GUIDANCE NOTE ON

OPERATION & MAINTENANCE (O&M) OF FAECAL SLUDGE & SEPTAGE MANAGEMENT (FSSM) PROJECTS AND ECONOMICS OF DESLUDGING IN UTTAR PRADESH

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प्रेषक,

राज्य मिशन निदेशक (अमृत)
नगरीय प्रशिक्षण एवं शोध केंद्र व् स्थानीय निकाय निदेशालय
चौथा तल, गोमती नगर विस्तार सेक्टर 7
लखनऊ

सेवा में,

नगर आयुक्त, नगर निगमः– इलाहाबाद, अलीगढ़, आगरा, कानपुर, लखनऊ, गोरखपुर, वाराणसी, सहारनपुर, गाजियाबाद, मुरादाबाद, मथुरा–वृन्दावन, बरेली, फिरोजाबाद, मेरठ, झाँसी, शाहजहाँपुर एवं अयोध्या उ0प्र0।

अधिशासी अधिकारी, नगर पालिका परिषदः–शिकोहाबाद, हाथरस, मैनपुरी, फतेहपुर, फर्रुखाबाद, इटावा, रायबरेली, सुल्तानपुर, हरदोई, लखीमपुर, उन्नाव, सीतापुर, देवरिया, जौनपुर, बदायूँ, पीलीभीत, मुजफ्फरनगर, शामली, मोदीनगर, लोनी, बड़ौत, खुर्जा, बुलन्दशहर, हापुड़, चन्दौसी, रामपुर, सम्भल, अमरोहा, उरई, बांदा, ललितपुर, मऊनाथ भंजन, आजमगढ़, बहराइच, अकबरपुर, गोण्डा, मिर्जापुर, बस्ती उ0प्र0।

पत्रांकः एसएमएमयू/ 438 /1073/2023 दिनाँकः 24 नवम्बर, 2023

विषय– अमृत के अंतर्गत फीकल स्लज एवं सेप्टेज प्रबंधन (FSSM) संयंत्रों के संचालन और रखरखाव (O&M) की लागत एवं सेप्टिक टैंक सफाई शुल्क (Desludging fees) निर्धारण के सम्बन्ध में।

महोदय,

उल्लेखनीय है कि आपकी निकाय में अमृत योजना के अंतर्गत उ0प्र0 जल निगम (नगरीय) के द्वारा FSTP/Co-treatment plant का निर्माण कार्य पूर्ण किया जा चुका है, जिसका संचालन परियोजना के हस्तान्तरण के पश्चात नगरीय निकायों के द्वारा ही किया जाना है।

FSTP/Co-treatment plant के संचालन एवं रख–रखाव हेतु निदेशक, नगरीय निकाय निदेशालय के पत्र संख्या–423/01/न0 प्रशि0/2023, दिनांक 07 नवम्बर, 2023 के द्वारा FSSM Bye-Laws (Draft) एवं पत्र संख्या–422/01/न0 प्रशि0/2023, दिनांक 07 नवम्बर, 2023 के द्वारा O&M के लिये Model Contract (Draft) प्रेषित किया जा चुका है।

नगरीय निकायों को अमृत योजना के अंतर्गत फीकल स्लज एवं सेप्टेज प्रबंधन (FSSM) संयंत्रों के संचालन और रखरखाव (O&M) की लागत एवं शहर में सेप्टिक टैंक सफाई शुल्क (Desludging fees) के बारे में मार्गदर्शन हेतु विवरण निम्नवत् है :–

1. <u>FSSM संयंत्रों का संचालन और रखरखाव (O&M)</u> :–

I. FSSM संयंत्रों के संचालन और रखरखाव (O&M) में आने वाला व्यय (प्रतिलिपि संलग्न) निकाय को केंद्रीय वित्त आयोग (CFC)]/ राज्य वित्त आयोग (SFC) अथवा निकाय निधि में उपलब्ध राशि से वहन करना होंगा।

II. 32 KLD FSTP के संचालन एवं रखरखाव (O&M) की शुद्ध अनुमानित लागत ₹ 1.4 लाख से ₹ 1.9 लाख प्रतिमाह के बीच में आती है। Technology के हिसाब से संचालन और रखरखाव (O&M) की लागत निम्नलिखित है, जिसका विवरण पृथक से संलग्न है :–

क्र.सं.	FSTP टेक्नोलॉजी	प्रतिमाह लागत(लाख)	वार्षिक लागत (लाख)
1.	ड्राईंग बेड्स बेस्ड नेचुरल सिस्टम	₹ 1.40	₹ 16.8
2.	टाइगर बायो–फिल्टर बेस्ड सिस्टम	₹ 1.86	₹ 22.3
3.	हाइब्रिड सिस्टम	₹ 1.54	₹ 18.5

