SEPTAGE MANAGEMENT IN CHUNAR TOWN

Towards Inclusive Urban Sanitation in Uttar Pradesh

SEPTAGE MANAGEMENT IN CHUNAR TOWN

Towards Inclusive Urban Sanitation in Uttar Pradesh

Research direction: Depinder Singh Kapur

Authors: Subrata Chakraborty and Manish Mishra

Research support: Jyoti Parsad and Sumita Singhal

Reviewers: Maitreyi Karthik and Sapna Gopal

Editor: Archana Shankar

Cover: Ajit Bajaj

Layout: Kirpal Singh

Production: Rakesh Shrivastava and Gundhar Das

We would like to express our sincere gratitude to Mr. Mansoor Ahmad, Chairperson, Chunar, Mr. Rajpati Bais, Executive Officer, Chunar and Mrs. Pratibha Singh, Former Executive Officer, Chunar for providing their able support in successful Septage Management in Chunar Town.

The following individuals/ groups have made contributions to the Septage Management Journey in Chunar - Lalmani Yadav, Mithilesh Kumar, City Sanitation Task Force Members, Saurabh Singh, Ajit Singh, Kajal, Shamsher Singh, Deepak Srivastav, Shahnawaz Ansari, Rajnath Yadav , Elefo Biotech, Sanitation Supervisors and workers.

The following former colleagues of the Centre For Science and Environment who made contributions to the Septage Management Journey in Chunar - Suresh Kumar Rohilla, Rahul Mankotia, Bhitush Luthra, Naveen Kumar, Shantanu Kumar Sahoo, Bhavik Gupta and Chirag Patel.

The Centre for Science and Environment is grateful to the Swedish International Development Cooperation Agency (Sida) for their institutional support.

Maps in this report are indicative and not to scale.

Citation: Depinder Singh Kapur, Subrata Chakraborty and Manish Mishra 2023, *Septage Management in Chunar Town—Towards Inclusive Urban Sanitation in Uttar Pradesh*, Centre for Science and Environment, New Delhi

Published by
Centre for Science and Environment
41, Tughlakabad Institutional Area
New Delhi 110062
Phones: 91-11-40616000
Fax: 91-11-29955879
E-mail: sales@cseindia.org
Website: www.cseindia.org

Contents

LIST OF TABLES

LIST OF GRAPHS

LIST OF FIGURES

LIST OF MAPS

LIST OF ANNEXURES

LIST OF ABBREVIATIONS

- Ar—Argon
- As—Arsenic
- C:N ratio—Carbon to nitrogen ratio
- CapEx—Capital expenditure
- Cd—Cadmium
- CNPP- Chunar Nagar Palika Parishad
- CPCB—Central Pollution Control Board
- CPHEEO—Central Public Health and Environmental Engineering Organisation
- Cr—Chromium
- Cu—Copper
- E. coli—Escherichia coli
- FCO—Fertilizer Control Order
- FSS—Faecal sludge and septage
- FSSM—Faecal sludge and septage management
- FSSTP—Faecal sludge and septage treatment plant
- GOI—Government of India
- HDPE—High density polyethylene
- Hg—Mercury
- IFA—International Fertilizer Industry Association
- KII—Key Information Interview
- MoHUA—Ministry of Housing and Urban Affairs
- MPN—Most probable number
- MSW—Municipal Solid Waste
- Ni—Nickel
- NPP—Nagar Palika Parishad
- NMCG—National Mission for Clean Ganga
- SMCG—State Mission for Clean Ganga
- ODF—Open-defecation free
- OpEx—Operational expenditure
- OSS—On-site sanitation systems
- Pb—Lead
- PDB—Planted drying bed
- ISAF—Integrated settler and anaerobic filter
- PGF—Planted gravel filter
- CT—Collection tank
- ACF/DMF—Activated carbon filter/dual media filter
- UV—Ultraviolet
- PWD—Public Works Department
- SBM—Swachh Bharat Mission
- SDG—Sustainable Development Goal
- SFD—Shit flow diagram
- TK—Total potassium (as K_2O)
- TN—Total nitrogen
- TOC—Total organic carbon
- TP—Total phosphate (as P_2O_5)
- TS—Total solids
- TSU—Technical Support Unit
- ULB—Urban local body
- UPJN—Uttar Pradesh Jal Nigam
- Zn—Zinc

Executive summary

India's most populous state Uttar Pradesh—with a population of approximately 4.45 crore—has embarked on a journey to address urban sanitation and management of used water.

Septage management is a major challenge in its 763 towns and urban local bodies (ULBs). Untreated septage pollutes the groundwater and rivers, causes loss of valuable nutrients that can be harvested for agriculture, and has a high pathogen contamination and health risk.

As per the 2020–21 Annual Report of the Central Pollution Control Board (CPCB), the total wastewater generated in these ULBs amounts to 8,263 million litre per day (MLD), out of which only 3,374 MLD is treated at 107 treatment facilities across 31 ULBs.

Chunar, a small town in eastern Uttar Pradesh, is one of the 315 towns in the state with a population of less than 50,000. Any successful pilot intervention in this town, therefore, has a huge potential for learning and replication not only for Uttar Pradesh but also for neighbouring Bihar and Bengal.

The National Mission for Clean Ganga (NMCG) funded the setting up of a faecal sludge treatment plant (FSTP) of 10-kilolitre-per-day (KLD) capacity in Chunar and another plant for co-treatment of septage at the 20-KLD capacity sewage plant in Bijnor town (Uttar Pradesh) under its initiative for abatement of pollution in the Ganga River. The Centre for Science and Environment provided the technical oversight for the successful planning, design and operationalization of the Chunar FSTP, which has been fully operational since 2021.

Aim of the report

This report traces the journey of Chunar from a town without significant septage management to one where it is a role model in septage management in Uttar Pradesh. It aims to capture key lessons of the entire process—from contracting to commissioning a faecal sludge treatment plant, to identifying critical areas of implementation oversight that state agencies need to focus on, and ensuring sustainable operational status and results.

The report is an input from CSE to the National Mission on Clean Ganga (NMCG) and the Department of Urban Development (DoUD) (Uttar Pradesh). We hope that the lessons and recommendations from this report will feed into improving the technical and operational support oversight of current and upcoming septage and used-water management infrastructure under NMCG, Swachh Bharat Mission (SBM) and other state programmes in Uttar Pradesh and elsewhere.

Key learnings from Chunar

Septage treatment is not a technology challenge

A sufficient range of technologies and treatment systems exist, including hybrid systems that combine natural and mechanical treatment systems for septage management. The real challenge lies in making septage management a desirable, functional and operational urban sanitation service delivery.

The following steps are recommended to facilitate this:

- **Start with interim solutions before the treatment plant is ready**: Even before the plant was ready, in 2019, Chunar town started septage management operations with deep row entrenchment. This enabled the uptake of regular desludging and transportation to a treatment facility. By this interim measure, Chunar treated around 73,500 litre of faecal sludge and septage that otherwise would have been dumped into the Ganga River.
- **Initiate desludging operations with institutions:** Desludging from schools, government offices and commercial establishments should be the first call to ensure intake of sludge at the FSTP.
- **Contextual designing of FSSM plant**: Uttar Pradesh has followed a standard model of 32 KLD capacity of septage treatment plants. Ensuring faecal sludge reaches the plant in adequate quantities every day is critical for the biological treatment process of the state's FSTPs, which are mostly designed as either a natural or a hybrid treatment system. The Chunar FSTP was right-sized, planned and designed for 10 KLD capacity.
- **Design and building:** Construction of nature-based septage treatment systems require a good understanding of hydrological flows and flow velocity. Contractors who build large sewage treatment plants (STPs) are usually unable to execute small-sized FSTPs maintaining these engineering specs. Another problem in construction is ensuring the quality of cement concrete construction and curing. Concreting was completed in one go for construction of planted drying beds and all other civil works.

- **Flexibility in making changes in design and remaining quality concerns:** During the entire construction period, maintaining quality standards and addressing emerging issues like groundwater seepage are important. The Detailed Project Report (DPR) of Chunar FSTP did not include a reinforced cement concrete (RCC) base for the planted drying beds and for the retaining walls. This was changed.

Enabling environment

An enabling environment for the creation of sanitation infrastructure solutions can be defined as strengthening the capacity and resources of the municipalities to undertake decentralized and non-sewered sanitation solutions. This includes all relevant actions at the state level that support small- and medium-sized municipalities to undertake sustainable and inclusive sanitation services of FSSM.

A small town in UP—or for that matter any other state of India—usually lacks adequate municipal staff and financial resources to be able to plan and execute infrastructure for sanitation and used-water management. There is a high turnover of executive positions, including engineers and administrators, in the city. Even when there is external funding for infrastructure, as in the case of NMCG funding for the Chunar FSTP, the enabling environment has to be more than enabling of infrastructure creation.

Inclusive sanitation is a goal of all urban sanitation works. This will require moving beyond sustaining regular operations of the 10 KLD faecal sludge treatment plant. Mere infrastructure creation and its sustenance will not ensure that the most marginalized and poor communities of Chunar town have access to affordable and effective septage management systems of desludging services.

State-level enabling support

At the state level, a focal person or a cell to promote septage and used-water management is an urgent priority given the scale of work being done under AMRUT and SBM.

Any enabling measure, including the "Ease of Septage Management" framework under consideration of the Department of Urban Development (DoUD) of UP, will go a long way in anchoring meaningful state-level support to urban local bodies in Uttar Pradesh.

The following measures are recommended for meaningful state-level support to urban local bodies in Uttar Pradesh:

- Clear contracts and bid documents that define the work to be done, and the roles and entitlements of the contractor.
- Guidance and support—including timely release of payments to the contractors and ULB—to be provided during all stages of construction of the FSTP.
- Enabling bylaws and advisories that promote some form of regular desludging of septic tanks and septage reaching the treatment plant.
- Guidance, encouragement and incentives for municipal officers and engineers to complete their work in time.
- State government to ensure that coordination between local government and agencies like Public Works Department (PWD) and electricity department to ensure connecting road and power reaches the FSTP.
- Inter-agency coordination among DoUD, Nagar Palika/municipality, Jal Nigam, Jalkal and the National Mission for Clean Ganga (NMCG), Atal Mission for Rejuvenation and Urban Transformation (AMRUT) and Swachh Bharat Mission (SBM) is vital as and when necessary.
- Learning and capacity-building opportunities must be created for ULB officials, technical agencies and private sector engaged in desludging work and plant operations.

Town-level enabling actions

The following are enabling town-level actions:

- Formation of City Sanitation Task Force (CSTF) and Sanitation Cell: The committee can take crucial decisions about the location of the plant, desludging fees and desludging services and other decisions to overcome unforeseen challenges.
- Adopting FSSM bylaws: Regulatory framework at the city level for appropriate containment structure should be ensured.
- Engagement of citizens in the process: The success of an FSSM initiative depends on the attitude and behaviour of citizens. Local people may be apprehensive of the smell that might emanate from the FSSTP and resist construction of the plant close to their neighbourhood. These concerns are best addressed by continuously engaging with citizens through various Information, Education and Communication (IEC) programmes.
- Regular engagement with all stakeholders: Private desludging operators must be engaged in identifying appropriate schedules and costing for desludging services.

About this report

Chunar, on the Ganga riverbank, has an area of 14 sq. km and population of 41,210.[1] In the absence of sewer networks and a system for septage treatment, the National Mission for Clean Ganga (NMCG) reasoned that building FSSTPs or co-treatment plants would be an option for pollution abatement in the river Ganga. It partnered with Delhi-based think tank Centre for Science and Environment (CSE) and worked closely with the urban local body Chunar Nagar Palika Parishad (NPP), Department of Urban Development (DoUD), Uttar Pradesh Jal Nigam (UPJN) and State Mission for Clean Ganga.

In 2017, CSE prepared a shit flow diagram (SFD) in Chunar, showing 100 per cent unsafe management of faecal sludge and septage (FSS). To manage FSS—with the objective of pollution abatement in Ganga—construction of a faecal sludge and septage treatment plant (FSSTP) of 10 KLD capacity was decided, with technical support from CSE and financial assistance from Namami Gange. Construction of the FSSTP started in December 2019 and was completed in March 2021, with construction disrupted during the Covid-19 pandemic.

The FSSTP was commissioned in September 2022. Uttar Pradesh Jal Nigam (UPJN) took care of the construction and is responsible for the O&M of the plant. Chunar Nagar Palika Parishad (NPP) provided all the necessary support for land selection, social mobilization and desludging services. Chunar NPP also constituted the City Sanitation Task Force (CSTF) and the Sanitation Cell for better coordination and monitoring of sanitation-related topics, including faecal sludge and septage management (FSSM).

CSE's support to FSSM in Chunar was reinforced by that of its citizens, Nagar Palika Parishad (NPP) and Uttar Pradesh Jal Nigam (UPJN), the contractor engaged and State Mission for Clean Ganga (SMCG).

The journey has not ended—and will not end soon either. This document is an effort to document the Chunar journey, which begun in 2017, till December 2022, as this marks an important milestone of getting a functional FSSTP. The FSSTP is also the first NMCG-funded FSSTP in the country.

CSE acknowledges the support of various stakeholders who have contributed to the Chunar project.

1. The journey so far

About Chunar

Chunar lies in the Vidhyan Range, and is 42 km from the Mirzapur and 336 km from the state capital Lucknow. It was named after Chunar Fort, constructed in 1029 by King Sahadeo, and later in 1532 by Sher Khan, in 1538 by Sher Shah Suri and in 1575 by Akbar.

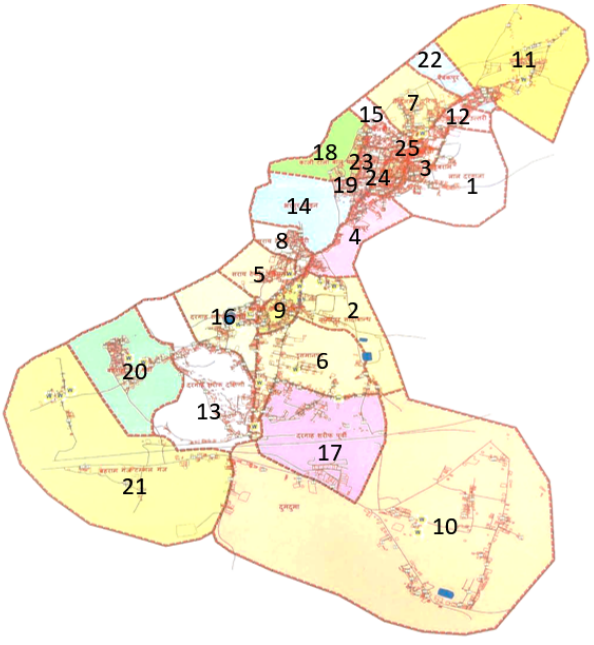
The town's key economic base is agriculture. Most of its workforce is engaged in agro-based businesses. Chunar is also well known for its small- and micro-scale pottery industries, especially clay toys. Living conditions in the city are generally moderate, with intermittent water supply and inadequate sanitary facilities.

Demographics and city profile

Chunar Nagar Palika Parishad is the urban local body in Mirzapur district. The town is divided into 25 municipal wards. Chunar's population, as per the Indian Census 2011, was 37,185, of which 19,647 were male and 17,538 female. The literacy rate was 66.4 per cent. The population of Scheduled Castes and Scheduled Tribes was 5,657 and 119 respectively.

