

Sab ke liye swasth shahar

Swachhta ki nayi lehar

SEPTAGE MANAGEMENT FOR CITY-WIDE INCLUSIVE SANITATION IN UTTAR PRADESH





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Executive Summary

Uttar Pradesh is the most populated state of India. 95 per cent of its cities and towns are totally dependent on non-sewered sanitation systems. Only 31 towns (out of the 734 in the state) have partial sewerage system coverage; together, they manage to treat just 40 per cent of the sewage generated, says a 2021 report by the Central Pollution Control Board (CPCB).¹

Sustainable and scientific management of faecal sludge and septage is, therefore, a priority for UP. Septage management has significant inclusive social outcomes, given that those dependent on septage systems are mostly the poorest and the marginalised. Women and other disadvantaged sections are often the worst impacted by poor sanitation. An effective and affordable septage management system will generate significant social, environmental and public health outcomes.

The state's Faecal Sludge and Septage Management (FSSM) Policy commits to addressing septage management for the entire state by 2023. In the last two years, despite the slowdown induced by the Covid 19 pandemic, UP has invested in creation of septage management infrastructure and aim to achieve ODF++ status for 59 of its towns.

As of June 2022, 62 FSSM projects are being built in UP under AMRUT, NMCG or ULB funding. These are spread across 59 ULBs/towns, in 53 districts, with a total investment of Rs 220 crore: Rs 190 crore of this would go towards building 40 FSTPs, and another Rs 30 crore for building 22 co-treatment plants.²

Fully functional and operational septage treatment systems are now in place in 10 cities of UP. These include 10 FSTPs and one co-treatment plant. As a result, the state has joined the ranks of achievers such as Odisha, Telengana, Tamil Nadu and Maharashtra. The installed and under-construction capacity of UP's septage treatment infrastructure stands at 2,075 kilolitre per day (KLD).³

Centre for Science and Environment (CSE) has been supporting the state's initiatives in septage management since 2017. In March-June 2022, CSE researchers conducted field assessments across the state to understand the current status of the various septage treatment plants and co-treatment systems that have been set up in the last two years. This report is an effort at capturing the findings of the assessments. Besides providing an overview of the status of the septage infrastructure created, the report also identifies emerging challenges in the three phases of the work — construction, commissioning and operationalisation. It lists the priorities as well in commissioning, operationalisation and O&M of the treatment plants.

Recommendations

The challenge of urban sanitation in UP and other parts of India is not a technology and infrastructural challenge, but one of governance and administration. Operations and maintenance is the key to successful treatment.

- **Last mile physical connectivity:** Most of the plants are in the completion stage. Timely release of final payments, following quality control checks, is required. All-weather road connectivity to FSTPs will ensure access for desludging trucks and tankers.
- **O&M cost recovery by private operators:** Financial viability of the FSTPs will be a challenge if the desludging fee charged from households is kept very high — as per the tender document, a desludging fee of Rs 2,500 is to be charged from a household. It discourages the households from regular desludging.
- **Adequate quantity and frequency of sludge at treatment facility:** These systems are based on biological processes, and hence an adequate quantity of sludge as per design and in a regular frequency is a must. An effective and affordable desludging plan is required for each town.
- **Dedicated septage management cell/nodal officer at state level:** Such a cell/officer, preferably in the Uttar Pradesh Department of Urban Development (DoUD), can help coordinate all work related to overseeing construction, quality control and quality assurance, O&M, policy rollout, planning and monitoring. This will go a long way in sustainability of the work done and in effective upscaling of septage management all across the 734 towns of UP.
- **Enabling policy, capacity development and behaviour change communication:** Desludging bye-laws are needed at the state and ULB levels. These bye-laws should promote regular desludging of septic tanks at a minimal fee, and ban indiscriminate dumping of sludge in the open. A capacity building strategy should embed the current work priorities including designing and operation and maintenance (O&M) works, integrated wastewater and septage management (as per SBM 2.0), occupational health and safety, social and community behavior change.
- **Avoid indiscriminate combination of hybrid septage treatment chains in FSTPs:** Design of the septage treatment systems should be simplified into a few standard chains and offered for bidders to choose from. They can apply any technology but should avoid using an indiscriminate mix of mechanical and natural treatment technologies in one system/chain.

Purpose of this Report

Uttar Pradesh has made significant progress in creating septage treatment infrastructure in its urban centres. This is a key milestone in addressing the challenge of urban sanitation. The objective is now to ensure the infrastructure becomes functional, and an enabling state policy and city level bye-laws are enacted to support the upscaling of septage management in all the 734 ULBs of the state.

As part of its initiatives in the state, CSE has been working closely with the state administration since 2017 to build capacity as well as advise policy; it has also supported in setting up one FSTP (in Chunar town) and one septage-sewage co-treatment plant (in Bijnor town) as demonstration models for upscaling. Both plants are now operational.

This report aims to take this partnership further, and provide a framework to plan future collaboration and action. While its primary objective is to assess and highlight the status of UP's septage treatment infrastructure and the technologies in use, it also aims to identify emerging priorities for operationalisation of the plants, as well as the long-term upscaling and sustainability challenges. The report identifies key challenges and issues with a set of clear recommendations.

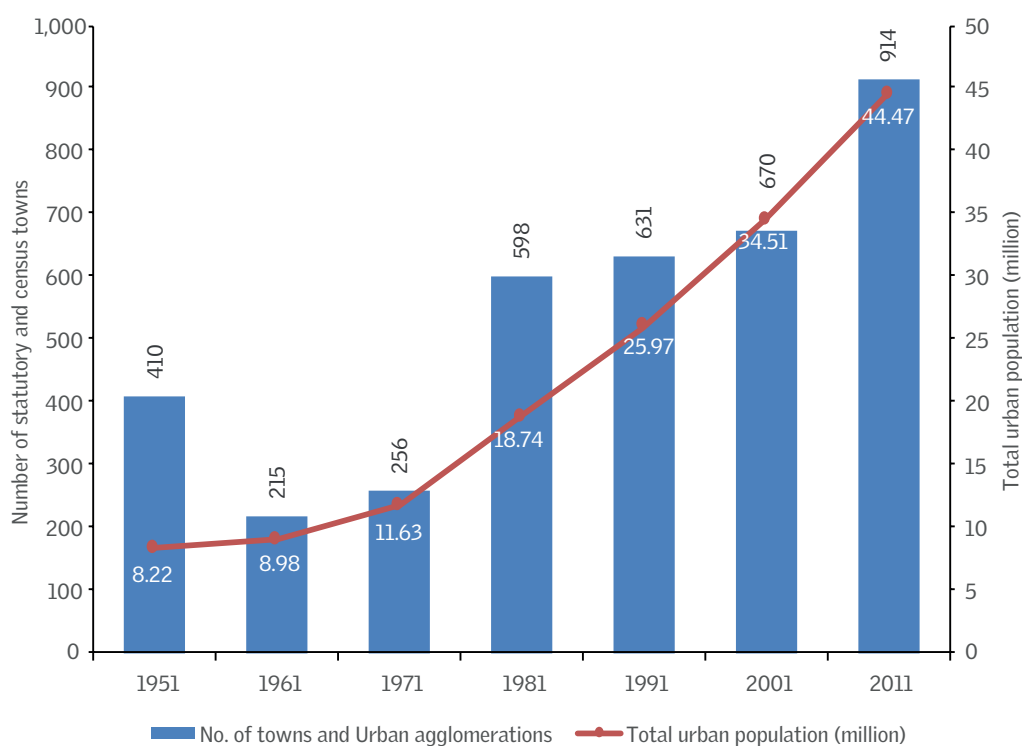
Introduction

Uttar Pradesh is the most populous state in India. The state has a population of 19.96 crore (over 199 million), of which 15.51 crore (about 155 million) live in rural areas and 4.45 crore (44.5 million) in urban areas. It is estimated that by 2021, the urban population of the state would have reached 5.83 crore (over 58 million) – an increase of 1.38 crore (almost 14 million) compared to 1.09 crore (almost 11 million) in the period 2001-2011.⁴

