
Mr. Pradeep Rane	M	pradeeprane91@yahoo.co.in	Junior Project Engineer	Goa State Urban Development Agency	Goa
Mr. Sankalp Parab	M	sank090996@gmail.com	Junior Project Engineer	Goa State Urban Development Agency	Goa
Yashasvi Mahendrabhai Bhatt	M	yashmbhatt@gmail.com	Manager (Tech)	NA	Gujarat
Biren Bhanuprasad Dalal	M	bbdalal@tce.co.in	Team Leader	PMU, AMRUT 2.0	Gujarat

*Proceedings of  
National Capacity Building Workshop 2.0 on World Toilet Day-2023 in Chennai, Tamil Nadu  
ANNEXURES*

Sunder Sheoran	M	eomcnarnaul1@gmail.com	EE, MC, Narnaul	ULB	Haryana
Ankit Vashisth	M	mctohana@rediffmail.com	EE, MC, Tohana	ULB	Haryana
Virendra Thakur	M	cepmuiph@gmail.com	Chief Engineer	Jal Shakti Vibhag, PMU, Mandi	Himachal Pradesh
Mandeep Gupta	M	jsvdivisionrajgarh98@gmail.com	EE	Jal Shakti Vibhag, Rajgarh	Himachal Pradesh
Rajendra Chauhan	M	raj74.chauhan@yahoo.com	Project Officer O/o Mission Director SBM	Urban Development	Himachal Pradesh
Urvashi Walia	F	mcnerchowk@gmail.com	Executive Officer	MC Ner Chowk	Himachal Pradesh
Mayank Verma	M	mayankshimla@gmail.com	M7E Expert	SBM 2.0, PMU, Urban Development	Himachal Pradesh
Vijay Singh Manhas	M		EE	S&D Division West	J&K
Fayaz Ahmed Mehta	M		EE	S&D Division 1st Srinagar	J&K
Shri Suraj Oraon	M	ccbpjharkhand@gmail.com	Assistant Director SUDA, UDHD, Jharkhand	SUDA, UDHD, Jharkhand	Jharkhand
Shri Ravi Prakash	M	jnacjsr@gmail.com	Deputy Municipal Commissioner, JNAC	ULB, Jharkhand	Jharkhand
Shri Sandeep Paswan	M	executiveofficer.chirkunda@gmail.com	Executive Officer, Chirkunda Nagar Panchayat	ULB, Chirkunda Nagar Panchayat	Jharkhand
Sheik Mohammed Shibl	M	sheikmohammed@washinstitute.org	FSSM Specialist	WASH Institute	Kerala

*Proceedings of  
National Capacity Building Workshop 2.0 on World Toilet Day-2023 in Chennai, Tamil Nadu  
ANNEXURES*

Roopa Anand Rao	F	roopa@washinstitute.org	Deputy Project Director	Capacity Building	Bangalore
Rajesh Pai	M	rajesh@washinstitute.org	Director - Capacity Building	Capacity Building	Wash Institute
Karthik R	M	karthik@washinstitute.org	Project Manager	Technical Team	Bangalore
N Srinivas	M	nsrinivas@kuidfc.com	Executive Director Technical	KUIDFC, GoK	Karnataka
C Karthik Keyan	M	c.karthik2008@gmail.com	AEE	KUIDFC, GoK	Karnataka
Archana B C	F	swmcelldma@gmail.com	Enviornmental engineer	DMA GoK	Karnataka
Kiran Chandra Muthu PM	M	swmcelldma@gmail.com	Enviornmental Engineer	DMA GoK	Karnataka
Rishikesh Rath	M	rishikesh.plan@gmail.com	Documentation/ Reporting	WASH Institute	WASH Institute
Sasanka Velidandla	M	sasanka@washinstitute.org	Director - Government Advisory & Talent Management • Program and Management	Advisory	WASHi
Vipasyana Reddy	F	vipasyana.reddy@egovernments.org	Senior Program Manager	eGov Foundation	Bengaluru
Prof. Sadashiva Murthy BM	M	hodenv@sjce.ac.in	HOD Environmental Engineering	Sri Jayachamarajendra College of Engineering	Mysore
Shri Mruthyunjaya K S	M		Presenter - Assistant Executive Engineer (Environment) and SBM Nodal officer	Mysore City Corporation	Mysore

*Proceedings of  
National Capacity Building Workshop 2.0 on World Toilet Day-2023 in Chennai, Tamil Nadu  
ANNEXURES*