Map 1: Chunar with ward boundaries and ward-wise population (Census 2011)

S.N	Ward Name	Ward Name	Households	Population
1	LALDARWAZA	लालदरवाजा	241	1459
2	Nagarpur Saadibandh	नागारपुर सादीबंध	154	1037
3	Gola sahabram	गोला साहबराम	175	1196
4	BHARPUR	भरपूर	203	1310
5	SARAYETEKOR Paschimi	सराय टेकोर पश्चिमी	277	1727
6	USMANPUR	उसमानपुर	248	1092
7	Settlement Area	सेटलमेंट एरिया	245	1494
8	Saraitaikore Uttari	सराय टेकोर उत्तरी	208	1473
9	Saraitaikore Daxini	सराय टेकोर दक्षिणी	247	1704
10	Dumduma	दुमदुमा	163	1131
11	CHAKAIPUR	चकईपुर	312	1970
12	Saddupur Mohana Uttari	सद्दुपुर उत्तरी	296	1864
13	Dargah Sharif Daxini	दरगाह सरीफ दक्षिणी	395	2018
14	Bharpur line	भरपूर लाइन	228	1326
15	BELVEER	बेलवीर	305	1766
16	DARGAHSHAREEF UTTARI	दरगाह सरीफ उत्तरी	266	1485
17	DARGAH SHAREEF Purvi	दरगाह सरीफ पूर्वी	185	1148
18	KAZITOLA BALUGHAT	काज़ितोला बालूघाट	228	1380
19	SABJIIMAHAL	सब्जीमहाल	161	1035
20	BAHRAMGANJ PURVI	बहराम गंज पूर्वी	196	1417
21	TUMMALGANJ	टम्मलगंज / बहरामगंज	282	2103
22	AIEBAKPUR	ऐयबकपुर	147	1097
23	GANGESHWAR NATH	गंगेश्वर नाथ	218	1396
24	MOCHITOLA	मोचीटोला	193	1264
25	SADHHPUR DASHCHIDI	सद्दुपुर दक्षिणी	378	2303
	Total		5951	37195



As per Census 2011 data, Chunar had 5,951 households in 2011. As per the latest data, however, the town has a population of 41,210 in 8,058 households.[2] Its core is densely populated, while households in the peripheral area have a rural settlement pattern. The town has no sewerage network and is completely dependent on on-site sanitation systems (OSSs). Chunar was declared ODF in 2019, ODF + in 2021 and ODF ++ in 2022.

Drainage

The city, with an average altitude of 84 metre above the sea level, has a triangular form, with the river Ganga in the west and the river Jargo in the east. The Jargo merges with the Ganga at the north boundary of Chunar town.

Chunar has alluvial sandy soil, brought by the deposition of sand silt by rivers. Groundwater is available at 5–45 metre below ground level (mbgl) (pre-monsoon) and 3.1–15.5 mbgl (post-monsoon). The city experiences waterlogging—which is mainly anthropogenic—during the monsoons.

Climate and rainfall

Chunar falls under eastern plain zone of Uttar Pradesh. The climate ranges from dry sub-humid to moist sub-humid. The temperature rises to a maximum of 41.8°C during peak summers and falls to a minimum of 9.6°C during winters. Chunar lies in a moderate to high rainfall region, with the lowest rainfall in April (rainfall up to 3 mm) and the highest in August (rainfall up to 345 mm).

2. Sanitation in Chunar: Overview

Status of sanitation

According to Census 2011 data, 9 per cent of Chunar has a sewer network. A CSE field study, however, revealed that there is no functional sewer network. Most of the households dependent on on-site sanitation systems either have septic tanks or lined pits (see *Table 1: Sanitation systems in Chunar*).

Table 1: Sanitation systems in Chunar

Sanitation system	Percentage of households
Piped sewer system	9
Septic tanks	53
Pit latrine (with or without slabs)	1
Public latrine	3
Open defecation	31
Other	3
Total	100

Chunar shit flow diagrams

To analyse existing FSSM practices in Chunar, CSE prepared a detailed report on excreta flow diagrams (or shit flow diagrams [SFDs]) based on a detailed survey (including households, key informant interviews, focused group discussions with masons and desludgers, and physical inspection of sanitation facilities) in Chunar.

In 2017, CSE developed the first shit flow diagram for Chunar to depict the status of sanitation and found there was 100 per cent unsafe management of faecal sludge and septage. On January 4, 2020, the trenching facility became operational. Subsequently, a second SFD was developed, which indicated that unsafe management of faecal sludge and septage changed from 100 per cent unsafe to 89 per cent unsafe in 2020. With intensive information, education and communication (IEC) and awareness programmes coupled with installation of faecal sludge and septage treatment plant (FSSTP) in Chunar, the status of sanitation progressed from 89 per cent unsafe to 49 per cent unsafe in 2022 (see *Annexure 1: Chunar shit flow diagrams*).

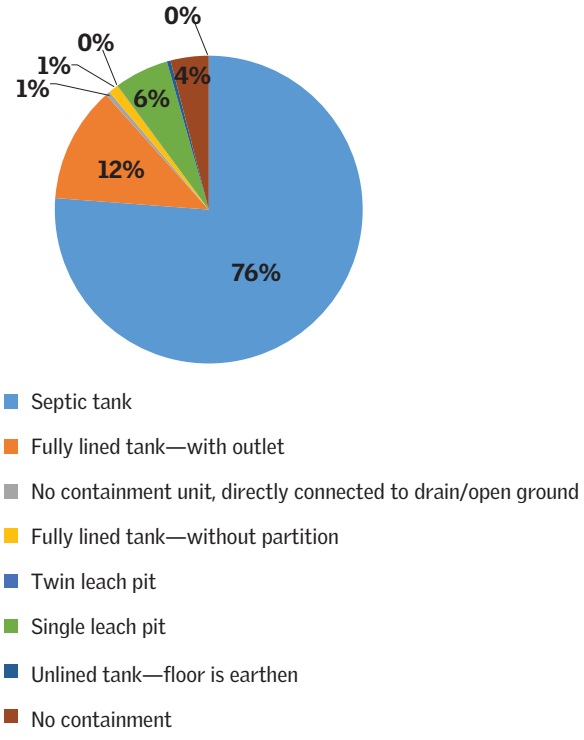
Chunar household survey (2021–22)

Between December 2021 and February 2022, a detailed household survey was conducted in Chunar, with the objective of assessing the possibility of introducing scheduled desludging.

Containment structure

The survey result indicated that 95 per cent of the households had access to individual household toilets. Out of the remaining 5 per cent households, 91 per cent practised open defecation and 9 per cent used community toilets or shared toilets. There were no sewer lines in Chunar. Of the 95 per cent households with toilet access, 76 per cent were septic tanks and 13 per cent were fully lined tanks, with or without partitions; 1 per cent of the households did not have any containment structure as such—the toilets were directly connected to either a drain or an open ground. Of the total toilets constructed, almost 50 per cent were built after 2014. The toilet outlets were linked to open drains (88 per cent), soak pits (11 per cent) and open grounds (1 per cent).[3]

Graph 1: Containment types



Photograph 1: Septic tank under construction in Chunar

Photograph 2: Effluent from a septic tank flows into an open drain

Economic profile of the households

During the household survey, 2 per cent of the households declared themselves to be in the above poverty line (APL) category, 63 per cent in the below poverty line (BPL) category, and 35 per cent of the households did not declare their economic status. The survey had also indicated that 90 per cent of the households are single families while 10 per cent are apartments occupied by multiple households.

Accessibility of the toilets

In 99 per cent of the households, on-site systems were located around (in front, behind or on the side) the household premises. In 9 per cent of the households, toilets were outside their property boundaries. In just about 12 per cent of the households, the on-site systems were accessible without breaking the top, while in the remaining cases the top had to be broken to access the system.

With regard to access of desludging vehicles to the households, 67 per cent of households in Chunar could be easily accessed by desludging trucks. The distance of the containment structure from the location of the desludging vehicle was less than 50 feet for 67 per cent of the households.

Graph 2: Accessibility of containment unit

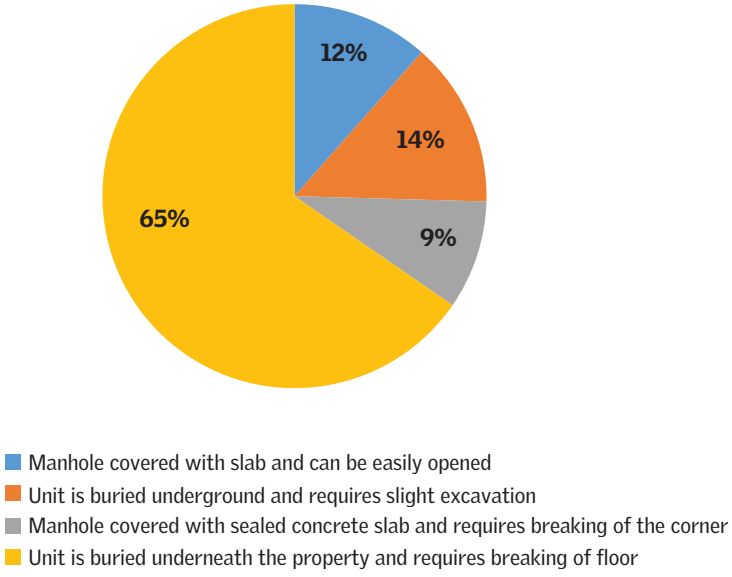


Table 2: Distance of containment structure from location of desludging vehicle

Distance	Percentage of households
Greater than 250 feet	10
200–250 feet	3
100–200 feet	6
50–100 feet	14
Less than 50 feet	67

Water supply

About 93 per cent of the households depended on piped water supply managed by the Jalkal Department. Other sources of water supply were hand pumps (4 per cent), tube wells (2 per cent) and any combination of piped water supply, hand pumps and tube wells. The supply of drinking water to households is managed by Uttar Pradesh Jalkal. The supply capacity is 5 MLD, groundwater being the source for supply by means of overhead tanks.

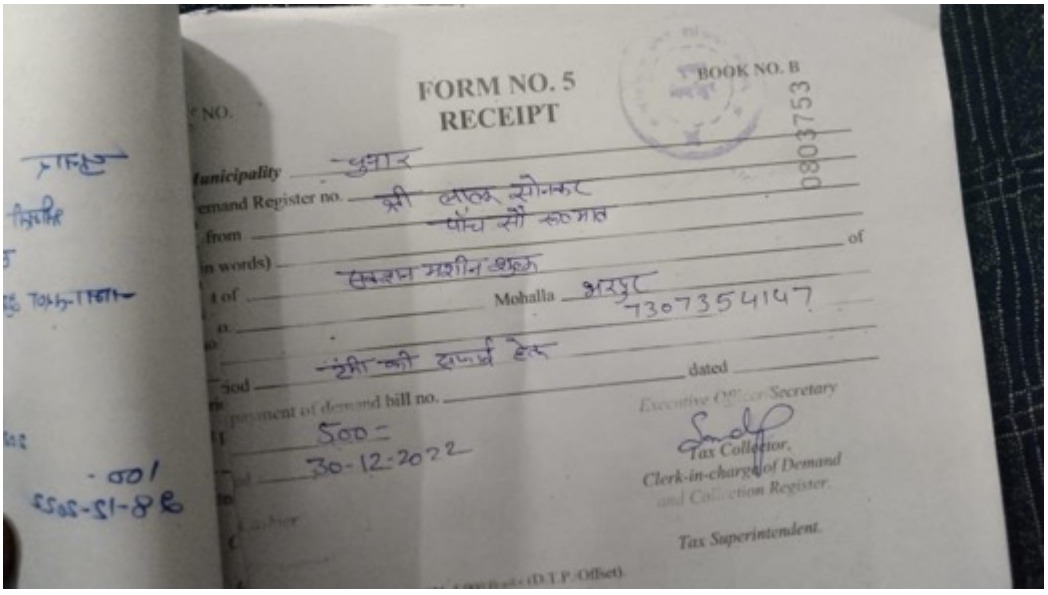
There is currently no treatment plant for used water—all the wastewater goes to the river Ganga through eight major and 14 small nullahs (see *Annexure 2: Response to NGT on treatment of Chunar nullahs*).

Sanitation workers

There are about 120 sanitation workers engaged by Nagar Palika Parishad Chunar (NPPC) for road sweeping, drain cleaning and desludging activities. Due to the unavailability of permanent government sanitation workers, NPPC has outsourced the responsibility. There are 60 pump operators working with the Jalkal Department, Chunar.

Sanitation services in different types of settlements

- There are four types of settlements, i.e. households living in government buildings such as Indira Awas, Kashiram Awas or DUDA Awas; individually owned households; institutional premises and commercial settlements.



Photograph 3: Receipt for payment of desludging fee

- Before intervention from CSE, NPPC provided demand-based desludging services in these settlements. Once the trenching facility became operational in January 2020, NPPC started regular cleaning of the septic tanks, and the faecal sludge and septage was taken to the trenching site for the next one year. In March 2021, the faecal sludge treatment plant (FSSTP) was soft commissioned and Chunar began decanting the sludge at the FSSTP. NPPC currently provides free desludging services to households living in government buildings such as Indira Awas, Kashiram Awas and DUDA Awas. For institutional and commercial buildings, Chunar charges Rs 3,000 per trip. NPPC supplies tap water for drinking to all the households. For individually owned households, the desludging fee is fixed at Rs 500.

- In March 2021 the 10-KLD FSSTP in Chunar started operation. Soft commissioning of the plant took place in September 2022. NPPC purchased a tractor-mounted vacuum tanker of 3.5 KL capacity for desludging septic tanks. Another vehicle, a Bolero mounted with a vacuum tanker of 1 KL capacity, is being procured to serve properties with narrower approach roads.

Role of private desludgers

Till November 2020, private desludgers operated from Varanasi—30 km away—to provide desludging services on demand in Chunar. They charged Rs 1,500–1,800 per trip while during 2017–21 NPCC charged Rs 3,000 per trip. Locals thus most often called private desludgers to clean their septic tanks. After the revision and notification of the FSSM bylaws in December 2021, NPPC reduced their charges from Rs 3,000 to Rs 500. Subsequently private desludgers stopped operating in Chunar as providing the service was no longer economically viable for them.

3. Construction of faecal sludge and septage treatment plant in Chunar

Why and how

- CSE has been involved in supporting governments at various levels and highlighting the issues of faecal sludge and septage management (FSSM). With the support of the Ministry of Housing and Urban Affairs (MoHUA) and the Ministry of Water Resources for River Development and Ganga Rejuvenation, Government of India, it has been working on an initiative aimed at capacitating urban local bodies and other stakeholders to help achieve convergence of national programmes, namely *National Mission for Clean Ganga* (NMCG), Atal Mission for Rejuvenation and Urban Transformation (AMRUT) and Swachh Bharat Mission (SBM) in identified flagship towns and cities by planning for citywide sanitation, including non-sewered areas, and identification of interventions for effective wastewater and faecal sludge and septage (FSS) management.
- MoHUA identified CSE to support a total of 23 towns (including Chunar) so that they become flagship towns in FSSM (see *Annexure 3: D.O. MD-SBM/AA/62/2016 dated May 30, 2016*).
- During the state-level meeting with the Principal Secretary, DoUD, government of Uttar Pradesh, on May 25, 2017, the state government requested CSE to prepare a detailed project report (DPR) for the FSSTP in Chunar (see *Annexure 4: PMU/194/431/2017 dated July 12, 2017*).
- During the City Sanitation Task Force Meeting (CSTF) in Chunar on June 1, 2017, the CSTF members approved the site shortlisted by CSE and requested CSE to prepare a DPR for the FSSTP (see *Annexure 5: Minutes of the meeting held on June 1, 2017*).
- In the meeting held with the National Mission for Clean Ganga (NMCG) in Delhi on February 5, 2018, chaired by the Executive Director (Projects), NMCG guided CSE to submit the DPR through the Uttar Pradesh State Programme for Mission Ganga (UPSPMG) for consideration of NMCG for possible funding under Namami Gange (see *Annexure 6: Minutes of the meeting held on February 9, 2018*).
- Chunar Nagar Palika Parishad (CNPP) provided CSE a No Objection Certificate to conduct surveys and test for designing and preparing a DPR for the FSSTP

on January 15, 2018 (see *Annexure 7: Chunar NPP-2018 dated January 15, 2018*).

- Accordingly, CSE facilitated the topographical survey along with soil-bearing capacity tests of the proposed site for the FSSTP.
- In this regard, ULB officials (Jalkal in charge, Sanitary Inspector and other CSTF members) from Nagar Palika Parishad Chunar (CNPPC) attended national exposure visits (in Bengaluru, Chennai, Pondicherry, Mysuru and Delhi) to see successful implementation of the FSSTP and to have first-hand interaction with the technology providers, municipality and beneficiaries.
- The DPR was prepared against the above background and submitted to CNPP for their necessary action.
- As the National Mission for Clean Ganga (NMCG) approved the DPR of FSSTP Chunar, NMCG appointed Uttar Pradesh Jal Nigam (UPJN) and provided funds for the implementation.
- UPJN prepared a bill of quantities (BOQ) and tender document for a 10-KLD FSSTP in Chunar, with specific criteria that the firm must have experience in construction of FSSTP of at least 3 KLD. Through following due process, the tender was awarded to Elefo Biotech Pvt Ltd in September 2019. Elefo Biotech prepared the design of all civil modules and got it vetted by the Indian Institute of Technology (Banaras Hindu University) (IIT [BHU]), Varanasi. The implementation of the project started in December 2019.
- For the Chunar project, the CSE lab team visited Chunar and collected samples of faecal sludge from different containments and tested for different parameters such as BOD, COD and TSS. After the project began operating, the quality of the treated wastewater has been checked at regular intervals.