In 1951, Uttar Pradesh had 410 urban centres, housing 13.6 per cent of its population; by 2011, these numbers had gone up to 915 urban centres accounting for 22.27 per cent of the population (see Graph 1).⁵

The level of urbanisation varies in the state. The western part is more urbanised, accounting for 32.45 per cent of the total urban population, and the eastern region is the least urbanised, holding only 13.40 per cent of the total urban population.⁶

Graph 1: Urbanisation trends in Uttar Pradesh (1951-2011)



Source: Census of India, 2011

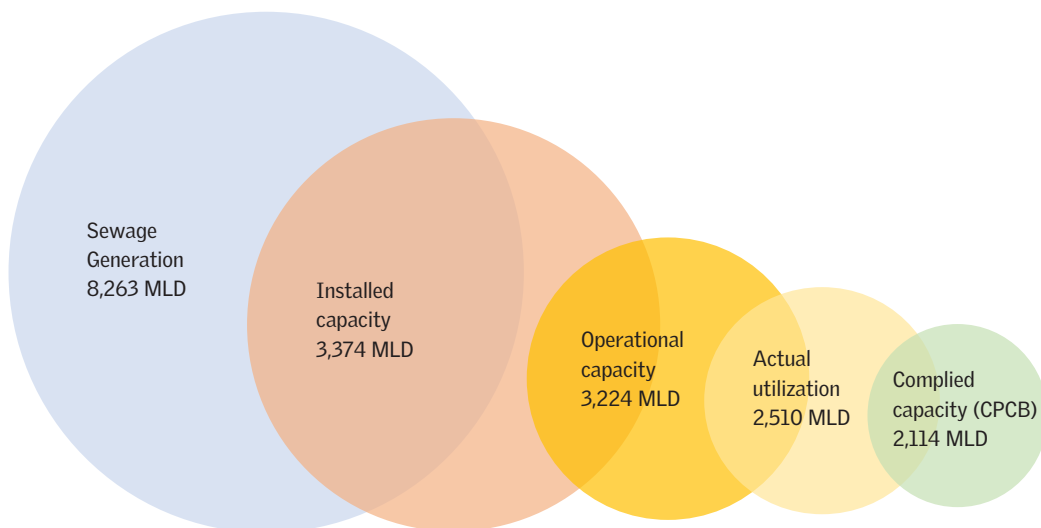
The state of sanitation services

Uttar Pradesh is heavily dependent on non-sewered sanitation systems. Only 20 per cent of the urban areas are serviced by sewerage systems.⁷ The state's 107 sewage treatment plants have a wastewater treatment capacity of 3,374 million litre per day (MLD), even as the estimated sewage generation is 8,263 MLD. Only 31 towns (out of 734 in the state) have partial coverage by sewerage systems. At best, these are able to treat a mere 40 per cent of the sewage they generate (*see Graph 2*).⁸

In 2019, the Government of Uttar Pradesh announced the State Policy on Faecal Sludge and Septage Management. The policy's goal was enumerated as follows: *“All ULBs commit to continually adopt sustainable septage management services that is inclusive and equitable; for its citizens to live in an environment free of pollution and health hazards; with the support of the public and private sector, under a sector regulator”*.

The policy had also envisioned that by the end of 2021, septage management would be mainstreamed in all ULBs, Nagar Nigams (NNs) and Nagar Palika Parishads (NPPs) in the state; by the end of 2023, the policy expects all ULBs to *“implement septage management solutions in an inclusive manner empowering all stakeholders in the process”*.

Graph 2: Sewage generation and treatment capacity in Uttar Pradesh



Source: National Inventory of Sewage Treatment Plants, March 2021, CPCB

Journey of septage management in UP

Uttar Pradesh has come a long way from making its cities open defecation free (ODF) and providing toilets for all, to addressing the next line of challenges — the conveyance, treatment and safe disposal or reuse of wastewater, including septage. Here is a chronological account of the journey.

2016

- CSE initiates an engagement in the state as a part of its efforts towards policy intervention for pollution abatement in the cities of the Ganga river basin. Partnering with the National Mission for Clean Ganga (NMCG, or Namami Gange), CSE helped build capacity of four cities located in the Ganga basin and guided them in preparing their City Sanitation Plans.
- The Union Ministry of Urban Development (MoUD) directs all the mission directors in the states to use rapid assessment tools for septage management for submission of proposals and investment plans on septage management — as a part of AMRUT SAAP (State Annual Action Plan).
- Under the National Policy, directions and guidelines on FSSM are incorporated in the AMRUT programme. The national nodal ministry (MoUD) issues directions (circular to states, DO No. MD-SBM/AA/63/2016) that ‘State Water and Sanitation Boards’ be renamed as ‘Water, Sanitation and Septage Boards’ — thereby integrating septage treatment in an environmentally safe manner.

2017

- The National FSSM Policy fast-tracks the FSM agenda at the national level and gives a go-ahead to states for initiating septage management by either adopting the national policy or putting in place their own state-specific policies. Odisha is one of the earliest in adopting a state-specific FSSM policy that commits the state to prioritise decentralised and non-sewered sanitation systems.
- CSE prepares a set of Shit Flow Diagrams (SFDs) for 66 towns of UP to understand the status of urban sanitation and FSSM in the state.

2018

- SBM (Urban) accords specific focus to septage management by including indicators related to it under ODF++ ratings for cities. The Central Pollution Control Board (CPCB) encourages ULBs having primary sewage treatment facilities to upgrade these to secondary facilities; this could generate

