



# SMALL remains BEAUTIFUL

PRIVATE SECTOR PARTICIPATION  
IN FAECAL SLUDGE & SEPTAGE  
MANAGEMENT

2020

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## ABOUT THE POLICY BRIEFS

During the first phase of the Swachh Bharat Mission—Urban (SBM-U) in 2014-2019, toilet construction increased manifold. Resultantly, almost all households in India now have access to a toilet. However, the large-scale toilet construction under the SBM-U has not been matched with a concomitant expansion of the sewerage network, that currently caters to about merely one-third of the Indian households. The remaining households are dependent on On-Site Sanitation (OSS) systems such as septic tanks and pits, that are prone to overflow and require timely desludging. Further, instances of direct disposal of faecal sludge into open drains, either directly from toilets lacking an OSS system, or from malfunctioning OSS systems, manifest adverse environmental and public health impacts. Against this background, Faecal Sludge and Septage Management (FSSM) emerges as a fundamental need to manage the problems associated with collection, treatment and disposal of faecal waste.

Over the past few years, under AMRUT and SBM, the state governments have set up a number of treatment facilities or FSTPs (Faecal Sludge Treatment Plants) to address the issues related to treatment of faecal sludge. However, much less attention has been attributed to the collection and conveyance part of the FSSM value chain, creating a significant service gap, that is unviable to be solely addressed by the public sector. To address the service disparities, a host of private enterprises providing FSSM services has emerged in India, predominantly through an informal, small-scale operation. With an increasing recognition of the fundamental role of the private sector in bridging the gap between the availability and requirement of FSSM services, the launch of the National Faecal Sludge and Septage Management (NFSSM) Policy in 2017 further emphasised the need to redress the informality associated with the sector.

As a part of its research programme on urban sanitation, SCI-FI has been researching the nature and scope of private sector participation in urban sanitation services. Based on SCI-FI's interventions and research, a series of five Policy Briefs has been prepared in an effort to summarise the sector characteristics and the gamut of private participation in the collection, conveyance and treatment part of the FSSM sector. The five policy briefs in the series are titled as follows:



1. PPP experiences of Key Infrastructure Sectors: Learnings for FSSM
2. Designing a Framework to Facilitate Private Investments in FSSM
3. Characteristics of the FSSM Sector
4. Business Needs and Good Practices in the FSSM Sector
5. Framework for Finance Flows in the FSSM Value Chain



# CHARACTERISTICS OF THE FSSM SECTOR



## 1 BACKGROUND



Following an understanding of the needs of the Faecal Sludge and Septage Management (FSSM) sector, as elucidated in the second Policy Brief of the series, this Policy Brief discusses the features of the FSSM sector to foster successful models of private partnership.

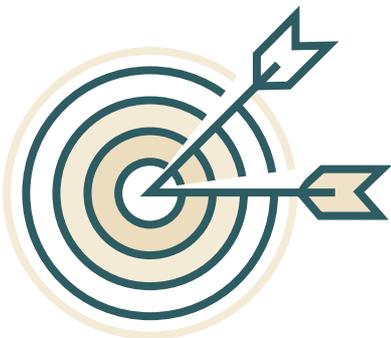
In India, private operations in FSSM have been observed across different segments of the value chain, including (a) Construction of septic tanks and toilets (b) Retrofitting and maintenance of septic tanks (c) Desludging or collecting faecal sludge (d) Conveyance and

disposal of faecal sludge, and (e) Construction and operation of faecal sludge treatment plants (FSTPs). However, as cities across the country aligned themselves to the directives under the National Faecal Sludge and Septage Management (NFSSM) Policy 2017 the role of the private sector has attained significant traction in the collection, conveyance and treatment of faecal sludge. These activities engage the bulk of the private sector operations, often informally, and are laced with high operational risks under the current scenario.

A comparison of the size of the FSSM business with other key infrastructure sectors revealed that the size of the FSSM business is relatively small, thus limiting opportunities for viable large-scale and complex models of private investments. In addition to recognising this key characteristic of the sector, implementation of successful models of private sector participation is also contingent upon understanding the scale, scope, demand and other opportunities for private businesses involved in FSSM.