Construction process

Steps for completion the construction can be divided in three sections: pre-construction, during construction and post-construction.

Pre-construction phase

Table 3: Timeline of pre-construction phase

Time	March 2017	June 2019	August 2019	November 2019	December 2019 to January 2020	September 2019	February 2020
Steps	Constitution of City Sanitation Task Force	Land acquisition for FSSTP site	Setting up to TSU Chunar, CSE	Demarcation of site	Cleaning of site	FSSSM bylaws and trenching presented in the board meeting	Levelling of site

Photograph 4: Demarcation of the site for the proposed faecal sludge and septage treatment plant (FSSTP)

- Chunar NPP and CSE jointly visited some possible sites for selection for construction of the FSSTP. After the pre-feasibility study and assessment of proposed sites, Ravine Land Site, Durgaji Marg, Dargah Shareef Mohalla, was selected. The site lies in the south of the city and is approximately 5 km from the centre of the city.
- In August 2019, CSE set up a technical support unit (TSU) at Nagar Palika Parishad Chunar for close monitoring and hand-holding support to build an enabling environment for construction and functioning of the FSSTP.
- In December 2019, Elefo Biotech started work on the site. CSE helped Elefo Biotech for demarcation of the FSSTP site. The site selected by Nagar Palika was undulating and required to be levelled. Due to the site's rocky terrain, levelling took additional time.
- CSE organized an orientation meeting with UPJN and Elefo Biotech on the structure and functioning of FSSTP to avoid any future construction related problem.
- CSE presented the draft FSSM bylaws, *Faecal Sludge and Septage Management*

in Chunar: Strategy cum Operative Guidelines[4,5,6] and the concept of trenching in the Board meeting for orientation, understanding and acceptance. It also discussed the importance and scope of scheduled desludging.

Photograph 5: Site before construction of the FSSTP

Photograph 6: Excavation at the FSSTP site

Table 4: Issues and interventions during pre-construction phase

Issues and challenges	Solution applied
Operation related	
Preparation of site for construction after demarcation as the terrain was rocky and undulating	Levelling of the site was challenging. Several rounds of discussion took place to address the challenge. A JCB was used for levelling the land and it took a considerable amount of time.
Capacity related	
Inadequate knowledge of contractor	Initially the tender document required firms with some experience of construction of FSSTPs to apply. Such firms were however not available. Elefo was selected with experience of working in construction of STP. Orientation training and meetings were therefore organized in the CSE Delhi office for a detailed discussion around construction of the FSSTP.

Interim solution: Trenching[7]

Photograph 7: Trenching in Chunar as an interim solution for safe disposal of faecal sludge

Trenching was conceived as an interim solution for managing faecal sludge and septage in Chunar until the proposed FSSTP became functional. CSE's Technical Support Unit (TSU)-Chunar in association with NPP Chunar (NPPC) had identified a site about 7.5 km from CNPP for trenching for safe disposal and treatment of faecal sludge and septage. The capacity of the trench was about 48 Kl. In August 2019, CSE submitted a DPR of trenching to CNPP. With active participation from NPPC staff and support from TSU-Chunar the trench received its first disposal on January 4, 2020. A total of 73,500 litre of septage was treated with the trench. This site was in use till February 2021. Subsequently, the site was closed following due procedure.

During construction

Table 5: Timeline of construction phase

February 2020	March 2020	July 2020	November–December 2020	September 2020	March 2021	September 2022
Excavation started	Covid-19 pandemic stalled construction	Construction began	Local protest	Removal of encroachment on approach road sorted out	Partial completion of construction and soft commissioning	Completion of construction with finishing

- Once the land was prepared for construction, the contractor started the excavation work for planted drying beds (PDBs), integrated settler and anaerobic filter (ISAF), planted gravel filter (PGF) and collection tanks.
- Construction of technical modules
  - Construction of PDBs for solid–liquid separation
    - Excavation of nine rectangular pits of size 7 x 8 sq. m was done with depth 1.725 m. The pits consist of filter material with boulders of 40 mm at the bottom and gravel of size 6–20 mm and sand on the top.

    The following precautions were taken during filling the filter materials in the PDBs:
    - The gravel was cleaned with high pressure water to remove dust.
    - The PDBs were waterproofed and ensured to be watertight.
    - Layering was done with different sizes of filter media so that the largest media was at the bottom and smallest at the top.

Photograph 8: Construction of planted drying beds (PDBs)

Photograph 9: Construction of planted drying beds hampered by rain

Photograph 10: Laying concrete in planted drying beds

- Construction of integrated settler and anaerobic filter (ISAF), planted gravel filter (PGF) and collection tanks:
  - The ISAF was constructed with five chambers—the first two chambers work as settlers and control the turbulence of water coming from PDBs.
  - The second two chambers were filled with cinder materials to reduce biochemical oxygen demand (BOD) level. The last chamber, the distribution chamber, is from where treated wastewater goes to the planted gravel filter for further treatment.
  - A collection tank was built after the PGF to hold the treated water.
  - At the end, there is an activated carbon filter (ACF), dual media filter (DMF) and a UV disinfector for getting desired levels of BoD and total suspended solids (TSS).

Photograph 11: Cinder materials used in the integrated settler and anaerobic filter (ISAF)

Photograph 12: Liquid treatment module

- Due to the rocky soil in the area, having a functional borewell has remained a challenge. The Jalkal office, Chunar provided water when necessary.
- There were community protests and encroachment, which were resolved.
- Chunar was hit by the Covid-19 pandemic during construction of the plant. With active intervention of the ULB and support from the contractor and Jal Nigam, the labour problem could be resolved.
- CSE TSU regularly supported construction of the plant, prepared reports on the following topics and shared the following with NMCG, UPJN and contractors:
    - o Progress report
    - o Quality of construction
    - o Any delay in payment from UPJN to the contractor

Table 6: Issues and interventions during construction phase

Issues and challenges	Solution applied
Design related	
The Chunar FSSTP site has two major elevation levels. The higher elevation segment has planted drying beds (nine), a sludge storage yard, overhead tank, administrative office, laboratory, toilet block and storeroom. The lower elevation segment has an integrated settler and anaerobic filter, planted gravel filter, collection tank, activated carbon filter, dual media filter and operator's room. A retaining wall was part of the design interfacing the high and low levels. The construction of the retention wall was proving not an optimal solution due to its poor effectiveness and high cost.	Jal Nigam and the contractor proposed a staircase in place of the retention wall, which was duly accepted by CSE. It was effective and saved money as well.
As per the detailed project report (DPR), the soil was not found suitable for construction of the base of the planted drying beds (PDBs) with plain cement concrete (PCC). The base of the PDBs were constructed with PCC but the PDBs failed hydraulic testing.	Jal Nigam and the contractor changed the type of concreting of the base of PDBs from PCC to reinforced cement concrete (RCC). The infrastructure could pass the hydraulic test.
As per the DPR, during construction, it was realized that there was not enough land to construct a polishing pond.	Instead of a polishing pond, UPJN and the contractor installed an activated carbon filter (ACF), dual media filter (DMF) and UV disinfector to ensure required quality of treated water.
Society related	
Encroachment of the approach road to the FSSTP site by local people. The land earmarked for the approach road was part of the vested land and some local people using them for their personal purposes.	Chunar NPP and the police force removed those encroaching on government land and the land for construction of approach road was recovered.
Agitation by local public to stop the construction work due to misconception that the plant would emit harmful gases and smell and adversely impact the environment	CSE and Chunar NPP conducted meetings with local people, prepared IEC material, and showed videos of FSSTPs operational in other cities.
Operation related	

Issues and challenges	Solution applied
Water availability at the site was a challenge due to depletion of the groundwater table. The contractor tried three times to dig borewells but remained unsuccessful. Curing of the construction thus became challenging.	Chunar NPP and CSE arranged supply of water tanker from Jalkal Chunar to the site. Jalkal Department, Chunar charged Rs 400 per 5,000 litre tanker.
Shortage and irregular supply of construction material as Chunar, being a small town, had limited resources.	The contractor began to place orders for construction material much in advance.
Covid-19 pandemic related	
Labour crisis hit the construction work during the Covid-19 pandemic. Labourers were mostly from outside the state and left Chunar during pandemic. So construction work was halted for around four months.	To mitigate this problem, NPP Chunar issued identity cards to local labour for working on the construction site. The contractor arranged a facility for labour to stay at the construction site.

Post-construction

Table 7: Timeline of post-construction phase

After July 2020	March 2021	September 2021	December 2021 to February 2022	January 2022	October 2022	October 2022
Awareness campaign (MalAsur)[7]	Soft commissioning done	Regular desludging started	Household survey	Formation of Sanitation Cell at ULB level	Notification of bylaws	Inauguration of scheduled desludging

Photograph 13: Hydraulic tests were carried out to ensure the structure was leak-proof

- After construction of FSSTP modules such as planted drying bed (PDB), integrated settler and anaerobic filter (ISAF), planted gravel filter (PGF) and collection tank (CT), UPJN tested the structures for leakage of water for 24 hours. After getting positive results for the hydraulic test, UPJN gave the go-ahead for a trial run and subsequent full-fledged operation.

- The slope of pipes for smooth flow of liquid from PDB to ISAF, PGF and CT were also tested and found satisfactory.
- CSE has prepared a checklist for soft commissioning and full-fledged operation of the plant and shared it with the contractor (see *Annexure 8: Checklist for soft commissioning and full-fledged operation*).
- It also prepared an O&M checklist for the smooth functioning of the Chunar project and submitted it to the contractor (see *Annexure 9: O&M checklist*).

Photograph 14: Soft commissioning of the FSSTP

- Soft commissioning of the FSSTP was completed on March 13, 2021, with 10 KL of sludge and three working PDBs.
- After construction of FSSTP, CSE facilitated a joint meeting with NMCG, NPP Chunar, UPJN and the contractor on mobilization of desludging activity and commissioning of the plant. Chunar NPP took the initiative to ensure supply of faecal sludge and septage on a regular basis from individual households, government buildings and community tanks.
- NMCG directed UPJN for issuing the commissioning certificate.
- CSE along with NPP Chunar took the initiative for cluster-based desludging. NPP Chunar requested nearby ULBs (Kachhwa and Ahraura) for decanting their faecal sludge at Chunar FSSTP. CSE TSU also conducted a survey of 30 villages in Narainpur Block to understand the potential for cluster-based desludging but it was found that all the villages had only soak pits or the twin-pit system, even in schools and other government offices.
- CSE provided regular support supervision of the project and maintained coordination with Chunar Nagar Palika Parishad (NPP), UP Jal Nigam (UPJN), State Mission for Clean Ganga (SMCG) and the contractor.

- To understand the potential of scheduled desludging, a detailed household survey was carried out. Scheduled desludging has also been inaugurated on a pilot basis.

Photograph 15: Chunar household survey

Photograph 16: Interaction with the community during the household survey

Table 8: Issues and interventions during post-construction phase

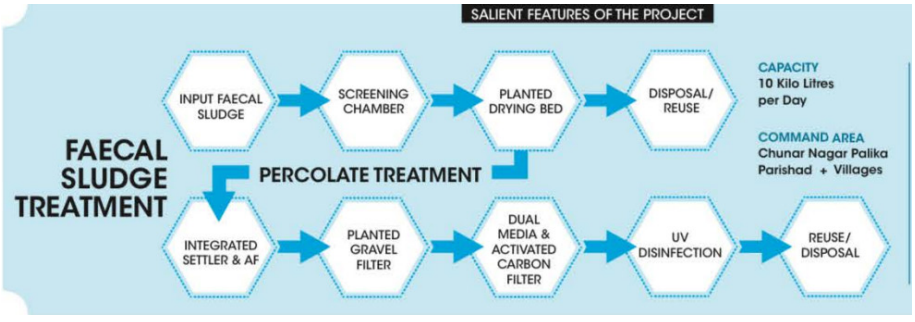
Issues and challenges	Solution applied
Operational	
After construction, an electricity connection to the plant was required for functioning of electric motor and UV disinfector and other electric appliances in the plant. As this was initially not part of the DPR, neither UPJN nor the contractor were willing to take the responsibility for ensuring electricity connection and paying of its bills on regular basis.	CSE called a joint meeting with NMCG, SMCG, UPJN and the contractor where it was decided that UPJN will get the electricity connection and the regular bills will be paid by the contractor from its OpEx.
Awareness among citizens regarding regular desludging of the septic tank was poor.	NPPC together with CSE TSU had intensive IEC and awareness programmes across the wards. NPPC and CSE also conducted the MalAsur campaign in local schools to educate students about FSSM. This is helped people understand the importance of the scientific management of the faecal sludge.
Water availability at the site for daily usage is a challenge as the groundwater table is depleted and repeated attempts to dig borewells remained unsuccessful.	The contractor purchased water from Jalkal, Chunar
Financial	
Delay in payment to the contractor by UPJN	CSE conducts regular meetings with NMCG. Whenever there are such delays, the contractor informs CSE with the expectation the CSE will do required facilitation for the smooth operation of the plant
Institutional	
Acceptance of bylaws by NPP Chunar Board members	Multiple rounds of discussion happened with the Board members on the frequency and cost of desludging. Eventually, the bylaws were accepted by the Board. The bylaws are currently in the final stage for gazette notification.

Snapshots: Chunar FSSTP

Process

Infrastructure is created in Chunar on the basis of the following process:

Figure 1: Process flowchart of Chunar FSSTP

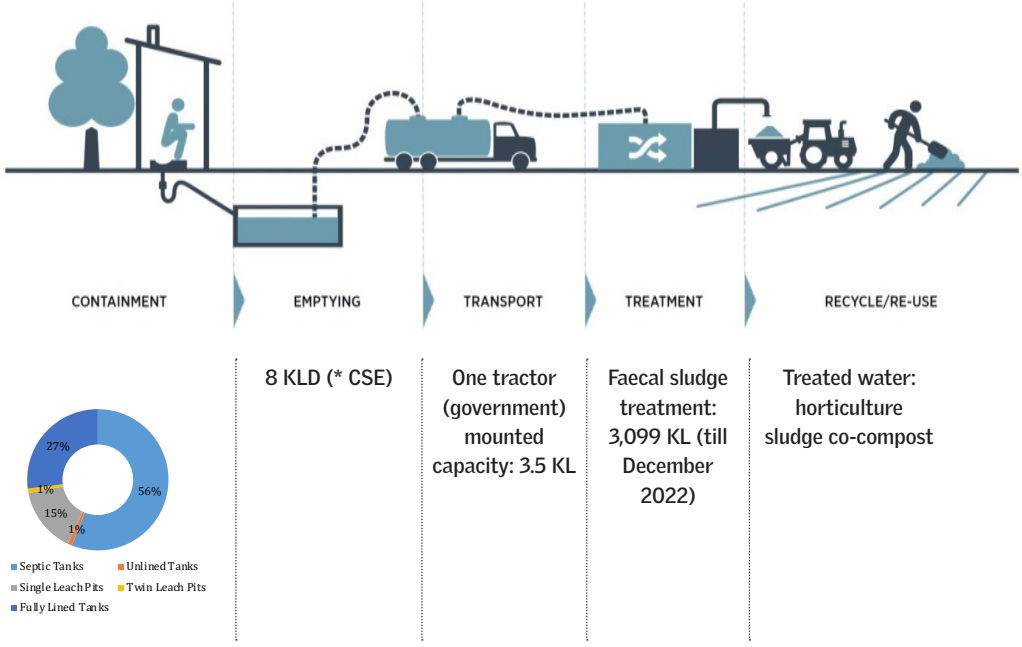


Project highlights

- CapEx: Rs 2.17 crore; OpEx: Rs 8 lakh/annum—for creation of enabling environment and O&M of plant
- Funding agency: National Mission For Clean Ganga
- Implementing agency: Uttar Pradesh Jal Nigam (UPJN)
- Executing Agency: Elefo Biotech Private Limited
- Technical support: Centre for Science and Environment
- Commissioning date: March 13, 2021
- Geo-coordinates: 25.100721°, 82.868087°
- Technology: Planted drying bed (PDB) with anaerobic baffle reactor (ABR)
- Total area: 3,250 m² (0.8 acre); built-up area: 1,366 sq. m

The Chunar project as per the sanitation value chain is as follows:

Figure 2: Sanitation value chain



Costing of Chunar project

NMCG has given UPJN the responsibility of creation of FSSTP infrastructure and its O&M. NPP Chunar has been given responsibility of providing desludging services, doing IEC activities and creation of dashboard for real-time monitoring.