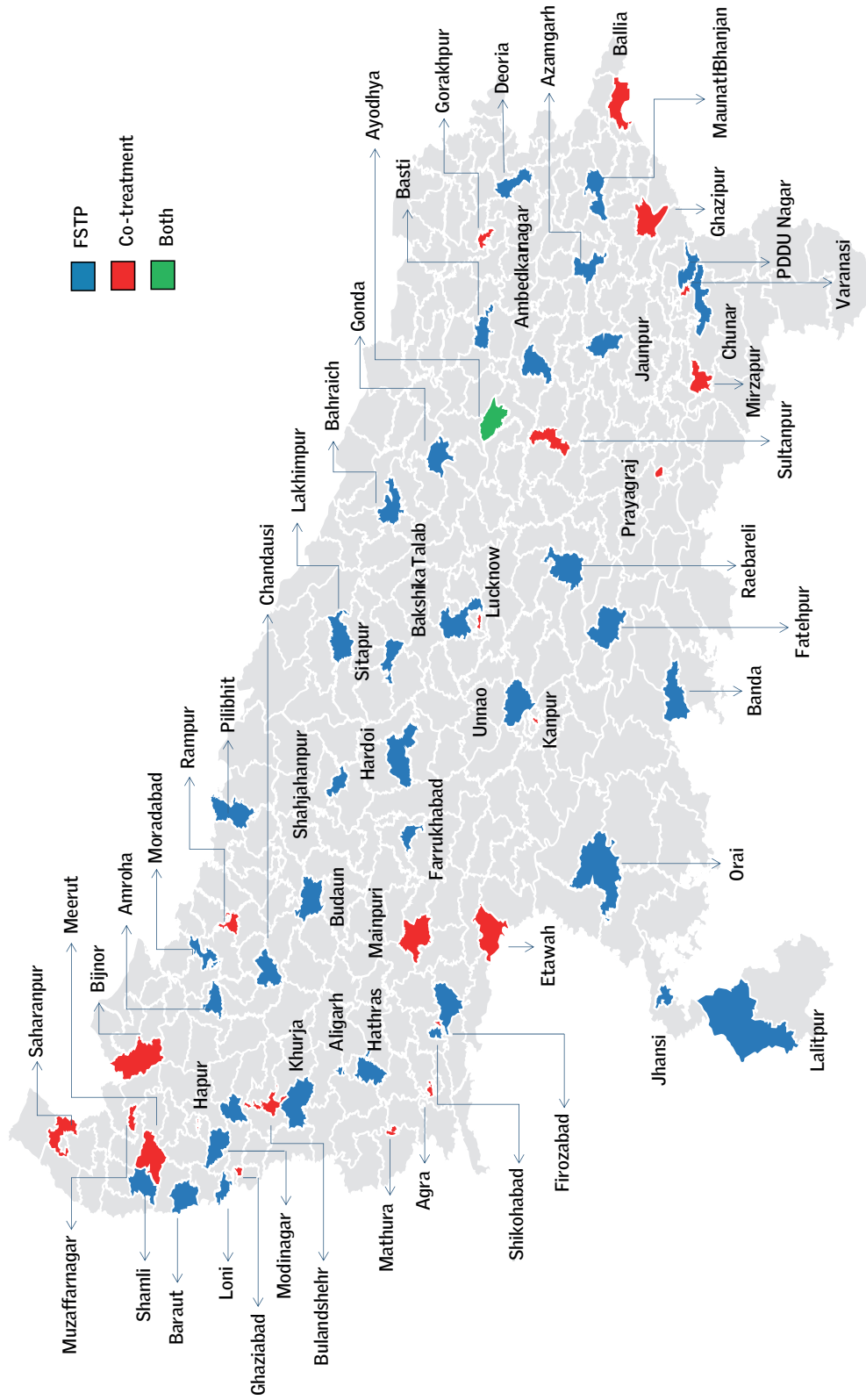
opportunities for ULBs to integrate septage disposal facilities in all such locations along with STP upgradation.

- CSE begins partnering with the Department of Urban Development (DoUD) in UP to support the state's efforts at effective faecal sludge and septage management. CSE provides guidance in the preparation of tender documents for FSTPs and co-treatment infrastructure, and develops and implements a capacity building strategy — helps the state orient its officials on the basics of FSSM as well as on planning and designing of infrastructure.
- CSE supports the drafting of the UP State FSSM Policy, developed through a series of consultations with all stakeholders.
- MoU is signed between the DoUD and CSE in January — under it, CSE is to set up a small Programme Support Unit (PSU) at the state level and two Technical Support Units (TSUs) to help the cities of Chunar and Bijnor in building model FSSM projects.
- Simultaneously in Jhansi, a faecal sludge treatment plant is commissioned by the Jhansi Municipal Corporation. The 6 KLD (kilolitre per day capacity) plant is built by a private contractor at a cost of Rs 2 crore. The plant uses a simple sludge bed technology, and has an annual maintenance and operation cost of Rs 27.6 lakh.⁹

2019

- CSE's study of septage-sewage co-treatment potential at Bharwara STP plant in Lucknow is presented to the principal secretary of DoUD. Based on the study, tenders are processed for 22 co-treatment projects (21 under AMRUT and one under NMCG funding).
- The first AMRUT-funded FSTP project gets operational in Unnao. Septage-sewage co-treatment is prioritised at all existing STPs, based on the recommendations of a report by NIUA-IIT Roorkee, which covers various quantitative and qualitative parameters of sludge input that an STP can handle.
- The UP Jal Nigam (UPJN) floats tenders on design, built, operate and transfer (DBOT) mode for 31 FSTPs under AMRUT and 21 co-treatment plants at existing STPs. In addition, five ULBs floated individual tenders for FSTPs through AMRUT funding. UP prioritises medium sized-population cities for FSSM — targeting cities where sewerage network is non-existent or minimal.

Map 1: FSSM projects in UP



Source: Uttar Pradesh Jai Nigam

Co-treatment facility is proposed for larger cities where functional sewer networks exist and STPs have spare/unutilised capacity.

2020

- NMCG realises that in a scenario where a majority of the region's households remain dependent on septage systems and there is no provision for treating septage, building more STPs will not address the problem of cleaning the Ganga. It prioritises septage management for pollution abatement and river rejuvenation in Ganga towns — CSE partners with the Mission to develop one town each for FSTP and co-treatment systems to demonstrate FSSM in the state.

2021

- First Namami Gange-funded FSTP gets commissioned in Chunar.

2022

- First Namami Gange funded co-treatment unit gets commissioned in Bijnor.
- 62 FSSM projects are being built in UP (*see Map 1*) under AMRUT, NMCG or ULB funding, spread across 59 ULBs in 53 districts at an investment of Rs 190 crore for FSTPs and Rs 30 crore for co-treatment units.¹⁰

Methodology

The content of this report is based on the field visits made by the CSE team in the period March-May 2022. A checklist was developed to identify the stages of completion of physical infrastructure works, and to understand the technology and treatment chains in the FSTPs under construction. Interactions on the basis of the checklist were done with ULB officials, engineers of the UP Jal Nigam and operators of the upcoming treatment plants. Concerns, challenges and recommendations were discussed and arrived at.

Data collection checklist: To understand the status of the 62 FSSM projects in 59 cities, a data collection checklist (*see Annexure 1*) was prepared. The main data points in the checklist were related to the demographic information, institutional arrangement, contract and contractors' details, technology details of the projects, status of completion of the project, and various issues being faced by the plants (either by the contractors or by the UP Jal Nigam).

Visit to the project sites: Project sites were visited by the team to understand the physical progress and functioning of the plants, the location and approach roads etc.

Discussions with officials: The team held discussions with the key stakeholders, including the executive officers of the concerned ULBs, district project managers and district coordinators of the SBM programme, engineers of UPJN, and representatives of the private contractor working in the project.

Review of documents: The team also reviewed various documents (DPRs, Tender documents) collected during the visit. Apart from this, information from the UP Septage Management Policy 2019, UP Urban Sanitation Policy, Census Report 2011 and various government websites were also considered.