III. भिन्न क्षमताओं पर आधारित Co-treatment plants के संचालन और रखरखाव (O&M) की शुद्ध अनुमानित लागत ₹ 0.94 लाख से ₹ 1.73 लाख प्रतिमाह के बीच में आती है। भिन्न–भिन्न क्षमता (Capacity) वाले Co-treatment plants के संचालन और रखरखाव (O&M) की अनुमानित लागत निम्नवत् दी गयी है-

क्र.सं.	Co-treatment क्षमता (KLD)	प्रतिमाह लागत (लाख)	वार्षिक लागत (लाख)
1.	25	₹ 0.94	₹ 11.3
2.	50	₹ 1.08	₹ 13.0
3.	75	₹ 1.32	₹ 15.8
4.	100	₹ 1.73	₹ 20.8

IV. भविष्य में होने वाले सभी अनुबंधों (Contracts) में संयंत्र का संचालन और रखरखाव (O&M) की लागत एवं शहर में सेप्टिक टैंक सफाई शुल्क (Desludging fees) घटक अलग होने चाहिए। नए अनुबंधों की अवधि 02 वर्ष से कम नहीं होनी चाहिए।

V. संयंत्र का संचालन और रखरखाव (O&M) एवं शहर में सेप्टिक टैंक सफाई सेवाएं प्रदान करने के लिए एक अथवा दो अलग–अलग ठेकेदार को देने का निर्णय निकाय को अपने स्तर पर लेना होगा।

2. <u>शहर में सेप्टिक टैंक सफाई शुल्क</u> (Desludging fees)

I. दूरी और चक्कर की संख्या (Number of Trips) के आधार पर शहर में सेप्टिक टैंक सफाई हेतु वैक्यूम टैंकर की प्रति चक्कर (आना–जाना) अनुमानित लागत एवं शुल्क (Based on certain assumptions) (प्रतिलिपि संलग्न) निम्नवत् है :–

क्र.सं.	प्रति चक्कर पूर्ण दूरी (कि.मी)	डिस्लजिंग लागत (₹) एक टैंकर द्वारा प्रतिदिन चक्कर				डिस्लजिंग शुल्क (₹) एक टैंकर द्वारा प्रतिदिन चक्कर			
		1	2	3	4	1	2	3	4
1.	10 से कम	1,350	750	550	450	2,200	1,200	800	700
2.	10-15	1,450	850	750	550	2,300	1,300	1000	800
3.	15-20	1,600	1000	800	700	2,400	1,400	1,100	900
4.	20 से अधिक	1,700	1,200	1000	850	2,600	1,600	1,200	1,100

नोट :– फ़ील्ड ऑब्जरवेशन के आधार पर एक टैंकर द्वारा लगाई जाने वाले चक्कर की अधिकतम संख्या 04 ली गयी है।

II. अगर निकाय पूरे शहर में सेप्टिक टैंक क्लीनिंग सेवाएं नो प्रॉफिट नो लॉस के आधार पर प्रदान करने की ज़िम्मेदारी लेना चाहता है तो ऊपर दी गयी लागत का सन्दर्भ लेते हुए प्रति चक्कर शुक्ल निर्धारित कर सकता है।

III. अगर निकाय शहर के प्राइवेट ऑपरेटर्स के सहयोग से सेवाएं प्रदान करना चाहता है या प्रति चक्कर कुछ प्रॉफिट की अपेक्षा रखता है तो ऊपर दिया गया शुल्क का सन्दर्भ लेकर निर्धारित कर सकता है।

IV. निकाय को प्राइवेट ऑपरेटर्स से परामर्श कर के शुल्क निर्धारित करना चाहिए और उसके बाद ही शुल्क को उपविधि (FSSM Byelaws) का हिस्सा बनाए।

V. City Specific लागत और शुल्क जानने हेतु, निकाय CSE द्वारा बनाए गए डिस्लजिंग कैलकुलेटर[1] का प्रयोग कर सकता है।

<u>संलग्नकः– उपरोक्तानुसार।</u>

भवदीय,

24/11/2023

(पी0 के0 श्रीवास्तव)
अपर मिशन निदेशक (अमृत)

[1] https://drive.google.com/file/d/1pR9Z3xMGnQB2R-PN3me6c8nkYuzvLUCU/view?usp=drive_link