The following is details for the budget, allotment and utilization figures segregated at the level of UPJN and NPP Chunar:

Table 9: Financial details of UPJN and NPP Chunar (till December 2022)

Particulars	Budget (Rs)	Allotted (Rs)	Utilization (Rs)
UPJN to utilize			
Construction of FSSTP	192 lakh	192 lakh	192 lakh
O&M for five years	25 lakh	25 lakh	Nil
Subtotal 1	217 lakh	217 lakh	192 lakh
Nagar Palika Parishad to utilize			
GIS mapping and dashboard	7 lakh	3.5 lakh	Nil
Purchase of vacuum tanker of 1 kl	5.10 lakh	5.10 lakh	5.10 lakh
O&M of vacuum tanker	22.77 lakh	3.73 lakh	3.73 lakh
IEC	15 lakh	6.25 lakh	6.25 lakh
Subtotal 2	**49.87 lakh**	**18.58**	**15.08 lakh**
Total (subtotal 1 + subtotal 2)	**266.87**	**235.58**	**207.08**

In terms CapEx and OpEx, the budget, allotment and utilization figures are as follow:

Table 10: Details of CapEx and OpEx (till December 2022)

CapEx/Opex	Budget (Rs)	Allotment (Rs)	Utilization (Rs)
CapEx	Rs 192 lakh	Rs 192 lakh	Rs 192 lakh
OpEx	Rs 25 lakh	Rs 25 lakh	Nil
Total	**Rs 217 lakh**	**Rs 217 lakh**	**Rs 192 lakh**

Photograph 17: Before construction of the faecal sludge and septage treatment plant (FSSTP)

Photograph 18: Construction of the FSSTP in Chunar in progress

Photograph 19: Solid–liquid separation unit

Photograph 20: Liquid treatment unit

Photographs 17–20: Chunar FSTP before, during and after construction

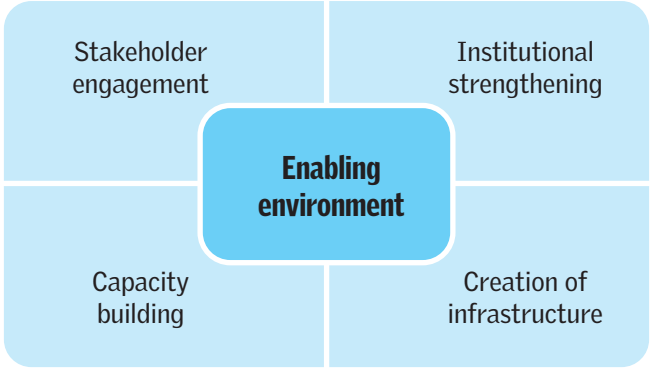
4. Towards an enabling environment

An enabling environment for safe and scientific treatment of faecal sludge and septage in Chunar was created through a four-pronged strategy, including stakeholder engagement, institutional strengthening, creation of the FSSTP infrastructure and capacity-building programmes.

Stakeholder engagement

The major stakeholders of the programme on the one hand are the citizens of Chunar city and on the other are the various departments and institutions, who plays important role in terms of influence and power for the success of the Chunar FSSTP programme.

Figure 3: Four components of enabling environment in Chunar



Citizen engagement

Table 11: Tools for citizen engagement

During	Activity	Objective and likely number of people impacted
August 2019–March 2020	• Transect walk and discussion with local public • Banner, leaflet distribution and loud speaker announcement during national Ganga Yatra event	To understand the issues related sanitation Citizen awareness related to FSSM
March 2020–December 2020 (during Covid-19 pandemic)	• CSE prepared IEC materials, posters, wall paintings, videos on Covid-appropriate behaviour, including making masks at home, wear PPE correctly, etc. • Orientation training of sanitation workers on Covid protocols • CSE provided PPE kits and foot-operated handwashing stations. • In August 2020 Chunar NPP and CSE started the MalAsur campaign to interact with people.	• Orienting citizens and sanitation workers on practising Covid-appropriate behaviour • Awareness generation about FSSM
January 2021 to December 2022	• Open gathering and exposure to Chunar FSSTP[8] • Ward-wise IEC programmes, including MalAsur campaign and awareness generation through leaflets, banners and loudspeaker announcements • Five-day IEC programme in Chunar, covering schools and wards[9]	• To understand the FSSM in Chunar, about 500 people, including ward members, visited the plant on that day. • Awareness generation on FSSM and regular desludging

Photographs 21a–h: IEC activities in Chunar

Other government departments and institutions

Table 12: Government departmental and institutional engagement

Department	Engagement
State Mission for Clean Ganga	Chunar FSSTP, the first project built in the country with NMCG funding, is of immense importance to all the stakeholders. SMCG, the state interface of the NMCG, facilitates the implementation of the programme. There is regular coordination with State Mission for Clean Ganga (SMCG)-UP.
UPJN	• As the implementing agency selected by SMCG for the construction of the FSSTP, UPJN is an important stakeholder of the project. Regular meetings have been taking place from the pre-tendering stage for smooth implementation and operationalization of the plant. • CSE organized an exposure visit for UPJN officials to Malaysia, Bangladesh and parts of the India to understand the issues and challenges related to FSSM. • UPJN officials participated various training programmes organized by CSE.
Jalkal	• Jalkal Department is an important stakeholder in the Chunar programme and supported organizing various events such as World Water Day and World Toilet Day for awareness generation. Jalkal officials actively participated in the Chunar-level programmes. • Jalkal helped in the construction of the FSSTP by providing a water tanker at a low price. • Jalkal engineers participated in various trainings organized by CSE.
NPPC	• The most crucial stakeholder for the successful implementation of Chunar programme, including land selection, awareness generation, providing desludging services, implementation of bylaws etc. • CSE provided technical support to constitute a sanitation cell for regular monitoring of the FSSM-related issues. • The City Sanitation Task Force has been constituted in Chunar NPP. So far nine CSTF meetings have been held for the smooth implementation of the FSSM in Chunar.
School/college	In Chunar, seven schools and colleges participated in the FSSM awareness campaign.
Other institutions	The Consortium for DEWATS Dissemination (CDD) Society helped in the preparation of the DPR for the Chunar FSSTP and BBC Media Action helped CSE in the implementation of the MalAsur campaign, including development of IEC materials.

Institutional strengthening

CSE has worked closely with NPP Chunar from the start. Apart from regular coordination, the following strategies have been taken to institutionally strengthen the functioning of the ULB for better management of FSSM:

Constitution and functioning of City Sanitation Task Force

Chunar's City Sanitation Task Force (CSTF) was constituted on March 21, 2017 under Swachh Bharat Mission (SBM) with CSE's systematic support to capacitate CSTF members by conducting classroom trainings, national and international exposure visits with the intent to enhance understanding on Citywide Sanitation and preparation of City Sanitation Plan. CSTF meets regularly to discuss how to improve sanitation of the city. NPPC and CSE conducted nine CSTF meetings till now. There are 20 members in CSTF Chunar from different backgrounds. The city chairman is the head of the CSTF, and the members are current or ex elected representatives, Nagar Palika Parishad officials and from academics, social work, media or medical (primary healthcare [PHC]). The key roles of the CSTF members are providing overall guidance to sanitation implementation agencies, regular supervision and monitoring of implementation of sanitation-related activities, generating awareness among citizens and other stakeholders, and issuing regular briefing to media on progress of sanitation status of Chunar

Sanitation Cell Nagar Palika Parishad Chunar[10]

Photograph 22: Chunar Sanitation Cell

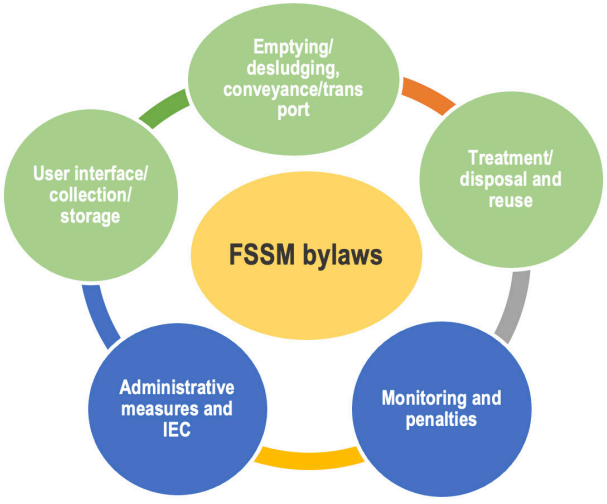
In January 2022, the Nagar Palika Parishad Chunar constituted a dedicated cell of five members (see *Annexure 10: Sanitation Cell Nagar Palika Parishad Chunar*), with technical support from CSE, to address all the issues and challenges regarding sanitation and especially related to FSSM. Chunar NPP allotted and publicized a dedicated phone number for citizens to register

any complaint, grievance related to sanitation or request for desludging. The Sanitation Cell submits on a monthly basis a report to the Executive Officer on the number of complaints received, how many are resolved, associated issues and number of desludging requests received vis-à-vis those serviced.

Formation of FSSM bylaws[11] and gazette notification

CSE prepared draft bylaws on faecal sludge and septage management for Chunar, and CSE Technical Support Units (TSUs) presented the draft in a board meeting to incorporate inputs from the elected representatives and officers. Once the inputs were incorporated in the document, it was shared with NPP Chunar. NPPC notified the bylaws in newspapers on October 10, 2022. The Chunar FSSM bylaws are in the process of being gazette notified (see *Figure 4: Components of FSSM bylaws*).

Figure 4: Components of FSSM bylaws



Steps for gazette notification of the bylaws

- CSE initiated the discussion on the importance of having the FSSM bylaws;
- CSE presented the draft bylaws to the Chunar Board meeting;
- Final bylaws accepted by the Chunar Board;
- Newspaper publication of the bylaws for public opinion;
- Newspaper publication of revised bylaws, with public comments incorporated, for public opinion;
- Gazette notification (pending).

Creation of infrastructure

As described earlier, the Chunar FSSTP is complete and commissioned. The infrastructure is a crucial element of the sanitation landscape in Chunar.

Capacity building

Chunar officials are regularly provided with trainings,[12] both on-site and online, and exposure visits (see *Table 13: Capacity building*).

Table 13: Capacity building

Capacity building initiative	Description
International training and exposure visit for faecal sludge and septage management (FSSM) in February 2020 in Bangladesh[13]	The training was a part of CSE's initiative for capacity building of officials from state and city officials from Uttar Pradesh and National Mission for Clean Ganga. The event included two days of classroom training and an exposure visit to a FSSTP.
Masons training at NPPC, February 2020	CSE conducted training on construction of on-site sanitation to local masons. Two days of training was provided to 25 masons to bring improvement in the design and infrastructure of septic tanks.
Training and Exposure Visit for Planning and Implementation of Faecal Sludge and Septage Management (FSSM), December2018	The training was organized in Lucknow for two days. The Executive Officer Chunar, as a member of CSTF, participated in the training.
Training on Sewerage to Sustainable Sanitation: Mapping of Excreta Flow and Faecal Sludge and Septage Management, October 2017	Event on Planning and Designing of Faecal Sludge/Septage and Decentralized Wastewater Treatment Plants. Excreta flow diagram was introduced to the participants for improved urban sanitation programming. Officer from Jalkal Vibhag from NPP Chunar participated in this learning experience.
Orientation cum consultation on FSSM bylaws and trenching, September 2019	• CSE TSU presented FSSM bylaws in council meeting • The idea of trenching was shared • Advocating for the provision of scheduled desludging the on-site sanitation system tanks in Chunar

5. Learning from the Chunar FSSTP project

Contextual designing of plant is crucial

The following were the learnings in designing the FSSTP in Chunar:

- Designing for the right capacity: Pre-feasibility is the most important aspect while designing the required treatment capacity of the plant. Based on the pre-feasibility study and discussions with key stakeholders, the design capacity of the Chunar FSSTP plant arrived at was 10 KLD. In contrast, most of the 32 KLD FSSTPs in Uttar Pradesh were finalized at the state level without any feasibility study or consideration of the local context. The pre-feasibility study included an SFD for studying the status of FSSM and potential for adopting future interventions, geographical study, soil test and analysis of the FSS samples done by CSE's lab team.

- On-site implementation challenges in construction phase: Any detailed project report (DPR) that does not account for existing topography and soil condition is a grave risk for successful construction and operations. The landscape of Chunar site is uneven and therefore the modules are located in different levels. Customization of design was also done during the construction phase and deviation from the DPR was carried out when it was found to be important for the future sustainability and efficiency of the project. For example, in the DPR, a retaining wall was part of the design, interfacing the high and low levels. The engineers of UPJN and CSE, after discussion, decided that the construction of the retention wall would not provide an optimal solution due to its effectiveness and cost. Jal Nigam and the contractor proposed a staircase in place of the retention wall, which was duly accepted by CSE. It saved money and enhanced effectiveness of the project as well. Further, Jal Nigam and the contractor changed the type of concreting of the base of planted drying beds (PDBs) from plain cement concrete (PCC) to reinforced cement (RCC). PCC base of PDBs was mentioned in the DPR with technical suggestions for excavation of soil. But due to failure to excavate as per the DPR, UPJN and the contractor with consultation of CSE decided to construct the bases of the PDBs with RCC, as PCC failed the hydraulic test. The RCC flooring could pass hydraulic test. Therefore while preparing the DPR, the local context needs to be considered and studied properly rather than adhering to standard design parameters.

Maintaining quality of construction is crucial for sustainability of plant

During construction of the Chunar FSSTP certain precautions were taken to ensure the quality of the plant. The cube test and slump test are crucial for assessing the strength of the concrete, which were done in Chunar. Correct size of cover blocks were used for ensuring correct alignment and preventing rust. Adequate water is required during construction for curing, but due to shortage of water in the Chunar plant, water tankers from Jalkal were arranged. Such costs are usually not factored into DPRs and lead to poor quality construction outcomes. The ponding method was used in Chunar for curing of concrete structure. Concreting was completed in one go for construction of each structure such as PDBs.

Trenching is effective as an interim solution

The introduction of trenching as an interim measure in Chunar NPP helped safely manage 73,500 litre of faecal sludge that otherwise would have mixed with river water, leading to its contamination and becoming a threat to public health.

To assess the impact of trenching, CSE conducted a shit flow diagram analysis in 2020, which showed 11 per cent safe management of faecal sludge in comparison to 0 per cent in 2017. The low CapEx and OpEx of trenching make it a viable model to adopt for the smaller urban local bodies (ULBs) who are struggling to safely manage their faecal waste in the absence of a sewerage network or faecal sludge treatment plant. Also, the compost received after trenching exhibits nutrient properties comparable to FCO standard vermicompost and co-compost with a little sun drying and grinding (see *Annexure 11: Comparison of co-compost with trench compost*). The dried sludge can be either be used as a fertilizer in municipal gardens or on green patches developed on the road dividers. As an alternative, trees can also be planted on top of or alongside filled trenches, and the nutrients in the sludge will enhance growth rates and increase timber volumes. Therefore while planning, immediate requirements should be dealt with, along with medium- and long-term goals.

Multi-stakeholder collaboration

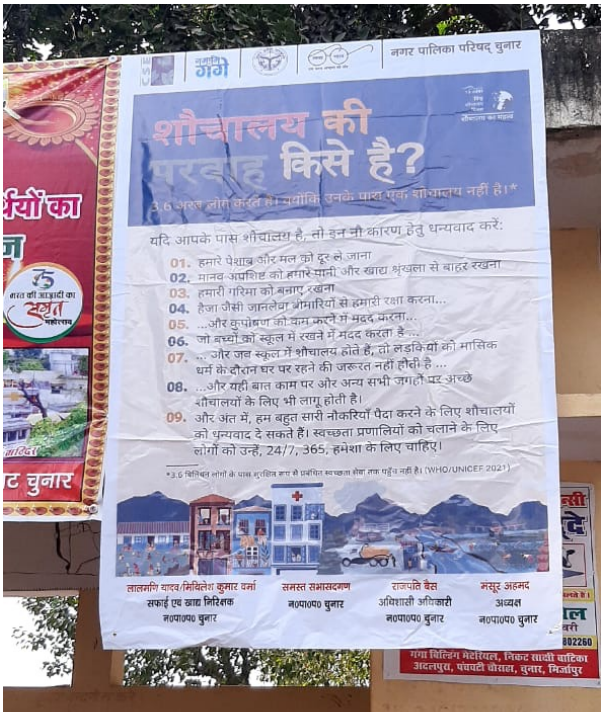
The Chunar FSSTP is an example where the National Mission for Clean Ganga–State Mission for Clean Ganga-Uttar Pradesh (NMCG-SMCG), Department of Urban Development (DoUD), Uttar Pradesh Jal Nigam (UPJN), Jalkal, Mirzapur district administration and NPP Chunar worked together at various levels of planning and implementation, and CSE played a catalytic role as knowledge partner. The district administration sent a police force to remove the encroachment from the approach road to the plant. The City Sanitation Task Force and Sanitation Cell took decisions

regarding lowering the desludging fees to Rs 500. Chunar NPP accepted the FSSM bylaws to regulate the desludging services.