Figure 1: Process flow used for developing the report



Findings

Based on data collected during the field visits and secondary research, the CSE team analysed the information to understand the status and issues related to:

- the physical progress of the FSSM plants
- various combinations of septage treatment technology modules in the FSTPs
- O&M issues based on reading the contracts and discussions with operators and officials

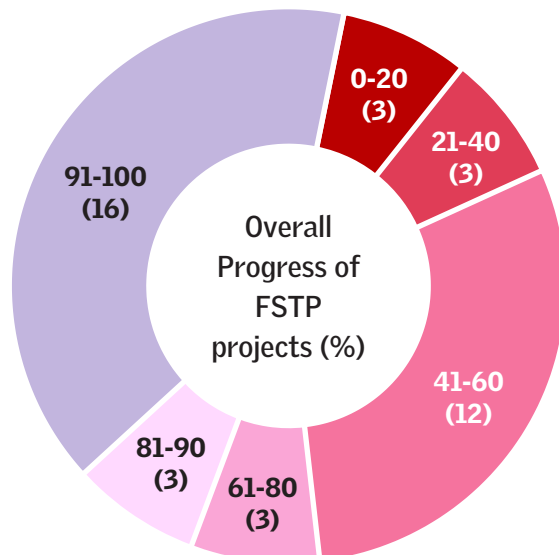
The State of the FSTPs and Co-treatment Plants

Information in this report about the physical progress made by the FSSM plants is based on observations of the CSE team during its site visits, as well as on the Monthly Progress Reports (MPR) of the UPJN. Out of 40 FSTPs, 15 indicate a progress between 91-100 percentage points, while 21 FSTPs have shown an over 60 per cent progress (*see Graph 3*).

Out of the 22 co-treatment plants, six have progressed to a 91-100 per cent completion stage, while 12 indicate a more than 60 per cent progress (*see Graph 4*).

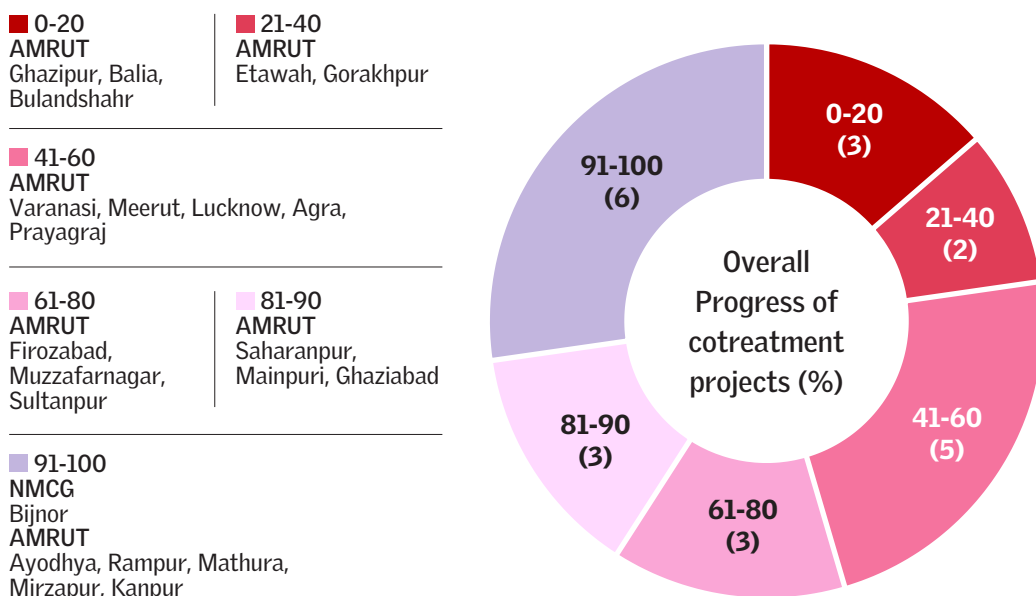
Graph 3: Progress of FSTP projects

<p>■ 0-20 AMRUT PDDU Nagar, Maunath Bhanjan, Azamgarh</p>	<p>■ 21-40 AMRUT Banda, Shikohabad, Akbarpur</p>
<hr/>	
<p>■ 41-60 AMRUT Jaunpur, Bahraich, Hardoi, Fatehpur, Khurja, Shamli, Jhansi, Lalitpur, Orai, Badaun, Chandausi, Deoria</p>	
<hr/>	
<p>■ 61-80 AMRUT Gonda, Farrukhabad, Basti</p>	<p>■ 81-90 AMRUT Pilibhit, Shahjahanpur, Baraut</p>
<hr/>	
<p>■ 91-100 ULB/15th FC Jhansi (2), Bakshi ka talab NMCG Chunar AMRUT Unnao, Aligarh, Ayodhya, Moradabad, Hathras, Hapur, Amroha, Sitapur, Loni, Modinagar, Lakhimpur, Raebareli</p>	



Source: CSE assessment

Graph 4: Progress of co-treatment plants



Source: CSE assessment

This shows that if a concerted effort is made at the state level towards ensuring last minute connectivity to the FSTPs and Co-treatment plants, at least 15 FSTPs and six Co-treatment plants will become operational very soon. More quality assurance and quality control oversight will be required for making the rest of the plants operational.

Septage Treatment

The FSSM initiative in Uttar Pradesh was started with establishment of the 32-KLD plant in Unnao and a six-KLD FSTP in Jhansi in the year 2018-19. In the years that followed, the UPJN identified 31 cities in two phases and invited bids under AMRUT funding. A total of 40 FSTPs have been tendered as per this process:

- **UPJN tender under AMRUT**
 - o Phase one tendering: 6 FSTPs on mechanised treatment systems
 - o Phase two tendering: 25 FSTPs on open technology
- **Individual ULB tenders:** 5 FSTPs under AMRUT
- **ULB funding:** 3 FSTPs
- **NMCG funding:** 1 FSTP

All the co-treatment plant have been funded under AMRUT except Bijnor co-treatment plant which was funded under NMCG.