संख्या एवं दिनांक तदैव।

प्रतिलिपि– निम्नलिखित को सूचनार्थ एवं आवश्यक कार्यवाही हेतु प्रेषित :–

1. प्रमुख सचिव नगर विकास अनुभाग–5, उत्तर प्रदेश शासन, लखनऊ।
2. निदेशक, नगरीय निकाय निदेशालय, उ0प्र0, लखनऊ।
3. प्रबंध निदेशक, उ0प्र0 जल निगम (नगरीय), लखनऊ।
4. सीनियर प्रोग्राम मैनेजर, सेंटर फॉर साइंस एंड एनवायरमेंट (CSE), लखनऊ।

24/11/2023

पी0 के0 श्रीवास्तव)
अपर मिशन निदेशक (अमृत)

Background

As per UP FSSM policy (2019), India's most populous state, Uttar Pradesh had approximately 4.45 crore population residing in 734 Urban Local Bodies (ULBs). However, based on CPCB report (2021), the total wastewater generated in these ULBs amounts to 8263 MLD, out of which, only 3374 MLD is currently being treated at 107 treatment facilities across 31 ULBs. With only 31 Urban Local Bodies (ULBs) having some form of sewer coverage, the need for managing septage in the remaining ULBs rises significantly. To address this, under Swachh Bharat Mission (SBM) 1.0, over 8 lakh Individual Household Latrines (IHHL) and approximately 70 thousand Community and Public toilets were built. This helped cities attain ODF status and now majority of the properties have lined containments. However, these figures are bound to rise as the number of ULBs has increased to 762 and even though, almost half of the population resides in these towns that account 4% of the total ULBs, the coverage of the sewerage network in these cities is only 22%. According to UP FSSM policy, 72 lakh households translating to more than 2/3rd population in Uttar Pradesh relies on Onsite Sanitation Systems (OSS), it is clear that the state is heavily reliant on them. These systems require timely and regular desludging to ensure efficient operations of containment like septic tanks. Desludging process requires specialized emptying vehicles capable of collecting, transporting and disposing septage. Further, this transported sludge needs to be treated at a treatment facility- either at a Faecal Sludge Treatment Plant (FSTP) or at a co-treatment abled Sewage Treatment Plant (STP).

Contract for FSSM projects

At present, in UP 57 out of 59 (52 funded under AMRUT, 2 under NMCG and 3 under ULB fund) initially tendered projects of these treatment facilities have achieved completion phase, next step challenge lies in its Operation & Maintenance (O&M). As mentioned in the contract, the stipulated amount to be paid to the contractor against desludging services and plant operations & maintenance by the ULB ranges between ₹ 1.25 crore/year for 32 KLD FSTPs and upto ₹ 4.2 crore/year for 100 KLD co-treatment facilities.

Most of the ULBs based on their current financial health have expressed their inability to pay this amount and seek guidance on actual amount required to run the plants. This being a result of the current contract between the implementing and executing agencies lacking a clear budget for operational and maintenance activities, however, it states that the contracting agency is responsible for recovering

O&M costs from the ULB by performing desludging activities in the town. Also, ULB was not kept in loop of this mechanism while finalizing the contract by the implementing agency.

Additionally, the desludging cost in the current contract is fused with that of O&M cost of the plant i.e., total cost of both the components needs to be recovered from the desludging services provided by the contractor at a maximum fee of ₹ 2500 for desludging of 5000 households in a year leaving no clarity on the proportion of each component. The required number of desludging per year is the responsibility of the ULB. The fees as well as number of desludging required every year has again made ULB hesitant in accepting it.

It is to be noted that few of the 25 KLD co-treatment facilities and 32 KLD FSTP in Modinagar (mentioned as co-treatment plant in government documents) in UP are essentially FSTPs within STP. These have liquid treatment modules in their design making them function like a FSTP. For understanding sake and to not create any confusion, we have categorized 25 KLD plants under co-treatment and 32 KLD Modinagar plant as FSTP. (Correct term should be FSTP).

Current desludging scenario

In UP, desludging services are provided by a mix of government and private sector operators, with private sector playing a dominant role. Desludging cost varies from ULB to ULB, and in most cases, there is no guidance & regulation by the state for undertaking the desludging activity by private operators or government at the city level.

Based on the data collected from the field, the daily running cost for a private operator in small town was ₹ 1500, ₹ 1600 for medium town and ₹ 2400 for large towns. In smaller and medium towns, operators are charging between ₹ 1000-1500 per trip; for making desludging business viable, each of the operators need to make 2 trips in a day. On the other side, in bigger towns, the operators are making more number of trips (current average is 75 trips per month), charging between 1000-2000, to recoup the running cost as well as making it viable.