NMCG and SMCG regularly provided administrative and financial support. UPJN monitors the quality of the plant and the contractor's work. The multi-stakeholder collaborative effort and communications between them coupled with the citizen engagement programme proved to be helpful in making the Chunar project operational and functional at full capacity level.

Citizen engagement

Construction and operationalization of the Chunar project faced many social challenges. Anticipating odour and pollution, local people had objected to the location of the project site. A series of meetings with the community helped people to change their views. People were also made aware of the ill effects of poor management of excreta and faecal sludge. During the household survey, people were not furnishing information. With intensive and regular activities for citizen engagement, these barriers could be overcome. Regular IEC activities have remained a crucial intervention for ensuring desludging from septic tanks to run the FSSTP at full capacity.



Photograph 23: IEC messaging on World Toilet Day 2022

During last few years, a few community members emerged as effective facilitators to mobilize the local community. CSTF members Mr Jyoti Prakash Singh (former ward member), Km Beena (social worker), Major Kripa Shankar Singh and Dr Bramhanand Shukla are some of those who are active in speaking to the public in Chunar and orienting them about FSSM. Mr Rajpati Bais, Executive Officer of Chunar, himself takes interest in community mobilization and visits IEC programmes that are regularly organized at the ward level, hospitals, near the Ganga Ghat, and various schools. He can explain the topic of FSSM in simple language even to the school children.

IEC activities have been conducted in Chunar since 2019. Around 11 phases of IEC events have been organized with the objective to make people aware about the correct size of septic tank, importance of regular desludging, link of sanitation to public health and the overarching MalAsur campaign. Events are generally organized on every World Toilet Day, World Earth Day, World Water Day and Independence Day. Another event was Ganga Utsav in November 2021, where about 1,000 people were reached directly and social media coverage reaching about 20,000 people. The campaign was for three days and comprised activities such as "Yoga for Ganga" and "Rally for Clean Ganga", with participation from the local public. Promotion of faecal sludge and septage management in Chunar was an integral part of the activities.

Photograph 24: Awareness campaign on World Water Day 2022

Photograph 25: IEC messaging through video by Executive Officer Chunar

Photograph 26: Day 1 of Ganga Utsav 2021

Photograph 27: Day 3 of Ganga Utsav 2021

Future IEC in Chunar should focus on raising awareness on the proper use of community toilets and public toilets, regular desludging of septic tanks—once every three to four years—retrofitting of existing faulty septic tanks and health and safety of sanitation workers. The cost for community engagement and training of plant operators, engineers, officials and sanitation workers are being funded from NMCG at the rate of Rs 3 lakh/annum for five years.

Training local masons, contractors, UPJN and CNPP officers for smooth implementation of FSSM in Chunar

Properly designed septic tanks are important for scientific primary and partial digestion of excreta, which is further treated in the FSSTP. During the preparation of SFDs and subsequent discussion with households and masons, it was found that septic tanks were not being designed appropriately in Chunar. CSE therefore created a model of a septic tank in the Chunar NPP office campus for demonstration and provided hands-on training to local masons in two batches on the scientific designing and construction of septic tanks with the expectation that this training would help masons to appropriately design, construct and retrofit septic tanks. There were 11 septic tanks constructed after the training and except for one all were done appropriately. As officials were not aware about the FSSTP technology—Chunar being the first FSSTP constructed in the east Uttar Pradesh—orientation training and discussions on FSSTP technology were held with UPJN officers and contractor in the CSE Delhi office. There were other trainings and meetings organized where Chunar NPP officials participated. These trainings were important for the stakeholders to understand various aspects of the programme, take ownership of it and make efforts for the programme to be successful.

Journey does not end with construction of FSSTP

The construction and the functioning of the FSSTP marks a milestone in the Chunar sanitation journey. To sustain ongoing efforts, however, there are many issues that require continuous work and emphasis. Proper O&M of the plant and desludging vehicles, makeover and retrofitting of existing faulty septic tanks, provisioning of smaller vacuum tankers for accessing septic tanks using narrow lanes, providing regular desludging services and fixing appropriate desludging fees are areas where Chunar requires to continue its journey.

6. Future challenges and the way forward

Coverage of sanitation services to most excluded and marginalized

Currently, UPJN is planning an STP with Interception and Diversion (I&D) but is not considering laying any new sewer lines in Chunar. The location and capacity of the STP is still to be finalized. There is no provision of co-treatment of septage with sewage in the proposed I&D DPR module. The existing FSSTP will therefore have to cater to the need for FSSM in Chunar.

The following are the challenges to ensuring full coverage and sustainable sanitation services:

Containment structures

Around 29 per cent houses of project area are using unlined septic tanks. Around 29 per cent toilets are still unlined and need actions to convert them as lined tank in near future. A total of 56 toilets in the project area are directly connected with an abutting drain, and would need prior consideration of upgradation.

Accessibility of containment structures

The biggest challenge for desludgers will be to access the containment structures as currently only 153 households have septic tanks with top covers that can be easily removed. For the rest of the septic tanks, breaking of floors or concrete slab will be required.

Table 14: Accessibility of containment structure

Accessibility	Grand total	%
Manhole covered with sealed concrete slab and requires breaking of the corner	337	7
Manhole covered with slab and can be easily opened	153	3
Unit is buried underground and requires slight excavation	611	13
Unit is buried underneath the property and requires breaking of floor	3,682	76
No information	62	1
Grand total	**4,845**	**100**

Road width to access containment structures

Out of 4,845 residential and/or commercial properties registered in Chunar town, 3,969—where the width of the road is greater than 3 metre—are accessible by

mechanical desludging vehicles. For the remaining 756 properties—where the width of the road is less than 3 metre—Chunar has to arrange for small vehicles to reach the property. With one 3,000 litre and one 1,000 litre desludging vacuum tanker, Chunar ULB can serve almost all the households (see *Annexure 12: Road to access containment structures*) if the width of the road is greater than 3 metre and the property is accessible for desludging services.

Distance to access containment structures

For 2,653 properties, the distance of the vehicle would be less than 50 feet. The number increases to 3,513 (72.5 per cent) when the distance considered is less than 100 feet. However, for 27 per cent properties the distance is more than 100 feet—these cannot be serviced with a 3 KL vacuum tanker. With the introduction of the 1 KL vacuum tanker, these households can be serviced. Overall the properties are accessible.

Fees for scheduled desludging

Although majority of the Chunar households belong to BPL category, they expressed their willingness to pay any fee in the range of Rs 500–1,000 as this is far less than what they would be required to pay to private desludgers in the absence of the ULB service system. Survey results related to willingness to pay highlight significant willingness, i.e. around 99 per cent houses, towards scheduled desludging services. More than 97 per cent of the houses were also willing to pay fees in the range of Rs 500–1,000 for desludging. This means that citizens in Chunar are willing to pay more than the existing desludging fee of Rs 500 if required.

Sustaining functioning of FSSTP

Frequency of desludging operations

Assuming that 4,845 properties are to be desludged over a period of three years, around six properties are to be desludged per day. With 10 KLD capacity of the FSSTP, further information is required to conclude whether Chunar can operate six desludging operations per day.

Table 15: Desludging frequency

Time	Desludging frequency
Total to be covered in three years	4,845
Total to be covered in one year	1,615
Total to be covered in one month	135
Total to be covered in one day	6

Poor desludging trend

Currently the number of desludging requests are limited to around six to seven per month. Cleaning requests for collection tanks are fairly low and it is rare to have a cleaning request for common collection tanks. Around Rs 1,500–3,500 per trip is charged for tank cleaning. Desludging requests need to be increased. Awareness among citizens needs to be generated regarding safe sanitation practices and importance of regular desludging.

Sustainability of desludging operations

As Chunar is inhabited predominantly by below poverty line (BPL) households, charging high desludging fees is not feasible. Even so, more than 97 per cent households felt that a fee of Rs 500–1,000 was practicable for desludging. This fee may not be sufficient to carry the O&M cost for the FSSTP site and desludging operations, but with financial support of the National Mission for Clean Ganga (NMCG) for the next five years, scheduled desludging can be introduced.

Running desludging services along with bearing the cost of O&M of the FSSTP site solely out of desludging fee looks difficult, but this is the case in all the other cities.

Containment structures

There are 4,845 containment structures that are either fully lined, with outlet; fully lined tank without partition; septic tanks; or unlined tank, where the floor is earthen. The ward-wise distribution of the tanks shows that most (4,095) of containment structures of these four categories are septic tanks.

Introduction of scheduled desludging requires the presence of septic tanks. The septic tanks are distributed among all the wards. In a few wards, the number of tanks is inadequate (see *Annexure 13: Ward-wise distribution of containment structures*).

Strengthening institutional and regulatory frameworks

Regularizing functioning of CSTF and Sanitation Cell

Chunar has set up its monitoring mechanism by constituting and regularizing CSTF and the City Sanitation Cell and additionally provisioned one helpline number for citizen communication. The steps already taken require to be maintained with regularity. Chunar is also supposed to create one online dashboard for better monitoring of FSSM services as mentioned in the agreement between NMCG and Chunar NPP (letter no. 165/Chunar NPP-2019 dated 13.09.2019). A dashboard would help Chunar monitor all activities on a real-time basis.

It is evident that the current desludging fees as decided by the NPP Chunar Board is not sufficient to sustain the O&M cost for the plant and desludging services. Necessary changes required to be made in the fees as well.

Future fund requirement of Chunar NPP to finance cost of O&M of FSSTP and desludging services

Currently, NMCG provides funding for O&M of the plant at the rate of Rs 5 lakh per year, which is available for the next five years (till FY 2026–27). This fund is currently managed by UPJN. NMCG also provides financial support to the Chunar NPP (see *Table 16: Year-wise cost and projections*). The calculation of cost of desludging for Chunar NPP (only for the 3.5 KL capacity vehicle) works out to Rs 5.55 lakh/year. One additional desludging vehicle of 1 KL capacity will increase the cost to Rs 6.63 lakh in 2023–24, assuming that the same driver and helper would operate both vehicles.

Table 16: Year-wise costs and projections

Costs	Year-wise cost and projection (in Rs lakh)				
	2022–23	2023–24	2024–25	2025–26	2026–27
Desludging cost	5.5	6.63	7.293	8.0223	8.82453
NMCG grant to ULB for desludging services	3.73	4.1	4.51	4.96	5.46
Difference in costs	1.77	2.53	2.783	3.0623	3.36453

Table 17: Chunar support to desludging operations in 2022–23 (till December 2022)

ULB support to desludging operation in 2022–23 (in Rs lakh)	
Desludging fees collected	0.16
ULB contribution from CFC and OSR	1.61

The gap in the cost of desludging services and the support received from NMCG will increase every year (see *Table 16: Year-wise costs and projections*). To finance this gap, Chunar NPP has two options—to either increase the desludging fee, which is currently very low (Rs 500 per household) or apportion a certain section of its revenue earned either from Own-Source Revenue (OSR) (tax/non-tax etc.) or grants from the Central Finance Commission or State Finance Commission. Increase in the desludging fee or other tax/non-tax would require Chunar NPP to bring changes in its bylaws.

What needs to be done for desludging operations—pricing of services, licensing, private operators, etc.

Chunar is a small town where desludging by private operators will not be successful

for two reasons. First, the private vehicles operate from Varanasi town, which is 25 km away and the distance adds to the cost of desludging. Second, the current desludging fee set by NPP Chunar (NPPC) is non-competitive and therefore NPPC requires to continue its service to the citizens. However, with regard to sustainability of desludging and operation of the plants on the one hand and equity of pricing on the other, NPPC currently has financial support for the next five years during which it has to invest smaller amounts of financial resources, but it should plan now to mobilize funds for the future.

Welfare of sanitation workers of Chunar NPP

Table 18: Details of sanitation workers in Chunar

Sanitation workers	Male	Female	Total
Permanent government employees	11	12	23
Contracted to government	16	8	24
Outsourcing	59	14	73
Total	86	34	120

Chunar has around 120 sanitation workers of which 23 are government employees, 24 are on contract basis and the rest are outsourced. Out of the 120 sanitation workers, the number of male and female workers is 86 and 34 respectively.

Currently, there is no visible discrimination between male and female candidates with regard to daily wage and work load. There is, however, a difference in payments and privileges between private and government employees. Chunar NPP requires ensuring the following services to sanitation workers:

- Regular training of sanitation workers regarding health and safety;
- Provision of safety kit and equipment to the sanitation workers;
- Regular health check-ups for the sanitation workers and health insurance coverage for the workers; and
- Linking sanitation workers to all the eligible government services.

Capacity building and citizen engagement

Capacity-building programmes for officials and staff engaged in the FSSM value chain are to be continued as before, with focus on O&M of the plants and vehicles to ensure sustainability of the operation. Training programmes could be organized (see *Table 19: Indicative list of trainings and IEC activities in Chunar*).

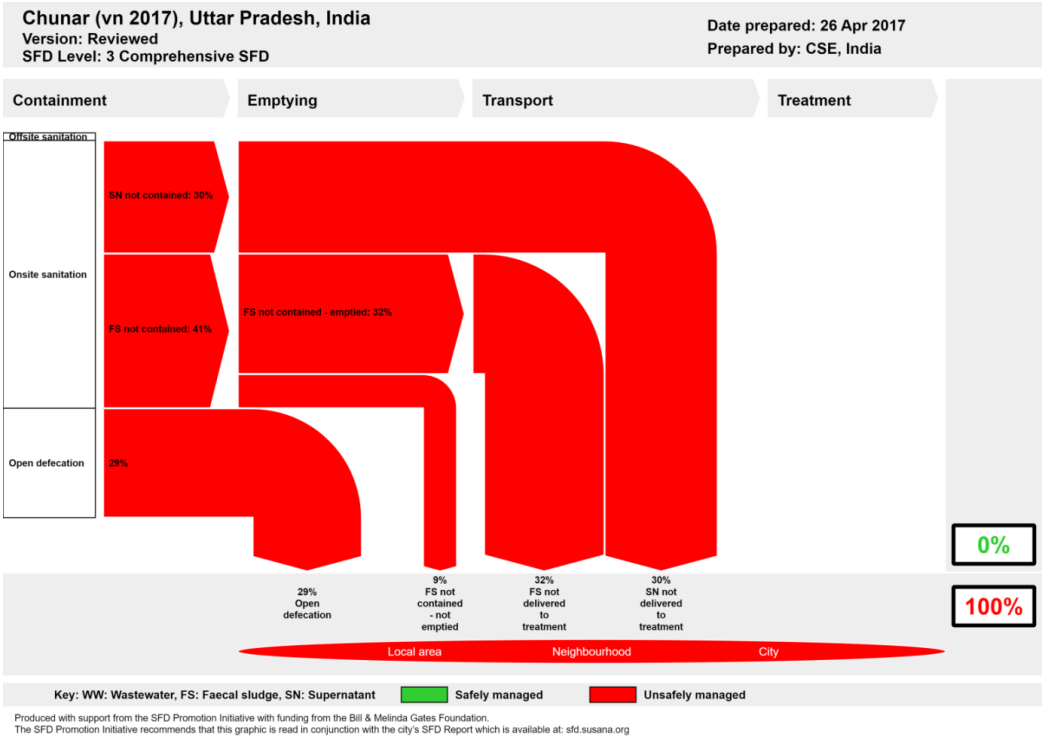
Table 19: Indicative list of trainings and IEC activities in Chunar

Participants	Training topic
Trainings	
Executive Officer	Overall management of FSSTP and desludging operations; reuse of treated wastewater and biosolids; financial sustainability of FSSTP
Sanitary and Food Inspector	Reuse of treated wastewater and biosolids, health and safety of sanitation workers, various government schemes, O&M of plant, O&M of vehicle
UPJN engineers	Reuse of treated wastewater and biosolids, O&M of plan, health and safety of sanitation workers
Contractor	O&M of plant, health and safety of sanitation workers
Driver and helper of desludging vehicle	O&M of vehicles, health and safety of sanitation workers
Sanitation workers	Health and safety of sanitation workers; reuse of treated wastewater and biosolids, various government schemes
Masons	Design and construction of septic tank
IEC activities	
Citizen	Overall cleanliness; proper designing, construction of new toilets and retrofitting of existing toilets; and regular desludging of septic tanks