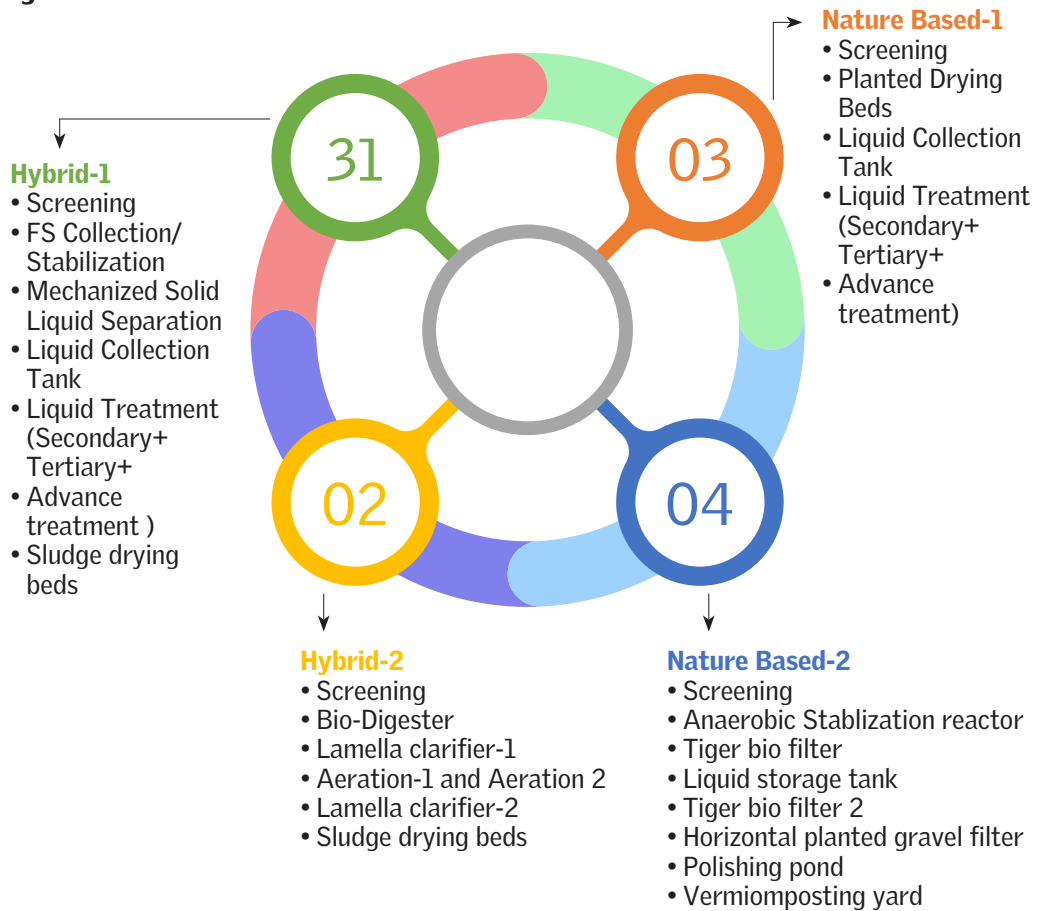
Treatment systems

The analysis of the 40 FSTPs shows that there are two typologies of septage treatment:

- **Hybrid:** Modules comprising both natural and mechanised treatment technologies, used in the different combinations.
- **Nature-based:** Nature-based treatment modules, independent of electromechanical equipment involved in the treatment process.

Within the hybrid and nature-based treatment systems, two treatment chains were identified (see Figure 2).

Figure 2: Treatment chains





PHOTOGRAPHS: CSE

FSTP visit at Pilibhit



Screening unit at FSTP Pilibhit



Mechanical de-watering unit at co-treatment plant, Mathura



Planted drying bed technology at Chunar



Hyper core technology at Modinagar



Pressurised sand and activated carbon filter for advance treatment at Hathras

Award of work

A model bid document was prepared by the UPJN for the process of inviting tenders for FSSM projects. Based on the model tenders, CSE organised consultation workshops with vendors and interested bidders in collaboration with the Nigam. Changes were suggested in the model bid document — this ensured private sector participation and successful tendering.

For the execution of the 62 FSSM projects in the state, a total of 18 bidders were shortlisted and awarded the contract (*see Annexure 1 for detail*).

Investment in septage treatment infrastructure

UP has awarded a total of 62 FSSM projects till date – the total investment comes to Rs 220 crore within a short span of just a couple of years. The major chunk of these projects are being funded under the Centre’s AMRUT scheme, while a few have received ULB funding and grants from NMCG (*see Tables 1 and 2*).

Table 1: Investment in FSTPs

Funding source	Total FSTPs (numbers)	Total capacity (KLD)	Total cost (Rs crore)
AMRUT	36	1152	181.55
ULB	3	43	6.09
NMCG	1	10	2.70

Table 2: Investment in co-treatment plants

Funding source	Total plants (numbers)	Total capacity (KLD)	Total cost (Rs crore)
AMRUT	21	850	30
NMCG	1	20	0.4

Source: CSE analysis based on UPJN data

Issues and Challenges

On the basis of observations from field visits and after reviewing the progress of the FSSM and co-treatment projects in various cities of Uttar Pradesh, certain issues and challenges have come to the fore (*see Table 3 and Graph 5*). These are classified below based on different phases of implementation of the projects:

- Pre-construction
- During construction
- Post-construction

The pre-construction stage consists of components which enable proper execution and functioning of a project throughout the design period. Proper planning, designing, site selection, subject knowledge and synergy between different agencies involved in project implementation is much needed for desired work quality and timely completion of any project. During its visits, the CSE team observed that many of the projects were still at a construction stage: several major and minor issues were identified by the team. Most of the sites had common issues related to approach roads, O&M plans, lack of coordination and subject knowledge competency. However, a few sites had specific concerns as well, such as location in a flood-prone area, delays in payment disbursement, delays due to land acquisition, lack of resources etc.

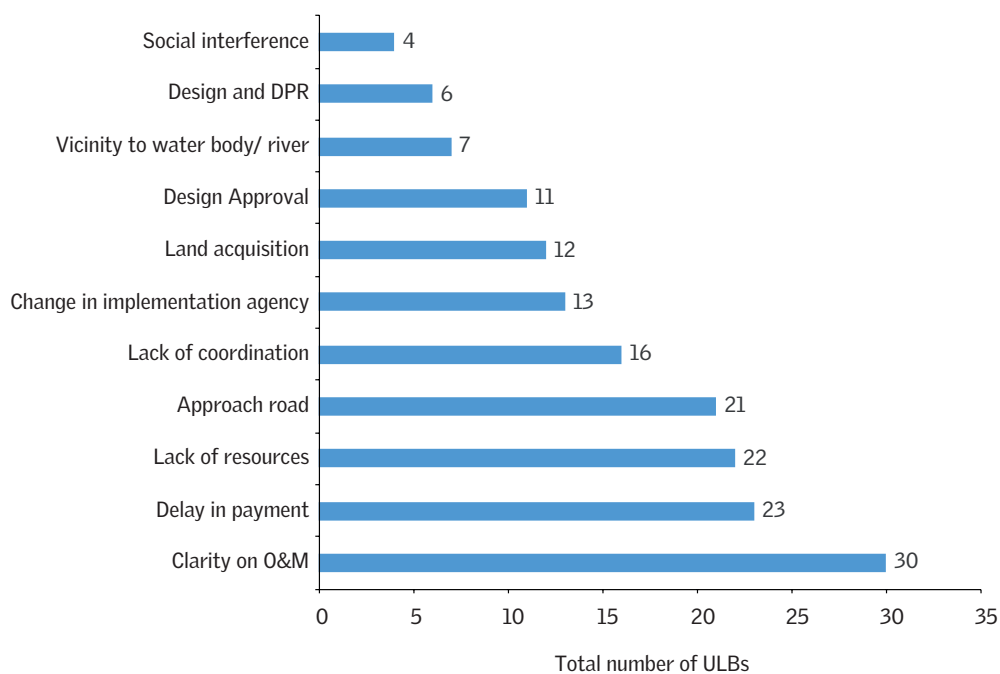
A significant delay in the projects happened because of the unprecedented pandemic. Hence, most of the sites have requested extensions for completing the remaining work. One common complaint at most of the sites has been that the designed capacity seems overestimated — bringing sufficient load to the facility, therefore, will be a big challenge in future for the concerned agency.

Table 3: Phase-wise issues and challenges

Phase	Issues and challenges	
Pre-construction	Tender process	Delay in design and DPR preparation
		Revision of design and DPR approval
		Date extension for bid submission
		Delay in issuing work order
	Site selection	Delay in land acquisition
		Improper site selection
	Contracting	Delay in construction commencement from contractor side
Delay in construction commencement due to weather and climate		

Phase	Issues and challenges	
During construction	Institutional	Lack of coordination between different agencies (ULB, UPJN, contractor)
		Change in implementing agency
		Delay in payment disbursement
		Lack of FSSM related knowledge
	QA/QC concerns	Lack of quality resources
		Improper approach road
		Sub-standard construction
	Miscellaneous	Social interference
		Delay due to weather and climate
Delay due to COVID-19		
Post construction	Awareness	Lack of clarity about O&M of FSTP/co-treatment facility
	O&M	Lack of clarity on O&M plan execution
		Ensuring sufficient load
	Capacity building	Officials involved in FSTP construction and O&M have less subject knowledge.
	Pre commissioning Tests & Checks	Several tests and checks need to be done before trial run such as — leakage test, slope test, volume test, checks for pipes and fittings, inoculum process etc. Person responsible were found to be unaware of all these tests and checks.