Objective

It becomes imperative for any ULB to receive guidance about Operations & Maintenance as well as desludging services from the state. This is needed to ensure optimal functioning of the FSTPs and Co-treatment facilities while safeguarding affordability to the household owner, profitability to the private operator and sustainability of the infrastructure.

The state to issue a guidance note to the ULBs suggesting the following for better city level planning of -

- Indicative cost of O&M for the different types of treatment plants present in UP.
- Fixation of desludging cost/fees based on distance of the FSSM plant and number of trips

For achieving this, CSE did a field level study on Operation & Maintenance cost of FSSM projects as well as on Economics behind desludging services in UP. The recommendations are based on the learnings from these two studies.

(Findings from CSE study on Economics of Desludging of 11 towns is attached as Annexure I for reference)

Recommendations

A. Operations & Maintenance (O&M) of plants

1. O&M cost should be borne by the ULB. For this, ULB can utilize funds available under Central Finance Commission (CFC), State Finance Commission (SFC) or Own Source Revenue (OSR).
2. For the Operations & Maintenance (O&M) part, irrespective of the mode of operations (technology/treatment system) of a FSTP of 32 KLD in UP, the cost ranges between ₹ 1.4 to ₹ 1.9 lakhs excluding profit. Technology wise O&M cost for 32 KLD FSTP is given below- (For detailed breakup of O&M cost, refer Annexure II Part A) (Based on 2022-23 estimate)

S.no	Technology	O&M cost/month (In Lakhs)
1.	Drying beds based natural system	₹ 1.40
2.	Tiger Bio-filter based system	₹ 1.86
3.	Hybrid system	₹ 1.54

3. Operations & Maintenance (O&M) cost of co-treatment plants in UP, based on different capacities, and slight technology configurations, ranges between ₹ 0.94 to ₹ 1.73 lakhs for 25 to 100 KLD capacity plants excluding profit. Capacity wise O&M cost for co-treatment plants is given below- (For detailed breakup of O&M cost, refer Annexure II Part B) (Based on 2022-23 estimate)

S.no	Capacity (KLD)	O&M cost/month (In Lakhs)
1.	25	₹ 0.94
2.	50	₹ 1.08
3.	75	₹ 1.32
4.	100	₹ 1.73

4. Profit/service charge above the O&M cost should be decided/negotiated between the ULB and contractor.
5. It is advised to delink desludging cost and O&M cost components in all the future contract. (Refer (Annexure II part C for details of O&M components)
6. For the new contracts in other ULBs, contract period should not be less 2 years. Decision to award O&M of the treatment plant as well as desludging services in the city to one contractor or two separate ones should be taken by the ULB.

B. Desludging services

1. Indicative desludging cost for an operator and an estimated desludging fees, based on certain assumptions (Refer Annexure III) for different categories with respect to distance travelled per trip (to and fro) by a single vacuum tanker vehicle is given in the below table

S.no.	Distance travelled in each trip (kms)	Desludging cost (₹)				Desludging fees (₹)			
		No. of trips/day by 1 vehicle				No. of trips/day by 1 vehicle			
1.	Less than 10	1,350	750	550	450	2,200	1,200	800	700
2.	10-15	1,450	850	750	550	2,300	1,300	1000	800
3.	15-20	1,600	1000	800	700	2,400	1,400	1,100	900
4.	More than 20	1,700	1,200	1000	850	2,600	1,600	1,200	1,100

*Maximum number of trips by one vehicle is taken as 4 based on the field observations

Desludging cost is given to provide an option to the state/ULB about providing the desludging services at break-even (no profit no loss) basis with ULB taking all the responsibility of providing the services. However, if the state/ULB decides to work in collaboration with the private sector or expects some normal profit, then the indicative desludging fees can be referred.

In order to promote equity and affordability in the city, it is advised that the fees should be finalized in consultation with private operators and contractor, if available, before putting up in the bye laws. Additionally, desludging fees calculator prepared by CSE[1] can also be referred to understand the cost of desludging per trip in the city.