Sridhar Selvaraj	M	sridhar@washinstitute.org	Capacity Building Expert	USAID	Trivandrum
Devika Hemalatha Devi	F	devika.hemalatha@washinstitute.org	Wastewater Specialist	WASH Institute (Kerala TSU for Suchitwa Mission)	Thiruvananthapuram
Akhilesh Ramesh	M	akhilesh@washinstitute.org	IEC Specialist	WASHi	Kerala
Swarna P	F	swarna@washinstitute.org	WW Specialist	WASHi	Kerala
Sooraj Sukumar	M		Senior Engineer	Kerala Water Authority	Kerala
Hari.N.R	M		Executive Engineer	Kerala Water Authority	Kerala
Reshmi.P.S	F		LWM Expert	Suchitwa Mission	Kerala
Tsering Angchuk	M		EE	Igoo, Phey Division Leh	Ladakh
Shafaqat Ali Khan	M		EE	Municipal Committee, Kargil	Ladakh
Stanzin Rabgais	M		EO	Municipal Committee, Leh	Ladakh
Furman Ali	M		AEE	PHE Department, Kargil	Ladakh
Sandeep Shrivastava	M	commburhanpur@mpurban.gov.in	Commissioner	Burhanpur Municipal Corporation	Madhya Pradesh
Rakesh Rawat	M	rrawat@mpurban.gov.in	Superintending Engineer	Directorate of Urban Administration and Development	Madhya Pradesh

*Proceedings of  
National Capacity Building Workshop 2.0 on World Toilet Day-2023 in Chennai, Tamil Nadu  
ANNEXURES*

Devendra Chauhan	M	devendra@mpurban.gov.in	Commissioner of Municipal Corporation MP	Urban Administration Department	Madhya Pradesh
Navnath Wath	M	director.smau@gmail.com	State Mission Director	SMM Urban Mumbai	Maharashtra
Mahesh Chaudhari	M	director.smau@gmail.com	Deputy Commissioner	SMM Urban Mumbai	Maharashtra
Yashwant Munde	M	yash028munde@gmail.com	Water Supply Engineer	Lonavala Municipal Council, Dist. Pune	Maharashtra
Mr. Onkar Ghusale	M		UWM Expert	KPMG	Maharashtra
Dr. Babasaheb Rajale	M		DMC (Solid Waste Mgmt.) (Director-Swachha Maharashtra Abhiyan) Disaster Management, (Security Dept.)	Navi Mumbai Municipal Corporation	Mumbai
Shri Sandeep Sheth	M		Manager Sustainability Projects, Suvidha Project Lead	Hindustan Unilever Ltd	Mumbai
Mr. Rajesh Narvekar	M	commissioner@nmmc.gov.in	Municipal Commissioner	Urban Local Body	Navi Mumbai Municipal Corporation
Mr. Shirish Aradwad	M	addl_ceme@nmmc.gov.in	Additional City Engineer	City Engineer Department	Navi Mumbai Municipal Corporation
Mr. Ankush Dhingra	M	ankushdhingra@kpmg.com	Associate Director	HHSS	Navi Mumbai Municipal Corporation
Chirag Patel	M	Chirag.patel@cept.ac.in	Senior Research Associate	CWAS	Mumbai



*Proceedings of  
National Capacity Building Workshop 2.0 on World Toilet Day-2023 in Chennai, Tamil Nadu  
ANNEXURES*

Sandeep Dhamne	M	sabdeep.dhamne@feedbackinfra.com	Director Feedback infra pvt	Water	Maharashtra
Sharath Chandra Arroju	M	sharathchandraarroju@gmail.com	State Mission Director	SBM (MUDA)	Manipur
M. Surjit Singh	M	rudrmomo@gmail.com	Executive Officer	Jiribam Municipal Council	Manipur
Prasanta Wahengbam	M	prasantawaheng@gmail.com	EE	PDA Manipur	Manipur
Tarnajit Okram	M	udmanipur@gmail.com	Nodal Officer-UWM	State Mission Directorate-SBM (MUDA)	Manipur
Farprey Marak	M	farpreymarak.fm@gmail.com	Assistant Engineer	Williamnagar Municipal Board	Meghalaya
Cherick Egan A Sangma	M	cherick123sangma456@gmail.com	Junior Engineer	Tura Municipal Board	Meghalaya
Malsawmzuala	M	sbmudpa@gmail.com	Joint Director, UD&PA & State Nodal Officer, SBM(U)	Urban Development Poverty Alleviation Department	Mizoram
J. Laldinglian a	M	sbmudpa@gmail.com	Assistant Engineer (UWM), UD&PA	Urban Development & Poverty Alleviation Department	Mizoram
K. Vanlalruat a	M	sbmudpa@gmail.com	Asst. Municipal Commissioner, Aizawl Municipal Corporation (AMC)	Aizawl ULB	Mizoram
praveen n	M	praveen.n@washinstitute.org	program manager	Capacity building	NA

*Proceedings of  
National Capacity Building Workshop 2.0 on World Toilet Day-2023 in Chennai, Tamil Nadu  
ANNEXURES*