Graph 5: Challenges faced by ULBs in building septage management infrastructure



Source: CSE analysis based on site visits

Key operational challenges for FSTPs

Design and construction: Tenders are floated with a “one fit for all” approach — no feasibility study was carried out at the planning stage to decide the scope and capacity of the plants. Due to this, bringing 32 KLD faecal sludge to all the FSTPs in the state will be a big challenge for most of the ULBs. Since these are biological treatment systems, under-utilised capacity will hamper operations and efficiency of the plant.

Capacity design issues of the new treatment plants should be addressed in the next round of construction works.

Lack of clarity on operation and maintenance cost recovery by private operators: The O&M cost recovery of the FSTPs is unclear for most ULBs. As per the DPRs and tender documents, O&M cost recovery is to be done through desludging services provided by the private operators. No additional payment will be made to these operators from either the ULB or the state government.

A private operator is expected to charge Rs 2,500 per household and achieve sustainable O&M cost recovery by desludging septic tanks of 5,000 households in a town every year. This is impractical both in terms of the high fees and the high annual desludging potential in small and medium towns of UP.

Improper site selection: Few of the sites have been found to be located in high risk flood-prone or low-lying areas. The FSTPs at these locations run a risk of getting damaged or defunct in floods.

Poor quality approach roads: The plants cannot become operational if all-weather approach roads of adequate width are not provided. Privately managed desludging vehicles will not go to many of the new FSTPs that are located 10 to 15 km outside the towns, if the roads are not good. This will lead to the indiscriminate disposal in the water bodies and open farms, plants receiving low amount of faecal sludge which subsequently will affect the biological treatment process of the plant.

In future, nearby villages may also access the FSTPs. But if the roads are in bad condition, this will not be possible.

Commissioning and handing over of FSTPs and co-treatment plants: Construction of FSTPs and co-treatment plants is a relatively new initiative in the state. So far, the urban sanitation discourse has been tilted in favor of centralised and mechanised STP solutions.



An FSTP site located close to a river (flood-prone area).

Commissioning of the FSTPs will require a handing-over protocol to be developed by UPJN, covering various aspects of O&M (both financial and operational). ULBs and the DoUD will need to coordinate and review any operational issues on a regular basis.

Co-treatment plants have been set up within existing operational STPs. They are better suited to receive faecal sludge and septage because the access and approach roads are already there. What is challenging here is that the location of the plants has been compromised in some instances, because they have been located wherever land was available within the STP premises. In such a scenario, the access routes of desludging trucks and their movement inside the STP will need to be looked into. It is unclear who will maintain the co-treatment infrastructure consisting of screw press, receiving and holding tanks and pipes that lead wastewater to the STP, or who would be responsible for moving the dried sludge to the sludge drying bed.

A nodal officer or a septage cell at the state level (preferably in DoUD) is needed to provide this critical operational and quality assurance oversight, coordinate with appropriate agencies at the ULB level, to monitor the plants on a regular basis, and to address financial and budgetary considerations. If this oversight is not provided, the investments made in FSSM will be compromised.



Improper approach road to FSTP in Pilibhit

Figure 3: Concerns and challenges at FSTP sites in UP

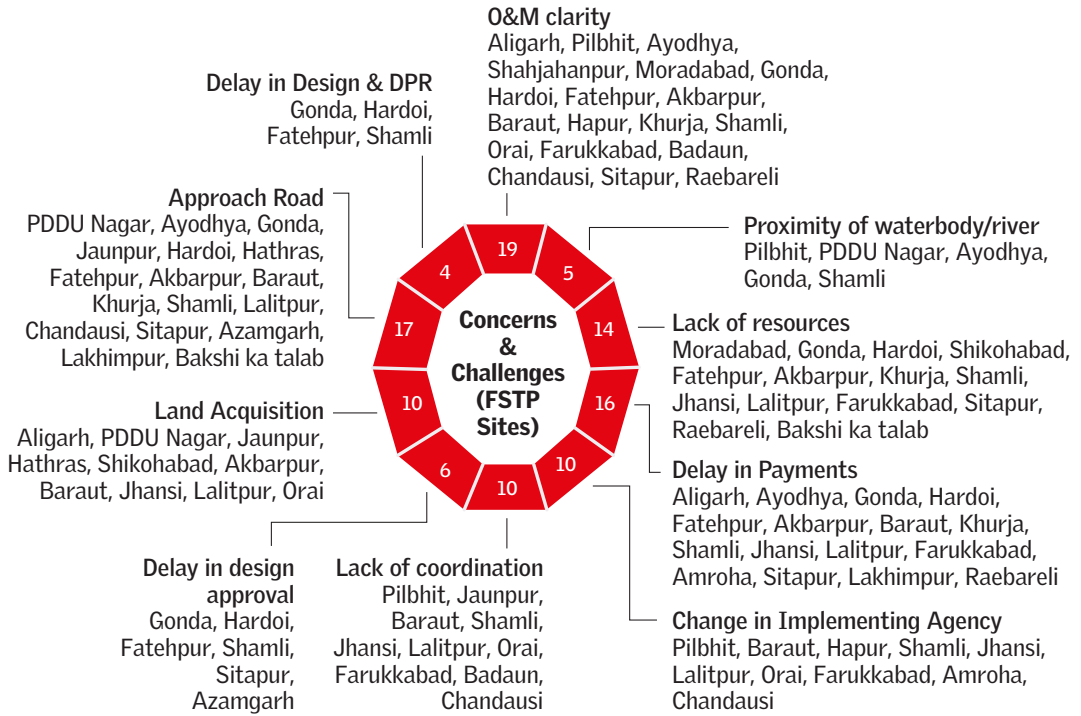
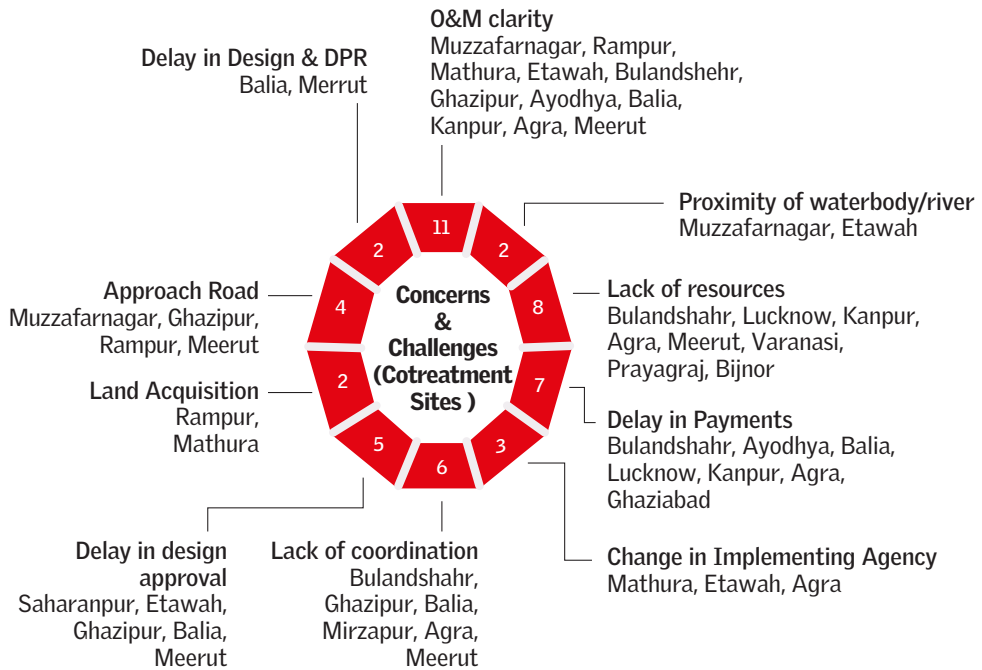