1. Desludging fees calculator- https://drive.google.com/file/d/1pR9Z3xMGnQB2R-PN3me6c8nkYuzvLUCU/view?usp=drive_link

Annexure I

Findings from CSE field study

Based on the field visits and interviews conducted at 11 towns in UP (Ayodhya, Bijnor, Chunar, Lakhimpur, Raebareli, Sitapur, Unnao, Kanpur, Lucknow, Mirzapur and Varanasi), the following findings related to the desludging and its landscape were noted:

1. At present, the cost incurred for providing a desludging service to a private operator on per kilometer basis (Under certain assumptions) is ₹ 40 for bigger cities like Lucknow, ₹ 42 for medium towns like Unnao and ₹ 44 for small towns like Chunar. The viability of desludging as a potential business prospect in any town depends a lot on the desludging potential of that town. As observed, a desludging potential of 1-5 per day in a small town to 25-30 per day in a medium town to more than 50 per day in bigger towns is a crucial factor in deciding the number of private operators working in any town.
2. Based on the data collected from the field, the daily running cost for a private operator in small town was ₹ 1500, ₹ 1600 for medium town and ₹ 2400 for large towns. In smaller and medium towns, operators are charging between ₹ 1000-1500 per trip; for making desludging business viable, each of the operators need to make 2 trips in a day. On the other side, in bigger towns, the operators are making more number of trips (current average is 75 trips per month), charging between ₹ 1000-2000, to recoup the running cost as well as making it viable.
3. It was revealed that private operators, irrespective of the number of vehicles each owned and the type of town each worked in-big or medium, had taken loan to start their business as all of the interviewed operators were in this business for full time. The money lenders, barring 2 cases where the capital was loaned from friends & family, were local banks or Non-Banking Finance Corporations (NBFCs) like Shriram Finance Limited. The loan amount falls in the range of ₹ 5-10 lakhs with a repayment period of minimum 10 and a maximum of 15 years at an interest rate of 10-15%. The money was used for purchasing vehicle for desludging operations- both tractor and vacuum tanker. In UP, the tractor is the preferred vehicle over truck for mounting vacuum tanker owing to the fact that more investment is required for purchasing a truck mounted tanker as well as the prevalence of narrow lanes in the towns that makes it harder for the truck mounted tankers to maneuver and access the households for desludging. For the same carrying capacity, the capital needed for acquiring a truck mounted tanker is 3 times more than that is required for

a tractor mounted tanker. In order to invest bare minimum for starting the business, private operators prefer to own second hand tractor which reduces the capital required by 15-40%. This also adds to lower Equated Monthly Installments (EMIs) that is required to be paid and ultimately increase in the take home earnings. However, for vacuum tankers, everyone opted for new one as the price difference between new and second hand is almost negligible and also due to shortage of the later ones in the market. It is to be noted that none of the private operators had any knowledge about availing loans at lower interest rates through National Safai Karamcharis Finance & Development Corporation (NSKFDC) and other government finance schemes.

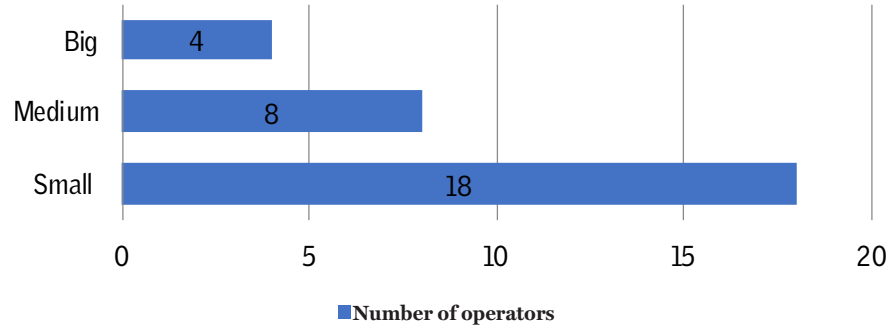
Table 1: Capital required for buying desludging vehicles

Condition (New/Second hand)	Desludging machine		Cost of vehicle (Lakhs) (₹)
	Vehicle type (Tractor/Truck)	Capacity of vacuum tanker (Litres)	
Second hand	Tractor	3000	3.5-4
Second hand	Tractor	4000	3.5-4.5
Second hand	Tractor	5000	4-5
New	Tractor	3000	5-6
New	Tractor	4000	6-8
New	Tractor	5000	9-10
New	Truck	1000	7 and above
New	Truck	3000	20 and above
New	Truck	4000	25 and above

Source: GeM portal and field interview

4. The market is fragmented, by small operators (Ownership of 1 vehicle) capturing 60%, followed by medium operators (Ownership 2-3 vehicles) with 27% and finally big operators (Ownership of > 3 vehicles) with 13% of the market share. It is also noted that the medium and big operators are mostly active in medium and big sized towns only however, with the help of their fleet of vehicles, they also provide desludging services in the nearby towns and peri-urban areas. The requests from nearby areas are entertained to increase revenue and also aids in times of low business. The presence of big operators in the business for over a decade suggests that in a specific town there is scope & sustainability in the business.
5. The services provided by the private operators have different channels for sourcing the business. The various channels adopted by the operators include- word of mouth, personal contacts, online market place and cards/flyers/tanker painting. Unlike other states like, Maharashtra where ULB floats tenders for