Annexures

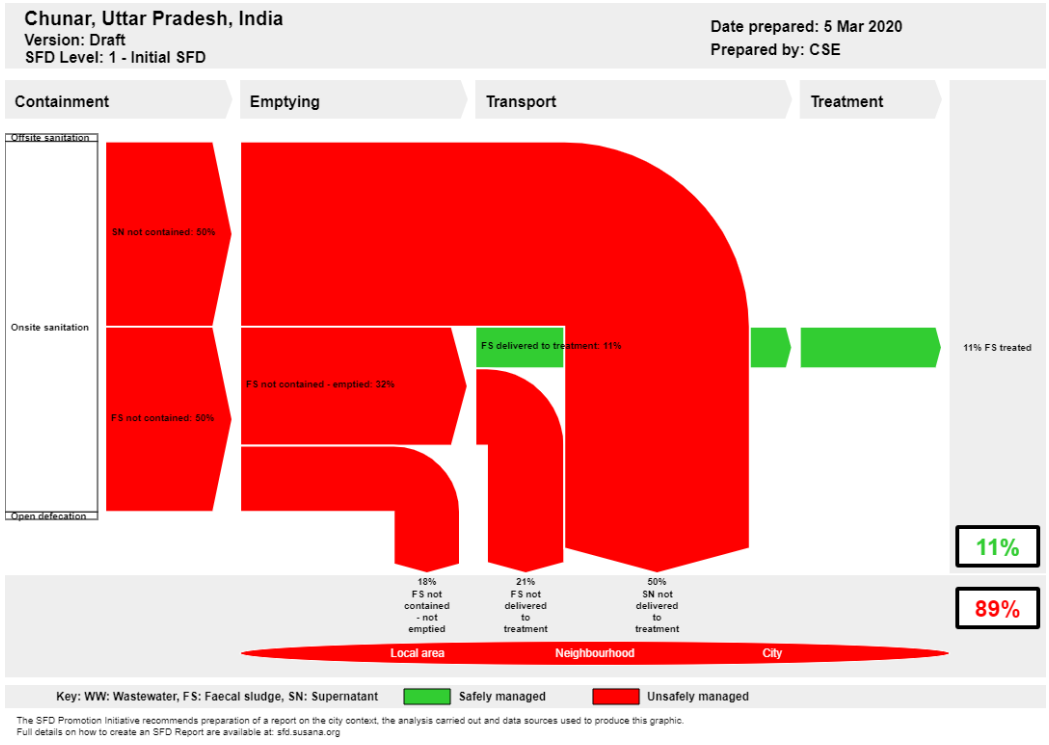
1. Chunar shit flow diagrams

Chunar SFD-1



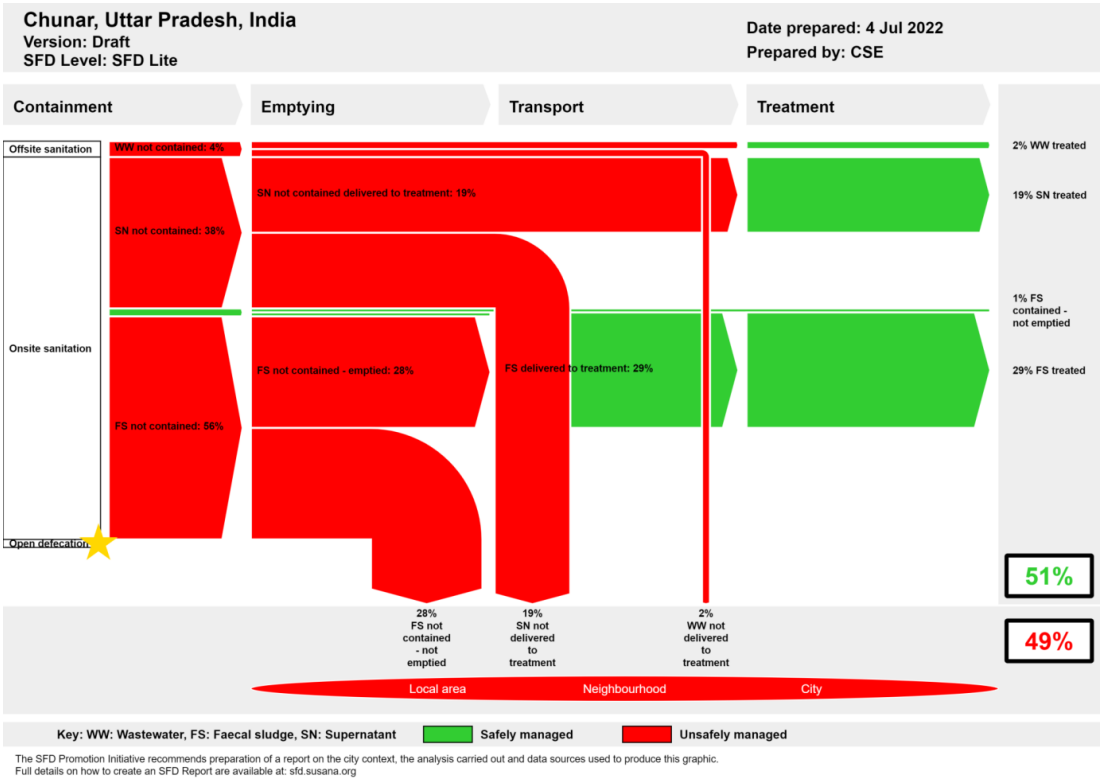
In 2017, the CSE team prepared the first shit flow diagram (SFD) in Chunar to understand the status of sanitation for adaptation of suitable interventions to improve the sanitation scenario. The SFD showed that 29 per cent of the population was practising open defecation and 100 per cent of the faecal sludge and supernatant was unsafely managed.

Chunar SFD-2



In 2020, the CSE team prepared the second SFD in Chunar to understand if there was any change in the status of sanitation. In 2019, Chunar town was declared open defecation free (ODF)—so there was 0 per cent open defecation (OD) in 2020. In 2020, Nagar Palika Parishad Chunar installed a trenching site of 48 KL capacity for safe disposal of faecal sludge and septage (FSS). The SFD thus indicated that only 11 per cent of the FSS was safely managed in Chunar.

Chunar SFD-3



In 2022, the CSE team prepared the third SFD in Chunar to understand the updated status of sanitation. In 2022, Chunar NPP installed facilities for treatment of wastewater by bioremediation in all the major nullahs. A faecal sludge and septage treatment plant (FSSTP) is also running at full capacity (10 KLD). The SFD figures showed a change to 51 per cent safe management of FSS and supernatant.

2. Response to NGT on the treatment of Chunar nullahs

FORMATE for REPORT ON PROGRESS BEING MADE AS PER HON'BLE NGT ORDER (regarding UNTAPPED DRAINS)

Name Of Munciple Corporation: **Nagar Palika Parishad Chunar, Mirzapur**

1. *Is Environmental* Plan of Corporation made as per CPCB format:
2. *Is Environmental* Plan is not made yet who is responsible officer and what is the timeline for preparing the plan:
3. Is any micro action plan made by Corporation ragarding following:
   - 4a. Water Pollution
   - 4b. Air pollution

S.N.	Name of the Drain	River	Average Flow Discharge (MLD)	Whether Drain is Tapped to STP/Untapped	Pollution Load of the untapped Drain				Status of Jaali on the Untapped Drain (Yes/No) With Photo	If Untapped any interim measures being taken (bio/phyto remediation)	Expenditure on interim measure (per month in Lacs.)	If interim measure not done. Date to start the interim measure	Permanent plan/project detail if any regarding tapping the untapped drain. (DPR/Sanction/Release/Ongoing Status with amount and time completion schedule)
	1	2	3	4	5A	5B	5C	5D	6	7	8	9	10
					BOD	COD	Total Coliform	Fecal Coliform					
1	Tammalganj Nala	Ganga		Untapped					Yes	बायो रेमीडिएशन की प्रक्रिया प्रारम्भ होने वाली है।	1.60 लाख	from Oct 2021	जल निगम द्वारा चुनार में STP की स्थापना की प्रक्रिया किया जा रहा है।
2	Dargah Sharif Nala	Ganga		Untapped					Yes				
3	Baharamganj East Nala	Ganga		Untapped					Yes				
4	Baharamganj west Nala	Ganga		Untapped					Yes				
5	Tekaur Basti North	Ganga		Untapped					Yes				
6	Tekaur Basti South	Ganga		Untapped					Yes				
7	Santoshi Mandir Nala	Ganga		Untapped					Yes				
8	Post Office South Drain	Ganga		Tapped					Yes				
9	Post Office North Drain	Ganga		Tapped					Yes				
10	Gangeshwar Nishad Park Drain	Ganga		Tapped					Yes				
11	Balughat Drain	Ganga		Tapped					Yes				
12	Berbir Ghat Drain	Ganga		Tapped					Yes				
13	Chauramata Drain	Ganga		Tapped					Yes				
14	Kanshiram Awas Drain	Ganga		Untapped					Yes				
15	Nagarpur Drain	Jargo river		Untapped					Yes				
16	Tekaur Nagarpur	Jargo river		Untapped					Yes				
17	Bharpur Kabristan	Jargo river		Untapped					Yes				
18	Bharpur Trimuhani	Jargo river		Untapped					Yes				
19	Saddugur Naipurawa	Jargo river		Untapped					Yes				
20	Pashu Chikitsalay	Jargo river		Untapped					Yes				
21	Nagar Palika	Jargo river		Untapped					Yes				
22	Pared Ground	Jargo river		Untapped					Yes				

Executive Officer
Nagar Palika Parishad Chunar
Mirzapur

3. D.O. MD-SBM/AA/62/2016 dated May 30, 2016

PRAVEEN PRAKASH, IAS
Joint Secretary & Mission Director (SBM)
GOVERNMENT OF INDIA
MINISTRY OF URBAN DEVELOPMENT

प्रवीण प्रकाश, भा.प्र.से.
संयुक्त सचिव एवं मिशन निदेशक (एस.बी.एम.)
भारत सरकार
शहरी विकास मंत्रालय

D.O No. MD-SBM/AA/62/2016

30th May, 2016

Sub: Support to Towns for achieving ODF status and for effective Fecal Sludge Management (FSM) - Reg.

Respected Sir,

As you are aware, one of the key objectives of Swachh Bharat Mission (Urban) is to help all 4041 cities/towns achieve 100% Open Defecation Free (ODF) status by 2nd October 2019.

2. As we move towards 100% coverage of toilets, we need to look ahead at managing the large volume of fecal sludge from the growing number of septic tanks and single pit latrines. Proper fecal sludge management (FSM) that maximizes safety and sustainability is essential and we need to develop a model that will cater to the country's future needs. Fecal sludge comprises partially stabilized excreta and slurry from improved single pit latrines, septic tanks, as well as latrines based on other improved and unimproved technologies. Unless managed appropriately, this fecal sludge poses a huge risk to public health and the environment.

3. At present about 64 million Indian households must be supported with safe FSM services. Safe disposal of fecal sludge means ensuring safety while handling/emptying the sludge from septic tanks/pits and the proper transport and disposal of the removed sludge. The demand and supply services for FSM need to be assessed, along with the associated safety issues. Local bodies, both rural and urban, state governments, and the central government have a stake in ensuring that the fecal sludge is disposed of properly, in a manner that does not cause any health or environmental hazards.

4. In this regard, MoUD has decided to extend extensive handholding support to 29 cities/towns so that they can become flagship towns for Fecal Sludge Management in India. For the same, two agencies, **Centre for Science & Environment (CSE, a leading non-profit working on environmental issues in India)** and the **National Institute for Urban Affairs (NIUA, a Government of India entity)**, working on urban transformation efforts) will provide active handholding to the below selected cities:

Sl. No	State	Towns/Cities	Assigned Agency
1	Andhra Pradesh	Proddatur, Dist. Kadapa	NIUA
2	Andhra Pradesh	Gudur, Dist Nellore	NIUA
3	Andhra Pradesh	Srikakulam, Dist Srikakulam	CSE
4	Uttarakhand	Rishikesh, Dist Dehradun	CSE
5	Uttar Pradesh	Unnao, Dist Unnao	NIUA
6	Uttar Pradesh	Ghazipur, Dist Ghazipur	NIUA
7	Uttar Pradesh	Chunar, Dist Mirzapur	CSE
8	Uttar Pradesh	Ramnagar, Dist Varanasi	CSE
9	Uttar Pradesh	Ganga Ghat, Dist Unnao	CSE
10	Uttar Pradesh	Bijnore, Dist Bijnore	CSE
11	Uttar Pradesh	Agra, Dist Agra	
12	Bihar	Bhagalpur, Dist Bhagalpur	NIUA
13	Bihar	Hajipur, Dist Vaishali	NIUA

Office: 140-C, Nirman Bhawan, New Delhi-110011 ♦ Mob: 9013133636, Phone: 011-23062309, Fax: 23062477
praveenprakashud@gmail.com, praveen.prakash71@nic.in

Sl. No	State	Towns/Cities	Assigned Agency
14	Bihar	Muzaffarpur, Dist Muzaffarpur	CSE
15	Bihar	Katihar, Dist Katihar	CSE
16	Bihar	Buxar, Dist Buxar	CSE
17	Bihar	Bodh Gaya, Dist Gaya	CSE
18	West Bengal	Bansberia, Dist Hugli	CSE
19	West Bengal	Bongaon, Dist North 24 Parganas	CSE
20	West Bengal	Darjeeling, Dist Darjeeling	CSE
21	Tamil Nadu	Tiruchirapalli	CSE
22	Madhya Pradesh	Gwalior	CSE
23	Madhya Pradesh	Dewas	CSE
24	Mizoram	Aizawl	CSE
25	Rajasthan	Bikaner	CSE
26	Odisha	Cuttack	CSE
27	Karnataka	Tumkur	CSE
28	Delhi	Delhi	CSE
29	Maharashtra	Solapur	CSE

The key contact person for the respective agencies are:

a) **Centre for Science and Environment (CSE)**
Shri Suresh Rohilla
Programme Director, Water Management
Email: srohilla@cseindia.org
Mobile: 9910317904

b) **National Institute of Urban Affairs (NIUA)**
Ms Paramita Datta Dey
Senior Research Officer
Phone: +91-11-24617517, 24643284 (ext: 207)
Email: pdey@niua.org

5. The scope of work of CSE and NIUA would be to help the towns/cities in capacity building for FSM apart form support to identify the technology and need for FSM in their area, support in selection of consultant for preparation of DPR, and Transaction Advisory Support for selection of private partner to operate the FSM facility. They may also support the city in other FSM related aspects such as behaviour change, regulatory changes etc.

6. I request you to kindly issue instructions to the concerned officers/ municipal commissioners to get in touch with CSE/NIUA at the earliest, and to work closely with them in order to fully leverage their significant expertise in this area. They may reach out to me in case any clarifications are required.

In anticipation of your kind support.