ST Ravishankar	M	ravishankar@washinstitute.org	Sr. program Manager, Technical (planning and engineering)	Technical	New Delhi
Dr Akanksha verma	F	akanksha@washinstitute.org	training coordinator	capacity building	New Delhi-WASHi
Prasanta Kumar Mohapatra	M	prasanta.k.mohapatra@gmail.com	Engineer-in-Chief	Odisha Water Supply & Sewerage Board	Odisha
Rabindra Kumar Sahu	M	rabindrakumarsahu123@gmail.com	Additional Secretary to Govt. & Additional Mission Director, SBM (Urban)	Housing & Urban Development, Govt. of Odisha	Odisha
G. Balaji	M	Pon.balaji@rediffmail.com	Junior Engineer, Public health division	Public works department	Pondicherry
V. Raju	M	rajuvelu21@gmail.com	Junior Engineer	Public works department	Pondicherry
Aparna Sursarla	F	Susarla.aparna@gmail.com	Solid waste management expert	Local Administration department	Pondicherry
A. Hemapriya	F	Hems.0612@gmail.com	IT cum MIS Expert	Local Administration department	Pondicherry
Nambi Rajan	M	nambirajan05011980@gmail.com	AE Civil	Port Blair Municipal council	Port Blair
Ashis Mandal	M	ashis.jemc@gmail.com	JE Civil	Port Blair Municipal Council	Port Blair
M Krishna	M	mk@kam-avida.com	Speaker	KAM-AVIDA ENVIRO	Hinjewadi

*Proceedings of  
National Capacity Building Workshop 2.0 on World Toilet Day-2023 in Chennai, Tamil Nadu  
ANNEXURES*

				ENGINEERS PVT. LTD.	
Pankaj Jain	M		EE	PWSSB	Punjab
Satwinder Singh Dhillon	M		EE	PWSSB	Punjab
Pradeep Chautani	M		Sub Divisional Engineer	PWSSB	Punjab
Harpreet Singh	M	xenhqlg35@gmail.com	EE	Department of Local Government	Punjab
K C Agarwal	M		PMU Expert	PMU SBM	Rajasthan
Jigme Wangchuk Bhutia	M	jigme.wangchuk@sikkim. gov.in	SBM Mission director	UDD	Sikkim
Sameer Rai	M	architect.sameer@sikkim .gov.in	Joint Chief Town Planner	UDD	Sikkim
Suman Shanker	M	sumanshanker151284@g mail.com	Divisional Engineer	UDD	Sikkim
P Nagamalle shwar Rao	M	knrcmnr@rediffmail.com	SE	Karimnagar Municipal corporation	Telangana
G. Vijaya Bhasker Reddy	M	eephmbnr@gmail.com	EE	PH Division, Mahbubnag ar	Telangana
Sri. G. Satyanara yana	M	eephnlg@yahoo.co.in	Executive Engineer	PH Division, Nalgonda	Telangana
P. Srinivas Reddy	M	rdhyderabad@gmail.com	RDMA, Hyderabad	Municipal Administrati on Department	Telangana
Dr M Sneha Latha	F	msneha@asci.org.in	Speaker: Assistant Professor	ASCI	Hyderabad

*Proceedings of  
National Capacity Building Workshop 2.0 on World Toilet Day-2023 in Chennai, Tamil Nadu  
ANNEXURES*

Mr Zameer Ahmed	M	dt@ncpeinfra.org.in	Director	NCPE INFRASTRUCTURE INDIA PRIVATE LIMITED	Hyderabad
Dr SM Subhani	M	md@ncpeinfra.org.in	Managing Director	NCPE INFRASTRUCTURE INDIA PRIVATE LIMITED	Hyderabad
Prof Jafari Ashfaque	M	md@ncpeinfra.org.in	Dean Academics	MJCET	Hyderabad
Dwipanjan Debnath	M		EE, Division II, Agartala Municipal Corporation	Govt. of Tripura, Directorate of Urban Development	Tripura
Biyaj Sinha	M		CEO, Khowai Municipal Council	Govt. of Tripura, Directorate of Urban Development	Tripura
Manik Lal Das	M		EO, Sonamura Nagar Panchayat	Govt. of Tripura, Directorate of Urban Development	Tripura
Maneesh Semwal	M		GM	Jal Sansthan	UK
Rakesh Jakhmola	M		AE	UDD	UK
Kamlajeet Singh	M		Chief Engineer	ULB Directorate	UP
Aquib Khan	M	aquibkhan@kpmg.com	UWM Expert SBM PMU	Directorate of Urban Local bodies	UP

*Proceedings of  
National Capacity Building Workshop 2.0 on World Toilet Day-2023 in Chennai, Tamil Nadu  
ANNEXURES*