Figure 4: Concerns and challenges of co-treatment plants in UP



Recommendations

The challenge of urban sanitation in UP and other parts of India is not a technology and infrastructural challenge, but one of governance and administration. Operations and maintenance is the key to successful treatment. In UP, timely payment for O&M services and a monitoring and quality control oversight has to be a part of the planning for FSSM work — currently, there is no strategy for this.

Septage treatment plants would be most beneficial for the marginal habitations of a town that are not connected to sewerage systems. But these plants, as well as co-treatment infrastructure, will need enabling institutional, financial and administrative support mechanisms to become operational and functional. Sanitation is a public health issue and the state must intervene to incentivise the private sector or increase and extend its own services to address this.

Creation of septage management infrastructure in UP is expected to continue under SBM 2.0 and AMRUT 2.0. The following recommendations have been culled out from the analysis of the first phase of septage infrastructure creation in the state (2018-22). The recommendations cover different phases of the work done, as well as for operations and long-term sustainability considerations.

Table 4: Recommendations for different phases of the work

Phase	Issues and challenges	Recommendations
Pre-construction	Tender process	<ul style="list-style-type: none"> Pre-feasibility study should be carried out at the planning stage to decide scope and capacity of the treatment system. Technical consultancy for DPR preparation and executing agency should be selected based on level of subject matter expertise. Proper review and approvals of DPR must be done. Site selection criteria should be followed. Low-lying areas and disputed lands should be avoided. Clear and practical O&M and monitoring plan should be added in the DPR/bid document. Proper land acquisition process should be followed to avoid any dispute during construction. Award of projects to the same contracting agency might increase the chances of delay in construction.
	Site selection	
	Contracting	
During construction	Institutional	<ul style="list-style-type: none"> Institutional strengthening needs to be done to promote septage management at the state and ULB levels. Ensure that construction is being done as per design and drawings and QA and QC is not neglected. Monthly monitoring should be done by a third party (subject matter expert). Delays in payment should be avoided. It will increase the cost of work due to high inflation rates and cost escalation.
	QA/QC concerns	
	Miscellaneous	

Phase	Issues and challenges	Recommendations
Post construction	Awareness	<ul style="list-style-type: none"> Initiate community awareness programmes to generate buy in from the people to pay for desludging services. Pre-commissioning checks and tests should be done. O&M responsibilities should be clear. Ensure that regular and sufficient load is received at the treatment facility. A proper desludging and monitoring framework will be needed for this. Plan for capacity building about O&M and monitoring of FSTP/co-treatment systems.
	O&M	
	Capacity Building	

Recommendations for long-term sustainability

Operationalisation of septage treatment infrastructure

Treatment plants must receive faecal sludge and septage daily, in adequate quantity and quality. These are primarily biological treatment systems — if the quantity, quality and frequency is not consistent, the treatment process will not work. To ensure this, ULBs should:

- **Mandate all institutions, government offices, private agencies, bus stands, offices and schools** to empty their septic tanks on a periodic basis, and send the sludge to the FSTP or co-treatment plant.
- **Incentivise households to empty their septic tanks** at a three year interval, by providing desludging services at a reduced fee.
- **Remove physical roadblocks for sludge to reach the FSTPs**, by ensuring access roads to the plants are clear and well-paved. New FSTPs should not be at a distance that makes septage desludging operations financially unviable for private operators.

O&M cost recovery is critical. Effective O&M of the FSTPs will be possible only if the operators are able to recover the cost of operations. Currently, the O&M cost recovery is expected to happen from a high desludging fee of Rs 2,500 per household (that the plant operator is expected to recover from households). It is important to find appropriate financial mechanisms to enable O&M of the FSTPs.

Enabling bye-laws and legislation are important at the state and ULB levels to promote septage management as a pro-poor inclusive sanitation. Reduce the desludging fee to the minimum to incentivise regular cleaning of septic tanks; keep the registration fee for tankers to the minimum to encourage more tankers to

register and operate. Ban dumping of faecal sludge and septage into waterbodies or in the open.

Registration and licensing process should be robust. There should be clarity in the clauses and liabilities of both the parties. Also, the consequences of not adhering to the contract should be clearly mentioned and enforced to regulate the collection- conveyance stage of FSSM.

Recommendations on institutional strengthening

A state-wide upscaling of the septage treatment infrastructure and sustainability needs coordinated support at the ULB and state levels. A Septage Management Cell (SMC) at the state level, working in the capital, preferably as a part of the DoUD, will greatly help in providing administrative coordination and financial support to ULBs to ensure completion and operationalisation of these plants. The SMC can play a critical role in:

- Coordination with AMRUT and NMCG, the Directorate of Urban Local Bodies, CPCB and others.
- Coordinate the involvement of third party technically sound partners/ advisors for support and handholding during tendering — this can act as a bridge between the implementing agency and potential contractors. Facilitate roundtable meetings between stakeholders, raise and support valid concerns of contractors, and provide support to the implementing agency in resolving the concerns.
- Regular monitoring for quality control and quality assurance by the implementing agency/contractor under the supervision of a third party inspection agency. The third party inspection agency can flag potential technical issues and hazards during the construction phase. A regular monitoring framework and testing protocol for treated sludge and effluents can be developed after commissioning of the plant.

Recommendations on capacity building and behaviour change communication

Given the current stage of ongoing septage management infrastructure work in UP, it is recommended that the staff involved should be provided a basic orientation on FSSM and on integrated wastewater and septage management. This must be done keeping in mind the state and national level missions and programmes on the subject (*see Table 5*).

Table 5: Recommended priority capacity development modules

Training type	Priority trainee stakeholder
Integrated wastewater and septage management for SBM 2.0	Town planners, engineers of ULBs and UPJN, EOs, elected officials
FSSM planning, including management and governance: Bye-laws, scheduled desludging, treatment systems	Town planners, ULB Eos, ULB engineers, private operators
Planning, design and O&M of FSTPs and co-treatment systems	Engineers from UPJN, AMRUT and SBM and private operators
Financial sustainability of O&M of FSTPs of UP (including costs from recycling and by-products)	Town planners, ULB Eos, ULB engineers
Preparation of behaviour change communication plan and its implementation	Town planners, EOs, elected officials
City-wide inclusive water and sanitation planning and implementation — integrating wastewater, greywater, drainage and water conservation, with a focus on ensuring equity, gender and inclusion (not just infrastructure provisioning)	Town planners, engineers of ULBs and UPJN, EOs, elected officials

Behaviour change communication (BCC) is important at both the community level as well as the institutional level. A practical yet evidence-based behaviour change communication strategy should be developed for the towns that aim to initiate safe and timely emptying practices, improve services and increase demand from households, businesses and institutions. A similar approach for institutions at the ULB and state level is recommended for sensitising them about septage management as a public health and state responsibility. This will enable the ULB and state authorities to formulate appropriate systems and pricing mechanisms that are inclusive of all social and economic strata of urban communities.