With regards,

Yours sincerely,

(Praveen Prakash)

To,

Chief Secretaries of concerned states

4. PMU/194/431/2017 dated July 12, 2017

निदेशक, नगरीय निकाय निदेशालय, लखनऊ की अध्यक्षता में दिनांक 25.05.2017 को "स्व॰ भारत मिशन (अर्बन)" के अन्तर्गत CSE नई दिल्ली के साथ सम्पन्न बैठक का कार्यवृत्तः–

उपस्थिति :–

1. डा0 सुरेश कुमार रोहिल्ला, प्रोग्राम डायरेक्टर, सेन्टर फार सांइस एण्ड इन्वायरमेंट, नई दिल्ली।
2. श्री सुखेन्द्र कुमार, सहायक निदेशक (लेखा), नगरीय निकाय निदेशालय, लखनऊ।
3. सुश्री रिद्विमा गुप्ता, प्रोग्राम आफिसर, सेन्टर फार सांइस एण्ड इन्वायरमेंट, नई दिल्ली।
4. डा0 सुमीत गौतम, प्रोग्राम आफिसर, सेन्टर फार सांइस एण्ड इन्वायरमेंट, नई दिल्ली।
5. श्री हरीश चन्दा, सैनिटेशन एक्सपर्ट, स्वच्छ भारत मिशन (अर्बन), उ0प्र0।
6. डा0 सीमा सिंह आई.ई.सी. एक्सपर्ट, स्वच्छ भारत मिशन (अर्बन), उ0प्र0।
7. श्री गोवालाल, अधिशासी अधिकारी, नगरपालिका परिषद रामनगर, वाराणसी उ0प्र0।
8. श्री आई.पी. सिंह, अधिशासी अधिकारी, नगरपालिका परिषद बिजनौर, बिजनौर उ0प्र0।
9. श्री शमशेर सिंह, जे.ई., नगरपालिका परिषद चुनार, मिर्जापुर उ0प्र0।
10. श्री सुनील कुमार मिश्रा, अधिशासी अधिकारी, नगरपालिका परिषद गंगाघाट, उन्नाव उ0प्र0।

बैठक में सर्वप्रथम उपस्थित प्रतिभागियों का स्वागत करते हुये निम्न बिन्दुओं पर व्यापक विचार–विमर्श के उपरान्त तदानुसार निर्णय लिया गये।

1. Center for Science & Environment (CSE) नई दिल्ली के प्रोग्राम डायरेक्टर डा0 सुरेश कुमार रोहिला द्वारा बैठक के उद्देश्यो पर प्रकाश डालते हुये अवगत कराया गया कि राष्ट्रीय स्तर पर स्वच्छ भारत मिशन, अमृत एवं NMCG कार्यक्रमों को गम्भीरतापूर्वक लिया जा रहा है। यह भी सूचित किया गया कि गंगा के किनारे स्थित दो नगरों रामनगर व चुनार के FSTP एवं DWWTs के पायलट प्रोजेक्ट को सहयोग प्रदान करने हेतु NMCG तत्पर है। इसके लिए प्रस्ताव तैयार करने की आवश्यकता है जिसमे CSE सहयोग करने के लिए अग्रसर है।

   इस सम्बन्ध में निश्चिंत किया गया कि निदेशक स्वच्छ भारत मिशन द्वारा पायलट प्रोजेक्ट के सहयोग हेतु SGRBA के माध्यम से NMCG को पत्र लिखा जाय तथा शेष दो अन्य नगरों गंगाघाट व बिजनौर के मॉडल CSE द्वारा तैयार करने में सहयोग की अपेक्षा की गयी।

2. CSE द्वारा अन्तर्राष्ट्रीय एक्सपोजर विजिट की तिथि निर्धारित किये जाने पर चर्चा की गयी। निदेशक महोदय द्वारा बताया गया कि प्रदेश में स्थानीय निकायों के चुनाव की तिथि घोषित होने तक इस विजिट के लिए प्रतीक्षा की जाय।

3. चयनित नगरों में FSTP निर्माण हेतु भूमि के चयन पर चर्चा की गयी। निदेशक द्वारा चारों नगरों के अधिशासी अधिकारियों को निर्देश दिये गये कि वे चयनित भूमि पर FSTP निर्माण के विषय में CSTF की बैठक आयोजित करके अनुमोदन प्राप्त कर लें साथ ही इस सम्बन्ध में आवश्यक बायलॉज भी बनाकर नगर निकाय की खुली बैठक में इसका अनुमोदन प्राप्त करके सूचित करें। इसी दौरान CSE द्वारा FSTP निर्माण की सम्भवानाएं बनवाने हेतु प्रारम्भिक सर्वेक्षण प्रारम्भ कर दिया जायेगा।

4. FSTP के निर्माण हेतु वित्तीय व्यवस्था की दिशा में PPP मोड पर कार्य करा जे की सम्भावनायें तलाशने हेतु अधिशासी अधिकारियों को निर्देश दिये गये।

5. रामनगर व बिजनौर के अधिशासी अधिकारियों द्वारा उनके नगरों में सम्पन्न CSTF की बैठकों के सम्बन्ध में अवगत कराया गया कि रामनगर में CSTF की द्वितीय बैठक 27.05.2017 को प्रस्तावित है। बिजनौर के अधिशासी अधिकारी द्वारा CSTF की बैठक मई के अन्तिम सप्ताह में बुलाने का आश्वासन दिया गया।

6. निदेशक स्वच्छ भारत मिशन द्वारा निकायों की तकीनीकी क्षमता की ओर ध्यान आकर्षित किया गया और निकायों के CSE तथा FSTP के प्रस्ताव तैयार किये जाने हेतु CSE के सक्रिय सहायेाग की अपेक्षा की गयी साथ ही पायलट FSTP कि क्रियान्वयन में तकनीकी सहयोग का अनुरोध किया गया। इस सम्बन्ध में निदेशक एस.बी.एम. तथा CSE के मध्य परस्पर सहमति व्यक्त की गयी। उक्त के लिए प्रदेश सरकार तथा CSE के मध्य एक औपचारिक साझेदारी बनाये जाने की आवश्यकता बतायी गयी। CSE द्वारा उक्त साझेदारी हेतु एम0ओ0यू0 का प्रारूप तैयार करने का आवश्वासन दिया गया।

उपर्युक्तानुसार हुए विचार–विमर्श के पश्चात् बैठक सधन्यवाद सम्पन्न हुई।

(विशाल भारद्वाज)
निदेशक

नगरीय निकाय निदेशालय, उ0प्र0
8वॉ तल इन्दिरा भवन, लखनऊ।

संख्याः पी0एम0यू0/ 194 /431/2017 दिनांक 12 जुलाई, 2017

पृ. सं. एवं दिनांक उक्तवत।

प्रतिलिपिः–

1. प्रमुख सचिव, नगर विकास विभाग, उ0प्र0 शासन, लखनऊ।
2. समस्त सम्बन्धित अधिशासी अधिकारी को आवश्यक कार्यवाही हेतु प्रेषित।

(विशाल भारद्वाज)
निदेशक

5. Minutes of meeting held on June 1, 2017

स्वच्छ गंगा मिशन योजनान्तर्गत सिटी सेनिटेशन प्लान (सी.एस.पी.) तैयार किये जाने हेतु आज दिनांक 01.06. 2017 को अपरान्ह 02.00 बजे टास्क फोर्स की बैठक मा0 श्रीमती हसीना बेगम अध्यक्ष नगर पालिका परिषद चुनार/अध्यक्ष टास्क फोर्स की अध्यक्षता में पालिका सभागार में सम्पन्न हुई। बैठक दिनांक 01.06.2017 की कार्यवृत्ति –

शहरी स्वच्छता कार्यबल की द्वितीय बैठक में आमंत्रित कार्यबल के सदस्यों के हस्ताक्षर कर अध्यक्ष महोदया की अनुमति से बैठक प्रारम्भ	सर्वप्रथम श्री शमशेर सिंह जलकल प्रभारी द्वारा समस्त उपस्थित सदस्यों का धन्यवाद करते हुए द्वितीय स्वछच्छता कार्यबल की बैठक में विस्तार से एफएसटीपी के संबंध में बताया गया, जिस पर उपस्थित सदस्यों द्वारा वार्ता की गई, गत बैठक दिनांक 21.3.2017 सहमति/अनुमोदन किया जाता है। अध्यक्ष महोदया द्वारा आज की सीएसटीएफ बैठक के लिए सहमति प्रदान किया गया।
बिन्दू सं0 1 – एफएसटीपी निर्माण हेतु भूमि उपलब्ध व कार्ययोजना पर विचार	सर्वप्रथम श्री शमशेर सिंह जलकल प्रभारी द्वारा एफएसटीपी के भूमि उपलब्धता एवं मौके का स्थल निरीक्षण के संबंध में बताया गया। सीएसई नई दिल्ली से आये, श्री राजरतन सरदार व श्री सुमित कुमार गौतम द्वारा उपस्थित सदस्यों के समक्ष विस्तार से एफएसटीपी के संबंध में बताया गया, जिस पर समस्त उपस्थित सदस्यों द्वारा चिन्हित भूमि पर एफएसटीपी बनाने हेतु आवश्यक कार्यवाही करने एवं भूमि की स्वीकृति हेतु अध्यक्ष द्वारा निर्णय लिया गया। इस संबंध में सीएसई ने चुनार में सर्वे की गई भूमि जिस पर एफएसटीपी योग्य भूमि के बारे में एक प्रजेन्टेशन दिया, विस्तार पूर्वक विचार विमर्श के पश्चात सीएसटीएफ सदस्यों द्वारा रामबाग के पास वार्ड नं0 11 में आराजी सं0 363, जो वर्तमान में बीहड़ भूमि में वर्गीकृत है, को सबसे उपयुक्त मानते हुए उस भूमि का सर्वे और टेक्निकल धरातरलीय अध्ययन करने के लिए सहमति प्रदान की जा रही है।
बिन्दू सं0 2 – स्टेटस रिपोर्ट	सिटी सेनिटेशन प्लान (सी.एस.पी.) तैयार किये जाने हेतु स्टेटस रिपोर्ट पर विचार विमर्श किया गया, जिस पर सभी सदस्यगण विचार करते हुए यह तय किया गया कि गंगाजी जो कि अब अत्यधिक प्रदूषित हो चुकी है, और कही कही नाले जैसी स्थिति हो गई है, व स्वच्छ बनाने हेतु स्वच्छ गंगा मिशन योजनान्तर्गत एक सेनिटेशन प्लान तैयार किया जाना चाहिए, जिससे नगर पालिका परिषद चुनार एक माडल सिटी कहलाये।

बिन्दू सं0 3 – सीएसई प्रतिनिधि के द्वारा सीएसई पर प्रस्तुतिकरण आदि किया जाना।	सी.एस.सी. प्रतिनिधि श्री राजरतन सरदार द्वारा प्रस्तुतिकरण किया गया कि उसमें दर्शाया गया कि शहर से निकलने वाला 89 प्रतिशत फीकल स्लज वातावरण को प्रदूषित करता है, जब कोई व्यक्ति अपना टायलेट खाली कराता है तो शहर के बाहर कही भी खुले स्थान या नाला में डाल देता है, जिससे वातावरण प्रदूषित होने के साथ साथ कई तरह की बीमारियां भी फेलती है, इससे बचने के लिए फीकल स्लज को ट्रीटमेंट किया जाना आवश्यक है।
बिन्दू सं0 4 – एफ.एस.एम. टेक्नोलाजी पर विचार।	एफ.एस.एम. टेक्नोलाजी के अन्तर्गत फीकल स्लज को ट्रीटमेंट प्लान में ले जाकर उससे खाद तैयार की जाएगी, तथा खाद्य का किसानों को बेच दिया जाएगा, तथा निकलने वाले पानी को ट्रीटमेंट करने के उपरान्त कृषि कार्य हेतु एवं बागवानी हेतु या गंगा जी में छोड़ दिया जाएगा।

अधिशासी अधिकारी
नगर पालिका परिषद चुनार

प्रतिलिपि– अध्यक्ष/सदस्य टास्क फोर्स के सदस्यगण को सूचनार्थ एंव आवश्यक कार्यवाही हेतु प्रेषित।

अधिशासी अधिकारी
नगर पालिका परिषद चुनार

6. Minutes of meeting held on February 9, 2018

No.: T-12/2017-18/095/NMCG
National Mission for Clean Ganga
Ministry of Water Resources, River Development
& Ganga Rejuvenation

1st Floor,
Major Dhyan Chand National Stadium,
India Gate, New Delhi – 110002
Date: 9th February 2018

Subject: Record of discussions to explore measures for furthering the Septage management in small towns, involvement of CSE in Swachhta Pakhwara and other IEC activities was held on 05.02.2018 under the chairmanship of Executive Director (Projects), NMCG.

Please find enclosed, herewith, the Record of discussions held at National Mission for Clean Ganga, New Delhi on 05.02.2018 under the chairmanship of Executive Director (Projects), NMCG to explore measures for furthering the Septage management in small towns, involvement of CSE in Swachhta Pakhwara and other IEC activities for information.

2. This issues with the approval of Director General, NMCG.

Encl: As above.

9/2/18
(Rajat Gupta)
Sr. Specialist, NMCG

To,

Shri Suresh Kumar Rohilla, Program Director – Urban Water Management, Centre for Science & Environment, 41, Tughlakabad Institutional Area, New Delhi – 110062.

Internal Distribution:

PS to DG/ PS to ED (Projects)/ PS to ED (Technical)/ All concerned officials of Project Wing/ All concerned officials of Communication Wing, NMCG.

Record of discussions

A meeting was held with officials of Centre for Science & Environment (CSE) on 5/2/2018 under the chairmanship of Shri Hitesh Kumar S. Makwana, Executive Director (Projects), NMCG of exploring measures for furthering Feacal Sludge Management (FSM) in towns along Ganga and areas of support in Swachhata Pakhwara 2018. The list of the participants is at Annexure.

The discussions and the decision arrived at for future actions are as under:

1. Shri SK Rohilla, Programme Director (Water Management) made a brief presentation on the initiatives & works taken up in the field of FSM. He also indicated that CSE has signed a MoU with Govt. of Uttar Pradesh for providing knowledge support to Govt of UP in development of a FSM policy for the State and for taking up FSM projects in towns of Uttar Pradesh. These towns also include small towns along main stem of river Ganga and asked if NMCG would support some of these towns. ED (Projects) clarified that NMCG is focussing on towns along main stem of river Ganga and may be considered under Namami Gange, if submitted & recommended by UPSPMG.
2. The DPR, under preparation by CSE for Chunar towns, may be submitted through UPSPMG for consideration of NMCG under Namami Gange. (CSE)
3. The list of 97 towns along Ganga main stem may be shared with CSE for identifying and mapping of the class II to class VI towns along main stem of river Ganga . (Ms. Nidhi, NMCG)
4. The list of towns along main stem of river Ganga may be examined with the perspective to identify the towns where conventional STPs may not be feasible and FSM may be considered in place. (Ms. Nidhi, NMCG and CSE).
5. In order to avoid the indiscriminate disposal of septic tank sludge in various towns along river Ganga and streamline the faecal sludge management, NMCG may explore the possibility of issuing directions under Section -5 to ULBs. (Shri Shreyas Gune, NMCG).
6. Regarding support of CSE towards Swachhata Pakhwara, it was decided that CSE may connect NMCG's communication wing to Media & Communication wing of CSE to explore further the CSE's support. (Shri Najeeb, NMCG and CSE).

7. Chunar NPP-2018 dated January 15, 2018

कार्यालय नगर पालिका परिषद चुनार

सेवा में,

डॉ सुरेश कुमार रोहिल्ला
प्रोग्राम डायरेक्टर – वाटर प्रोग्राम।
सेंटर फॉर साईन्स एण्ड इवायर्मेंट, नई दिल्ली।

पत्रांक : 777/न0पा0प0 चुनार –2018 दिनांक : 15.01.2018

विषय : एफएसटीपी के सर्वेक्षण एवं निर्माण कार्य के लिए अनापत्ती के सम्बंध में।

महोदय,

उपरोक्त विषयान्तर्गत व प्रासंगिक पत्र के संदर्भ में निवेदन है कि प्रोजेक्ट सलाहकार द्वारा एफएसटीपी के लिए लगभग 01 एकड़ भूमि मुहल्ला दरगाह शरीफ में अविवादित सरकारी भूमि पर सर्वेक्षण एवं निर्माण कार्य करने की मांग की गयी है। न0पा0प0 चुनार के आराजी नम्बर 363/4 जो बीहड़ के रूप में राजस्व अभिलख में दर्ज है। नगर पालिका परिषद चुनार एफएसटीपी बनाने हेतु परियोजना के सर्वेक्षण एवं निर्माण कार्य के लिए अनापत्ति दी जाती है।

अतः उपरोक्त भूमि की पैमाईस कराने हेतु इस कार्यालय के पत्रांक दिनांक 01.09.2017 के क्रम में पुनः पैमाईस कराने हेतु तहसील चुनार से सम्पर्क किया गया। पालिका भूमि के आस पास के कास्त कारें द्वारा विवाद करनें के कारण पैमाईस नहीं हो पाई। पुनः 15.1.2018 को तहसील चुनार से सम्पर्क करनें के पश्चात दिनांक 17.01.2018 को तहसील की टीम बनाकर पैमाईस करनें हेतु कहा गया है। पैमाईस रिपोर्ट व नजरी नक्शा प्राप्त होते ही आप को रिपोर्ट उपलब्ध करा दिया जाएगा।

भवदीय

अधिशासी अधिकारी
नगर पालिका परिषद चुनार

8. Checklist for soft commissioning and full-fledged operation

CHECKLIST
Commissioning of FSSTP

Ensure the following is done correctly:

During construction phase:

- ☐ Compaction of the ground is done in three equal layers (for depth >1m) firstly by mechanical rammer and then submerging the layer with water for eight to 10 hours before moving on the next layer.
- ☐ Curing of civil structure is done thrice daily for minimum seven days (morning 8–10 a.m., afternoon 12–2 p.m., evening 4–6 p.m.)
- ☐ Existing cracks are grouted with good quality mortar/cement slurry mixed with waterproofing agent.
- ☐ Plastering is done in a single stretch to avoid joints and the mortar used for plastering has waterproofing agent mixed with it.
- ☐ Plastering is done in the following steps:
  - Surface to be plastered is roughened
  - Base coat should have cement to sand ratio between 1:3 to 1:6
  - Base coat is 12 mm thick for brick masonry and 9-15 mm for concrete masonry
  - Finishing coat should have cement to sand ratio between 1:4 to 1:6 and its thickness is 2–3 mm
- ☐ Filter media should not be flaky and should be of uniform shape and size as required in the design.
- ☐ Filter media should only be filled in PDB after thorough washing and cleaning with water.
- ☐ Cinder material is washed thoroughly before filling in ISAF.
- ☐ Pipes connecting different modules should be free from any leakages and are not under any external load except groundwork.