Rahul Kumar	M		SLWM Consultant	Public Health Dept., Noida Authority	Noida
Manoj Kumar	M	manojjejn83@gmail.com	Asst Engineer	UP Jal Nigam	UP
Chetna Singh	F	chetna@washinstitute.org	Training Coordinator	Program- CB team	noida
Supriya Ghoshal	F	Supriya.directorsuda@gmail.com	Director, SUDA& State Mission Director	SUDA under Urban Development and Municipal affairs department	West Bengal
Kingshuk Roy	M	ce_medt@yahoo.com	Chief Engineer, MED	Municipal Engineering Directorate under UD&MA Department	West Bengal
Asraful Islam	M	asraf_enve03@yahoo.co.in	Chief Engineer	Kolkata Metropolitan Development Authority under UD&MA Department	West Bengal
Sutirtha Chatterjee	F	suthirthachatterjee@gmail.com	EE	SUDA under Urban Development and Municipal affairs department	West Bengal

# Water, Sanitation and Hygiene Institute (WASH Institute)

BRIDGING THE KNOWLEDGE GAP FOR SUSTAINABLE COMMUNITY BASED SOLUTION

**Registered office:** No.1/20 Kathiranampatti Pirivu, Reddiarchatram, Dindigul 624 622,  
Tamil Nadu. Email: [office@washinstitute.org](mailto:office@washinstitute.org)



## WASH Academy

No.1/20 Kathiranampatti Pirivu,  
Reddiarchatram, Dindigul 624 622,  
Tamil Nadu Tel: +91 451 2554214  
Email: [courses@washinstitute.org](mailto:courses@washinstitute.org)

## Finance Office

42, Vasant Enclave, Vasant Vihar,  
New Delhi 110 057, India.  
Tel: +91 11 - 26154842 / 49058088  
Email: [office@washinstitute.org](mailto:office@washinstitute.org)

## Program Office

FPAI Bhawan, Third Floor, Sector IV, RK Puram,  
New Delhi 110 022, India.  
Tel: +91 11 35507328  
Email: [program@washinstitute.org](mailto:program@washinstitute.org)

## Project Office

Kothi No. 38, B Block Market, G.T Road, New **Amritsar, Punjab** 143 001.

No.218,2nd Floor pillakamma Nagar Chikkajala, Chikkajala Post,  
**Bangalore North, Karnataka** 562 157.

H.No.7-210 First Floor, Besides Pragathi School, Irvendi Road, Sarapaka -  
507 128, Bhurgampadu Mandal, **Bhadradi Kothagudem, Telangana**.

- i) No.7, 1st floor, Boopathinayagam Street, Old Puducherry road, Egattur  
Village Road, Sholinganallur, **Chennai, Tamilnadu** 600 119.
- ii) No.44/43, Pachaiyappas college Hostel road, Chetpet, **Chennai,  
Tamilnadu** 600031.

H. No: 3-195, 4th Floor, NDR Complex, Near ITC Flyover Bridge,  
Opp. Saibaba Temple, Anaparathi, **East Godavari,  
Andhra Pradesh** 533 342.

House no. 291, Golden Colony, Fatehgarh Churian, Tehsil: Ajnala, Amritsar,  
**Gurudaspur, Punjab** 143 515.

D.No. 3-219, NH16, Vemagiri Village, Near Weigh bridge,  
**Kadiyam Mandal, East Godavari, Andrapradesh** 533 125.

First Floor, Plot No 94, Banki Road, Devasis Nagar, Hindaun City,  
**Karauli, Rajasthan** 322 230.

Parama Apartment, 3, Government Colony, 1st Floor Flat Number 201,  
Sodepur **Kolkata, West Bengal**.

No.35, Second Floor, LIC Colony 2nd Street, Kulamangalam Main Road,  
**Madurai, Tamilnadu** 625 014.

No.60/22. Arunodaya Nilaya, Opp to Police Quarter's, Maruti Extension,  
**Malur Town, Kolar, Karnataka** 563 130.

No.604/754, BRM College Road, Madhopur, P.O: Basudevapur,  
**Munger, Bihar** 811 202.

D-301 (7), East Avenue Apartment, Vill- Sarfabad, Sector 73,  
**Noida, Uttar Pradesh** 201 304.

20/1 Eswari Nagar, Viralimali, **Pudhukottai, Tamilnadu** 621 316.

4/130 C, 4/130 D, South Car Street, Thiruppullani, Kilakarai (TK)  
**Ramanathapuram, Tamilnadu** 623532.

Rajeev Tangri House, First Floor Lane-1, Ankit Vihar Navada Road,  
**Saharanpur, Uttar Pradesh** 247 001.

H no 1065C, Bazar para, **Uleberia, Howrah, West Bengal** 711 316.

[www.washinstitute.org](http://www.washinstitute.org)