Running BCC campaigns and sensitisation of institutions and officials can be done to get the following results:

- promoting buy-in of households for regular emptying of their septic tanks
- ensuring sanitation workers' safety by its institutionalization and licensing of operator. (for desludging and plant operations)
- improving accountability and responsibility of service providers (ULBs and the state government) in ensuring inclusive city-wide sanitation
- Highlighting environmental and human health costs of poor sanitation and inadequate wastewater and septage management

Annexures

Annexure 1: List of contractors and projects

The 62 FSSM projects in Uttar Pradesh have been awarded to 18 contractors; 11 contractors have received more than one project, with a maximum of 15 projects to a single contractor (J M Enviro Tech Pvt Ltd). In addition, there are instances where the same contractor is working on FSTP as well as co-treatment projects (Rubicon Inspection Systems).

Contractor	Type	ULB under each contractor
J M Enviro Tech Pvt Ltd	FSTP	Hathras, Shikohabad, Jhansi, Lalitpur, Orai, Farukhabad, Amroha, Shamli, Baraut, Badaun, Chandausi, Hapur, Fatehpur, Ambedkarnagar, Khurja
NACOF India Ltd	Co-treatment	Lucknow, Kanpur, Agra, Meerut, Varanasi, Ghaziabad, Prayagraj
Shri Ram Constructions	FSTP	Deoria, Basti, Sitapur, Maunath Bhanjan, Azamgarh
SS Engineering Corporation	Co-treatment	Muzaffarnagar, Rampur, Mathura, Saharanpur, Gorakhpur
Rubicon Inspection Systems	Co-treatment	Etawah, Mainpuri, Firozabad, Bulandshehr, Ghazipur
Aquatech Solutions Pvt Ltd	FSTP	Aligarh, Pilibhit, PDDU Nagar, Ayodhya
Rubicon Inspection Systems	FSTP	Gonda, Banda, Jaunpur
SS Engineering Corporation	FSTP	Shahjahanpur, Moradabad
R K Engineers Sales Pvt Ltd	FSTP	Bahraich, Hardoi
S K Enterprises	Co-treatment	Sultanpur, Ayodhya
DD Builders	FSTP	Modinagar, Lakhimpur
RVSB Realcon Pvt Ltd	Co-treatment	Balia
Sombansi Enviro Engg Pvt Ltd	Co-treatment	Mirzapur
EBL	FSTP	Loni
Satish Kumar & Co	FSTP	Raebareli
Elefo Biotech Private Limited	FSTP	Chunar
UPPCL	Co-treatment	Bijnor
Mehek Enterprises	FSTP	Bakshi ka Talab

Annexure 2: Checklist for FSTPs

1	Date of Visit	
2	Name of the ULB	
3	Name of the District	
4	Name of the Site	
5	Population and Households (Optional)- A. No. of households & population dependent on sewerage B. No of household & population dependent on onsite sanitation C. No. of desludging trucks owned by ULB D. No. of private desludging trucks E. No. of trips per day made by each truck F. Current disposal practice of FS (Land, water bodies, trenching etc.) G. Cost per HH for De-sludging services	
6	Officials met at ULB and Plant site along with the designation and contact details	
7	Visiting Person from CSE	

Population Details (Optional)-

SI No	Ward No	Population	No of Households	
Faecal Sludge Treatment Plant				Response (Please provide detailed description as far as possible)
1	Capacity in KLD			
2	Proposed service area of the FSTP — in terms of population(household percentage) and wards of the town			
3	Contact Details A. Name of the implementing agency B. Name of the funding agency C. Name of the executing agency along with the contact number			
4	Technology details of the FSSM project- if possible, along with a flow diagram			
5	Physical percentage completion of the project (to be collected from executing/ Implementing agency)			
6	Project Details- A. Date of project awarded (letter of Intent) by UPJN to the contractor B. Date of Land Handover by ULB to the implementing agency C. Date of actual start of the infrastructure work D. Contract duration including the trial run E. O&M duration F. New date of extension (if the contract is expired) G. Anticipated date of completion			
7	Issues faced if any (either by the contractor or UP Jal Nigam) A. Financial B. ULB Level or UPJN (lack of resources, land dispute etc.) C. Capacity related D. Design related — design not ready, faulty design E. Transportation of FS to the treatment facility			

SI No	Ward No	Population	No of Households
	F. Lack of awareness G. Political interference H. Law and order problem I. Any others — please specify		
8	Status of Power Connection, fresh water supply and approach road to the site		
9	Load details from inception (If the project is commissioned) Average Daily/ Average Monthly		
10	Photographs (good quality)		
11	Latitude and Longitude of the site		
12	Distance of the site from ULB office		

Annexure 3: Checklist for co-treatment plants

1	Date of Visit	
2	Name of the ULB	
3	Name of the District	
4	Name of the Site	
5	Population and Households (Optional)- H. No. of households & population dependent on sewerage I. No of household & population dependent on onsite sanitation J. No. of desludging trucks owned by ULB K. No. of private desludging trucks L. No. of trips per day made by each truck M. Current disposal practice of FS (Land, water bodies, trenching etc.) N. Cost per HH for De-sludging services	
6	Officials met at ULB and Plant site along with the designation and contact details	
7	Visiting Person from CSE	

Population Details (Optional)-

SI No	Ward No	Population	No of Households
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FS Co-Treatment with an existing STP		Response (Please provide detailed description as far as possible)
1	Proposed Co Treatment in KLD	
2	Proposed service area of the Co-treatment — in terms of population (household percentage) and wards of the town	
3	Contact Details A. Name of the implementing agency B. Name of the funding agency C. Name of the executing agency along with the contact number	
4	STP Details- A. Status of the STP B. STP Installed Capacity C. Current Capacity utilisation	

5	Technology details of the FSSM project- if possible, along with a flow diagram	
6	Physical percentage completion of the project (to be collected from executing/ Implementing agency)	
7	Project Details- A. Date of project awarded (letter of Intent) by UPJN to the contractor or the existing STP operator B. Date of actual start of the infrastructure work C. Contract duration including the trial run D. O&M duration E. New date of extension (if the contract is expired) F. Anticipated date of completion	
8	Infrastructure A. Technology of STP B. Capacity of STP C. Utilization of STP (if operational) D. FS quantity receiving at STP (if operational) E. Co Treatment Design document of STP F. Co treatment infrastructure — status of completion, procurement of materials, how long will it take to become functional G. Road access for trucks to co treatment point H. Recording system at STP level for receiving sludge	
9	Issues faced if any (either by the contractor or UP Jal Nigam) A. Financial — by the current STP operator if he/she is asked to add the co treatment infrastructure and also to maintain it. B. Capacity related C. Design related — design not ready, faulty design D. Transportation of FS to the STP desludging discharge point E. Lack of awareness F. Political interference G. Law and order problem H. Any Others- If any	
10	Status of Power Connection, fresh water supply and approach road to the site	
11	Load details from inception (If the project is commissioned) Average Daily Load/ Average Monthly Load	
12	Photographs (good quality)	
13	Latitude and Longitude of the site	
14	Distance of the site from ULB office	

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Sab ke liye swasth shahar

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