Graph 1: Market Segmentation



providing desludging services, in UP there are no such arrangements where a government body engages third party for providing such services. Seasoned operators who have been in business for more than 10 years get their bulk of desludging leads and majority of them translating into business through word of mouth from previous desludging household beneficiaries. For new entrants, the hustle to capture market share requires them to advertise their business more. For this, they splurge more and through different mediums of advertising. However, for them, the bulk of the desludging leads come from offline avenues like-cards, flyer, newspaper inserts and vacuum tanker painting advertisements. With the advent of online business dissemination options, the operators have also tried advertising their business through Justdial, Sulekha, etc. and have got substantial success also as operators in larger cities have witnessed increased lead conversions from these platforms.

6. In order to maximize their profits, the operators generally decant the emptied sludge at the nearest option available either in form of open drain or field. They prefer to decant within a radius of 2-3 kms from the households. There are occasions where the sludge is decanted on the agricultural fields on the request of local farmers located on outskirts of the town; however, farmers paying the operators for decanting on their field were not noted during the visits. The operators, on many instances preferred operating before ULB offices commence operating i.e. 10 am and also preferred to work on government holidays to avoid getting caught for indiscriminate faecal sludge dumping in the city. Also, there were examples from the field where registered private operators instead of designated treatment facility were found decanting at the nearby open drains. On inquiring, it was revealed that they only take around 10-20% of their total monthly tanker trips to the treatment plant and this was done in order to maximize their profit.
7. The factors contributing to operational expenditure for operators functioning in different categories of cities based on population:

Table 2: Factors affecting operational cost at different levels of towns

Particulars	City population		
	< 50k (Category A)	< 5 lakhs (Category B)	>5 lakhs (Category C)
Fee (₹)	500*	1100-3500	1000-2000
No. of trips per year	864*	240-1080	180-1200
Average distance travelled per trip (kms.)	16	14.4	14.5

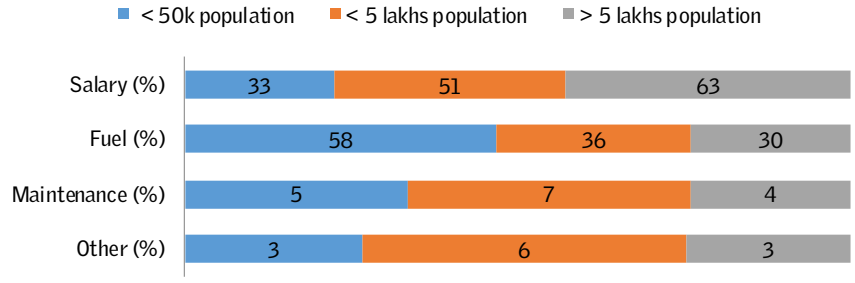
*In Chunar, desludging fee is fixed at 500. The O&M expenses for desludging are recovered from NMCG funds.

From the table, it is observed that the number of trips in category A town (Here, Chunar) is high which could be due to very low desludging fees and free services in Awas Yojna colonies. The low fee has also made it difficult for any private operator to sustain working profitably. Hence, the city has no private operators in the city. In category B and C, the fee range and number of trips per year suggest that both categories have similar nature and conditions for operations. The reason for this could be that the towns in category C, being larger cities, have zones acting as a medium populated towns as in category B.

8. The key cost contributors under operational expenditure for the private operators are salaries and fuel. The salaries are fixed as per the negotiations between the operator and workers (driver and helper) and these vary from town to town. Based on the population, cities were divided into 3 categories and the following was observed-

From the graph, it is evident that irrespective of category of town, the salary and fuel cost takes up the major chunk of the operational cost component. Fuel cost in smaller towns is more than that of salary part, indicating that the vehicles of the operators have to travel more and in contrast, the workers agree to do work even on low salaries. On the other hand, it can be observed that the case has reversed as the salary component takes the major portion of the operational cost. This can be attributed to 2 factors, one- due to costlier standard of living, the salaries of the workers are higher and second- availability of sludge decanting points in form of open drains in close proximities within the city resulting in lesser distance to be travelled for completing each trip.