After construction phase:

- ☐ Screen used should be of stainless steel and not mild steel grade.
- ☐ Water retaining/hydraulic test of PDBs is performed and water is retained in PDB for 24 hours.
- ☐ Flow test of the entire system by means of water or wastewater to check for leakages/obstructions.
- ☐ Plants (macrophytes) used in PDBs are young shoots and parasites free.
- ☐ Plants are acclimatized to the high strength FS by irrigating them with wastewater or diluted FS for minimum seven to 10 days.
- ☐ Minimum plant density of 4 plants/m^2 is maintained in PDBs.

9. O&M checklist

Table 17: Operational and preventive maintenance check list

Operational and Preventive Maintenance		Frequency						
		Daily	Weekly	Monthly	Quarterly	Half - yearly	Yearly	As Necessary
1	**Plant area**							
a	Check fence damage	X						
b	Check plant area	X						
2	**Screening chambers**							
a	Clean inlet, screens, and properly dispose of trash	X						
b	Check inlet flow	X						
c	Remove and dispose of rags and accumulation from bar screen	X						
d	Check for rock or metal objects in channel	X						
3	**Planted SDBs**							
a	Check the solidification of the sludge	X						
b	Cleaning of the Vent pipe							X
c	Removing dried sludge						X	
d	Replacing filter materials							X
4	**ISAF**							
a	Check if all manholes are closed	X						
b	Check inlet flow	X						
c	Desludging of chambers							X
5	**HPGF**							
a	Checking of swivel pipes					X		
b	Trimming of Plants							X
c	Removal of weed			X				
6	**Collection Tank**							
a	Check for debris		X					
b	Cleaning of inlet and outlet pipes of modules			X				
c	Desilting the tank							X
7	**DMF, ACF & UV**							
a	Cleaning of inlet and outlet pipes of modules	X						
b	Backwashing and rinsing of filters	X						
c	Lamp status of UV			X				

10. Sanitation Cell Nagar Palika Parishad Chunar

Sanitation Cell of Chunar NPP
Under the Project FSSTP Chunar

Introduction

The Municipal Council Chunar and Centre for Science and Environment have signed an MoU for FSSM implementation. For this purpose CSE has prepared a DPR of 10 KLD FSSTP for safe disposal and treatment of faecal sludge generated in Chunar. In continuation of this, we need to constitute a dedicated cell for sanitation service.

The cell will look after all the issues and challenges regarding sanitation such as construction of septic tanks, emptying of septic tanks and safe transportation of faecal sludge.

Members and responsibility

S. no.	Name	Designation	Organization	Contact
1	Lalmani Yadav	Cell Head	Chunar NPP	82996 68845
2	Rahul Kumar	Call Manager	Chunar NPP	86041 05880
3	Sandeep Kumar	Field Officer	Chunar NPP	87379 30606
4	Heeralal	FSSTP In charge	Chunar NPP	87567 65409
5	Manish Mishra	Technical Advisor	CSE-TSU	7607819033

Contact number for sanitation services: +91 7388721756

Role and responsibility:

Cell head: Monitor the work and documentation of all issues addressed and track the work efficiency of sanitation services provided by Sanitation Cell.

Call manager: A dedicated person for attending all calls regarding sanitation service demand by public and prepare report for the same.

Field officer: A dedicated person who will inspect and address the issues on ground.

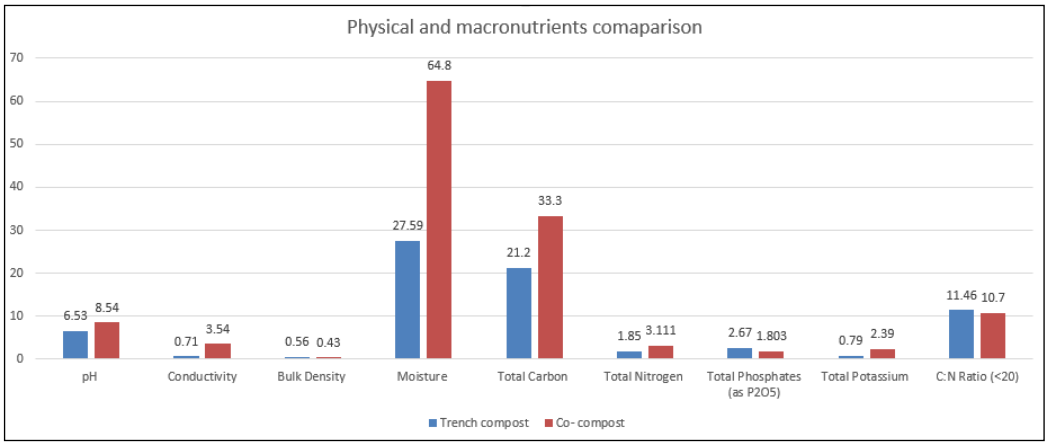
FSSTP in charge: Ensure safe emptying and disposal of Faecal Sludge at FSSTP and also ensure all workers will be wearing PPE during the Desludging activity.

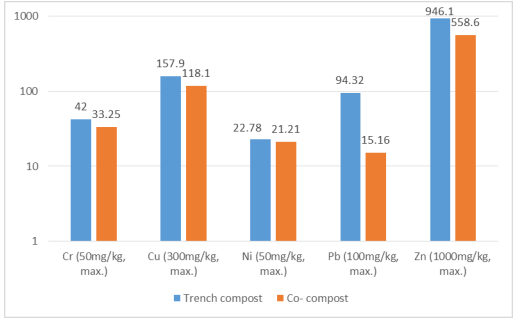
Technical advisor: Address all the technical issues and challenges regarding FSSM implementation in Chunar.

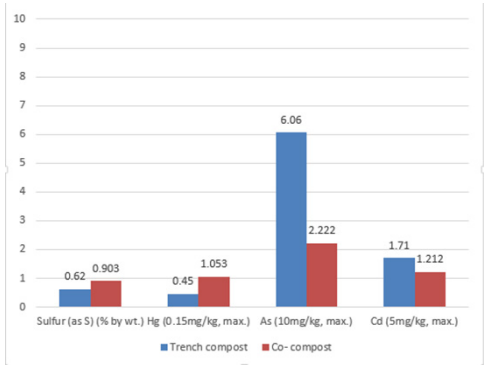
11. Comparison of co-compost with trench compost

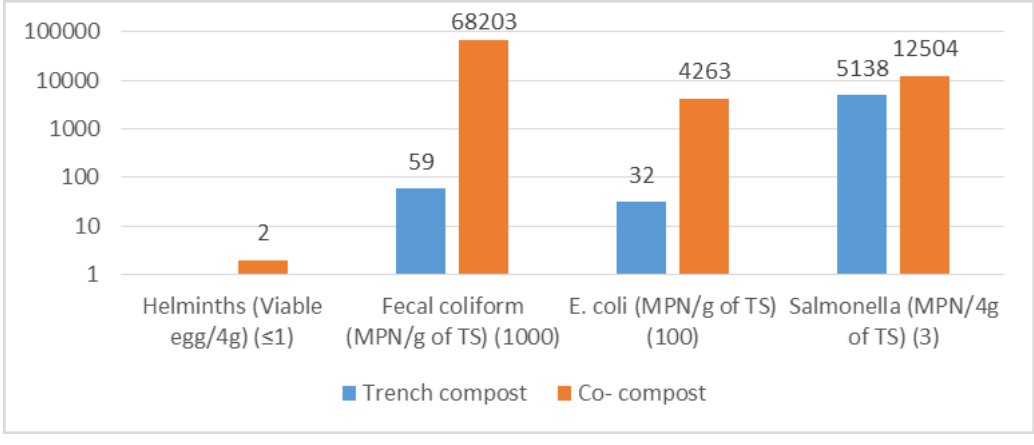
As an extended study, a comparative analysis was drawn between trench compost and co-compost to understand if the compost received from the trench need to further go for co-composting for better nutritional values.

Comparison of co-compost with trench compost		
Parameter	**Trench compost**	**Co-compost**
pH (6.5–7.5)	6.53	8.54
Conductivity (as dS m-1) (<4.0)	0.710	3.54
Colour (dark brown to black); odour (absence of foul odour)	Brown colour and absence of foul odor	Black colour and absence of foul odor
Bulk density (g cm-3) (<1.0)	0.56	0.43
Moisture (% by wt.) (15–25)	27.59	64.8
Particle size (minimum 90% material should pass through 4.0 mm IS sieve)	50 % sample passes through 4 mm sieve	70% material pass through 4.0 mm IS sieve
Total carbon (as C) (% by wt., min.) (12.0)	21.20 (TOC-12.30)	33.3
Total nitrogen (as N) (% by wt., min.) (0.8)	1.85	3.111
Total phosphates (as P205) (% by wt., min.) (0.4)	2.67	1.803
Total potassium (as K20) (% by wt., min.) (0.4)	0.79	2.39
C:N ratio (<20)	11.46	10.70
Sulphur (as S) (% by wt.)	0.62	0.903
Hg (0.15 mg/kg, max.)	0.45	1.053
As (10 mg/kg, max.)	6.06	2.222
Cd (5 mg/kg, max.)	1.71	1.212
Cr (50 mg/kg, max.)	42.0	33.25
Cu (300 mg/kg, max.)	157.9	118.1
Ni (50 mg/kg, max.)	22.78	21.21
Pb (100 mg/kg, max.)	94.32	15.16
Zn (1,000 mg/kg, max.)	946.1	558.6
Helminths (viable egg/4 g) (≤1)	<1	2.0
Fecal coliform (MPN/g of TS) (1000)	59.0	68,203
E. coli (MPN/g of TS) (100)	32.0	4,263
Salmonella (MPN/4 g of TS) (3)	5,138.0	12,504









The comparison between trench compost and co-compost shows that while a few parameters such as C, N and K are marginally higher in the co-compost, a few other parameters such as all the micronutrients (Cr, Cu, Ni, Pb, Zn) seems to be lower in the co-compost. The amount of mercury in the co-compost was found to be three times higher than in the trench compost. Besides this, microbiological analysis such as helminths, E. coli, salmonella and faecal coli shows higher amounts in the co-compost, which makes the case to use the trench compost as a safer option to use as a manure.

12. Road to access containment structures

Ward no.	Accessibility			Grand total
	No	Yes	No data	
1	6	218	0	224
2	59	161	1	220
3	42	71	0	113
4	18	106	0	124
5	74	106	5	180
6	1	281	0	282
7	3	247	1	250
8	37	118	11	155
9	30	136	1	166
10		12	0	12
11	11	297	1	308
12	74	110	0	184
13	2	271	7	273
14	20	182	0	202
15	108	180	1	288
16	1	58	79	59
17	4	78	8	82
18	55	118	1	173
19	5	217	4	222
20	48	207	0	255
21		186	0	186
22	95	160	0	255
23	47	135	0	182
24		167	0	167
25	16	147	0	163
Grand total	**756**	**3,969**	**120**	**4,845**

13. Ward-wise distribution of containment structures

Ward no.	Type of containment structure				Grand total
	Fully lined tank with outlet	Fully lined tank without partition	Septic tank	Unlined tank—floor is earthen	
1			224		224
2	1	1	219		221
3	25		88		113
4	71		53		124
5	42	1	142		185
6			282		282
7	26	2	223		251
8	75		91		166
9	37		130		167
10	3	1	4	4	12
11	70	1	230	8	309
12	12	8	161	3	184
13	102	1	177		280
14	63		139		202
15	8		281		289
16	110	5	21	2	138
17	18	1	69	2	90
18	1		173		174
19	6		220		226
20	12		243		255
21			186		186
22	2	2	251		255
23			182		182
24			166	1	167
25	23		140		163
Grand total	707	23	4,095	20	4,845

Glossary

Aerobic composting: Decomposition of organic matter using microorganisms that require oxygen. The microbes responsible for composting are naturally occurring and live in the moisture surrounding organic matter. Oxygen from the air diffuses in to the moisture and is taken up by the microbes.

Anaerobic decomposition: A sequence of processes by which microorganisms break down biodegradable material in the absence of oxygen.

Biosolids: Nutrient-rich organic materials resulting from the treatment of domestic sewage in a wastewater treatment facility (i.e. treated sewage sludge). Biosolids are a beneficial resource containing essential plant nutrients and organic matter and are recycled as fertilizer and soil amendment.

Co-composting: Controlled aerobic degradation of organics using more than one material (faecal sludge and organic municipal solid waste).

Demand based desludging: Desludging of septic tanks when there is a demand from property owners or users, typically when their septic tanks are full.

Scheduled desludging: Emptying of containment systems like septic tanks of a zone or town at planned regular intervals.

Faecal sludge and septage: Raw or partially digested slurry that results from the collection, storage or treatment of combinations of excreta and black water, with or without grey water.

Faecal sludge treatment plant: A facility where faecal sludge is received from the containments of a locality by vacuum tankers and is treated. It has various treatment modules beginning with solid-liquid separation, and subsequently treatment of liquid portion by commonly available wastewater treatment technologies. Further, separated solids, based on the treatment method used, are either sent to sludge drying bed or to sludge storage yard.

On-site sanitation systems: Containment structures which serves private or public establishments and results in certain degree of treatment of grey and black water coming out of the concerned establishments.

Personal protective equipment: Protective clothing, helmets, goggles or other garments or equipment designed to protect the wearer's body from external damage while working.

Shit flow diagram: An easy-to-understand advocacy and decision-support tool comprising a report (SFD report) which contains a graphic (SFD graphic).

Notes and references

1. SBM urban database for Nagar Palika Parishad Chunar, 2022
2. Ibid.
3. Household survey, Chunar Nagar Palika Parishad, 2022.
4. https://www.cseindia.org/chunar-nagar-palika-parishad-notification-2019-9723
5. https://www.cseindia.org/faecal-sludge-and-septage-management-in-chunar-9719
6. https://www.cseindia.org/trenching-for-safe-management-of-faecal-sludge-and-septage-9720
7. https://www.cseindia.org/various-iec-activities-to-support-fssm-in-chunar-11016
8. https://www.cseindia.org/various-activities-undertaken-by-tsu-chunar-under-iec-campaign-phase-ii-10932
9. https://www.cseindia.org/report-on-5-days-eic-program-in-chunar-11395
10. https://www.cseindia.org/formation-and-activation-of-sanitation-cell-in-chunar-11143
11. https://www.cseindia.org/chunar-nagar-palika-parishad-notification-2019-9723
12. https://www.cseindia.org/four-days-training-on-effective-faecal-sludge-and-used-water-management-11291
13. https://www.cseindia.org/international-training-exposure-visit-for-faecal-sludge-and-septage-management-fssm-in-bangladesh-9950
14. Household survey, Chunar Nagar Palika Parishad, 2022

The Centre for Science and Environment (CSE) worked closely with the National Mission for Clean Ganga (NMCG), State Mission for Clean Ganga-Uttar Pradesh (SMCG-UP), Department of Urban Development (DoUD), UP Jal Nigam (UPJN), Nagar Palika Parishad Chunar (NPPC), the contactor, local community and other stakeholders to design, develop and operationalize the 10 kilolitre per day (KLD) faecal sludge treatment plant (FSTP) in Chunar town.

This report presents the learnings from challenges faced during the construction of the FSTP, measures taken to overcome these challenges, and the way forward. It provides a valuable case study in the construction and operationalization of a sustainable FSTP and various aspects of implementing context-specific faecal sludge and septage management (FSSM) projects in small- and medium-sized cities of India.

Centre for Science and Environment
41, Tughlakabad Institutional Area, New Delhi 110 062
Phone: 91-11-40616000 Fax: 91-11-29955879
E-mail: cseindia@cseindia.org Website: www.cseindia.org