Graph 2: Proportion of key operational cost contributors



	Private Sector									Govt					
Particulars	Bijnor	Unnao	Raebareli	Lakhimpur	Ayodhya	Lucknow	Kanpur	Varanasi	Mirzapur	Raebareli	Unnao	Ayodhya	Lakhimpur	Chunar	Sitapur
Trip per Year (Per Month * 12)	240.0	900.0	1,080.0	540.0	180.0	1,200	1,020.0	960	240	12.0	240.0	240.0	24.0	900.0	1,200.0
Driver's Sal per year	80,400.0	162,000.0	156,000.0	126,000.0	73,566.0	168,000	120,000	144,000	96,000	2,800.0	108,000.0	121,560.0	7,200.0	70,458.0	104,700.0
Helper1 Sal per year	72,360.0	162,000.0	108,000.0	126,000.0	73,566.0	108,000	72,000	126,000	120,000	2,800.0	108,000.0	98,400.0	8,560.0	56,316.0	98,400.0
Helper2 Sal Per year	-	162,000.0	-	-	-		72,000	126,000	120,000	-	108,000.0	98,400.0	-	56,316.0	98,400.0
Incentive per desludging /year						240,000	306,000	288,000							
Avg Dist covered by Vehicle per HH	12.0	15.0	20.0	10.0	16.0	12	10	20	15	16.0	15.0	10.0	15.0	16.0	15.0
Avg Distance Per Year	2,880.0	13,500.0	21,600.0	5,400.0	2,880.0	14,400	10,200	19,200	3,600	192.0	3,600.0	2,400.0	360.0	14,400.0	18,000.0
Fuel cost per year	64,800.0	303,750.0	486,000.0	121,500.0	64,800.0	324,000	229,500	432,000	81,000	4,320.0	81,000.0	54,000.0	8,100.0	324,000.0	405,000.0
Maintanence per year	30,000.0	45,000.0	50,000.0	26,000.0	30,000.0	45,000	60,000	33,000	48,000	50,000.0	45,000.0	20,000.0	30,000.0	30,000.0	20,000.0
Registration per year	1,000.0	7,500.0	-	3,000.0	-	2,000	2,000	1,000		-	-	-	-	-	-
Insurance of vehicle per year	-	10,500.0	13,500.0	3,000.0	6,000.0	8,000	8,500		6,000	10,000.0	10,000.0	10,000.0	10,000.0	10,000.0	10,000.0
PPE per year	2,000.0	5,400.0	2,000.0	-	-	5,000	6,000	15,000	12,000	2,000.0	2,000.0	2,000.0	2,000.0	2,000.0	2,000.0
Hose Pipe cost per year	-					15,000	10,000	10,000	6,000	1,600.0	1,500.0	-	-	5,000.0	5,000.0
Other exp per year	12,500.0	10,000.0	30,000.0	10,000.0	15,000.0	40,000	35,000	30,000	25,000	1,000.0	2,000.0	1,000.0	1,000.0	1,000.0	2,000.0
Vehicle EMI PER YEAR at 10%															
Total cost per year	**263,060.0**	**868,150.0**	**845,500.0**	**415,500.0**	**262,932.0**	715,000	**921,000.0**	**1,205,000.0**	**514,000.0**	**74,520.0**	**465,500.0**	**405,360.0**	**66,860.0**	**555,090.0**	**745,500.0**
Total cost per HH	1,096.1	964.6	782.9	769.4	1,460.7	596	902.94	1,255.2	2,141.7	6,210.0	1,939.6	1,689.0	2,785.8	3,854.8	621.3
Charge per trip	1,500.0	1,200.0	1,200.0	1,100.0	2,000.0	1,000	1,500.0	1,800.0	3,500.0	1,500.0	1,200.0	1,500.0	1,100.0	500.0	500.0
Income per HH	**403.9**	**235.4**	**417.1**	**330.6**	**539.3**	404	**597.1**	**544.8**	**1,358.3**	**(4,710.0)**	**(739.6)**	**(189.0)**	**(1,685.8)**	**(3,354.8)**	**(121.3)**
Profit % (Operational)	**36.9%**	**24.4%**	**53.3%**	**43.0%**	**36.9%**	68%	**66.1%**	**43.4%**	**63.4%**	-75.8%	-38.1%	-11.2%	-60.5%	-87.0%	-19.5%
Profit per year	96,940.0	211,850.0	450,500.0	178,500.0	97,068.0	485,000	609,000.0	523,000.0	326,000.0	(56,520.0)	(177,500.0)	(45,360.0)	(40,460.0)	(3,019,312.5)	(145,500.0)

Annexure II (Part A)

Operation & Maintenance cost for 32 KLD FSTPs in Uttar Pradesh

Drying beds based system

	Description of activity	Total cost (₹/month)
A	Operation expenses for nature-based treatment system	98,182.40
B	Maintenance expenses for nature-based treatment system	42,291.67
	Total O&M cost (A+B)	1,40,474.07

Tiger bio-filter based system

	Description of activity	Total Cost (₹/month)
A	Operation expenses for nature-based treatment System	124,032.80
B	Maintenance expenses for nature-based treatment System	62,591.67
	Total O&M cost (A+B)	186,624.47

Hybrid system

	Description of activity	Total Cost (₹/month)
A	Operation expenses for Hybrid treatment System	113,596.8
B	Maintenance expenses for Hybrid treatment System	41,291.67
	Total O&M cost (A+B)	154,888.47

Note: For further Detailed breakup of the cost of each system, refer 'Operation and Maintenance cost of Faecal Sludge Treatment Plants in Uttar Pradesh', Centre for Science and Environment

Annexure II (Part B)

Operation & Maintenance cost for co-treatment plants in Uttar Pradesh

As the technology used in all the co-treatment plants in UP is almost similar i.e. simple solid liquid separation, liquid treatment at STP and solids treatment in drying beds. However, there are plants which are constructed as FSTPs but are being called as co-treatment plants. For example- Modinagar, Muzaffarnagar. The O&M cost calculations have considered the modules constructed irrespective of whether they are labelled as co-treatment or FSTPs in Uttar Pradesh. The O&M cost of different capacities of plants have been calculated based on the field visits, interviews and data collection. Below table gives the O&M cost for different capacity of plants in UP.

Description of activity	Total Cost/Month (₹)			
	25 KLD	50 KLD	75 KLD	100 KLD
Operations cost (A+B+C)	71,220	79,440	91,940	130,640
Human resource cost (A)	35,000	35,000	43,000	61,000
Energy cost (B)	15,720	19,440	19,440	19,440
Miscellaneous cost (C)	36,700	41,200	45,700	50,200
Maintenance cost	22,708	28,709	34,959	42,042
Grand total (₹)	93,928	108,149	126,899	172,682

Note: The above costs does not include:

- Estimation for DG set operations & monthly maintenance for 25/50/75 KLD plants. If the same is required then the cost increases by ₹ 16,200 (For daily 2 hours operations in a month) and monthly maintenance expense by ₹ 833.
- If solar panels are considered, then the monthly amount for its battery replacement after a life of 5 years comes out as ₹ 1667.
- For polymer dosing, different polyelectrolytes are available in the market in a price range of ₹ 50-400/kg which is sufficient for 10-100 KL of sludge. For the calculations part, polymer at ₹ 300/kg is considered which can treat 50 KL sludge.

Annexure II (Part C)

Operation & Maintenance (O&M) components

Faecal sludge treatment plants (FSTPs) require ongoing and appropriate operations and maintenance (O&M) activities in order to ensure long term functionality. O&M activities are at the interface of the technical, administrative, and institutional frameworks that enable sustained FSTP function. "Operation refers to all the activities that are required to ensure that a FSTP delivers treatment services as designed and "maintenance" refers to all the activities that ensure long- term operation of the equipment and infrastructure. Proper O&M of FSTP requires a number of crucial tasks to be carried out regardless of the size of the plant, and complexity of the technological setup. Having skilled workers perform these tasks in a timely manner and in accordance with best practices will maximize the value of the FSTP and ensures its long-term performance.

Operation cost

The cost for operating FSSM projects involves the following activities:

- Human resource for operating the plant- Site incharge, Plant operator, Site helper, etc
- Energy cost, which is the electricity required for the operation of pumps, common lighting etc.
- Any chemicals or consumables required for operating the plant
- Sampling/testing cost for the monitoring of septage and wastewater
- Other miscellaneous costs

Maintenance cost

The cost for maintaining a FSTP involves the following activities.

- Civil maintenance of the structures
- Maintenance/ replacement/ repair cost of electro mechanical equipment
- Maintenance of filter material, if any
- Replacement of solar batteries, panels etc.
- Gardening

Note: The frequency of the maintenance varies between one to three years. For ease of understanding, the frequency has been converted to yearly cost

Annexure III

Assumptions considered while proposing desludging cost-

i. Fuel cost = ₹ 90/litre
ii. Driver Salary = ₹ 12,000/month
iii. Helper Salary = ₹ 10,000/month
iv. The vehicle life period = 15 years
v. Annual maintenance = ₹ 35,000
vi. Other miscellaneous expenses (PPE, Insurance, Registration, etc.) = ₹ 25000

While calculating desludging fees, a normal annual profit = ₹ 3,00,000 per annum was assumed. (Based on the data collected during the field visits)

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