Towards this end, this policy brief is the third in the series of the policy briefs and elucidates the characteristics of the FSSM sector which shape the sector investments. It also highlights other potential areas for private sector participation other than collection, conveyance and treatment of faecal sludge.

## 2 OBJECTIVE

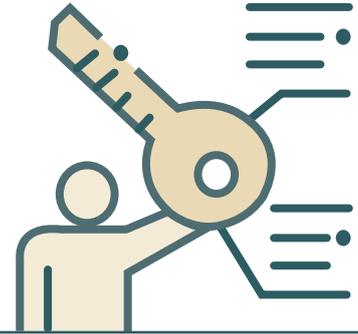


The objective of this policy brief is to discuss the features of the FSSM sector that influence what type of business can succeed. The FSSM sector has several such features, such as:

1. Financial opportunities are small – both project cost and revenues
2. Demand is skewed towards bulk customers. Additionally, the demand depends a lot on factors which may not be in control of Transport or Treatment Plant operator.
3. The business ramp up for FSTP is very uncertain and not under the control of the operator
4. Resource recovery potential is low
5. Safe transportation and treatment do not mitigate all public health risks
6. Many potential areas for private sector participation other than transport and treatment.

These characteristics are discussed in detail in the subsequent sections.

### 3 KEY CHARACTERISTICS OF THE FSSM SECTOR



#### 3.1 The financial opportunities in the. Sector are small

The generally recognized opportunities for private sector in this sector are in the following areas

- ▶ Emptying and Transport: Safely emptying of Septic Tanks and transporting the sludge to a treatment center.
- ▶ Fecal Sludge Treatment Plant (FSTP): Safe Treatment and disposal of sludge.

In addition to these, there are other areas for private sector involvement across the FSSM value chain that are also discussed herein.

##### 3.1.1 Emptying and Transport

Safe emptying and transport is carried out by trucks or smaller vehicles fitted with suction pumps. This is so that the contact of operators with the sludge is minimized.

A private operator can enter the sector by purchasing just one truck. Across the country, one truck carries out anywhere between 1 and 3 emptying operations in a day. As a maximum they may carry out 5 emptying operations. The fees charged vary between Rs. 500 and 1,500; in specific circumstances

where distance between the Household and Treatment Plant is large, it could go upto Rs. 2,000. This excludes extra payment for removing caked sludge if any.

On an average, a truck operator may do 3 trips for Rs. 1,000 each and may work for 300 days a year. At 3 trips a day for 300 days the annual revenue is

$$3 \times 300 \times 1000 = \text{Rs. } 9 \text{ Lakh.}$$

Case studies reveal that number of loads are lesser than this and many truck operations are part time only.

Even if we take the maximum of these numbers, the revenues for a truck operator working for 320 days would be

$$320 \times 5 \times 2000 = 32,00,000 \text{ or Rs. } 32 \text{ Lakh.}$$

This is a not a very big business. For comparison, many taxi or Uber / Ola drivers would do more than the maximum spelled out, especially, in cities like Mumbai and Delhi. More importantly, the figure quoted above is the gross revenue. The net profit for the operator would be much lower as he would need to pay for fuel costs, maintenance, salaries of driver and helper and tipping fees at the FSTP if any.

An operator can operate multiple trucks but even ten trucks (which is generally not observed) would give him a business of less than a Crore. And of course, a new operator could enter and compete with him anytime.

##### 3.1.2 Fecal Sludge Treatment

If anything, the FSTP business is even smaller than Emptying and Transport business. Following are the capital cost and estimated O & M cost of some treatment plants across India.

As can be seen, the capital cost of these plants is in the range of few Crores at most. Note that even for large cities, a single treatment plant may not be much larger. It would make sense for the city to make multiple treatment plants so that the distance traversed by trucks from different parts of the city is minimised.

The actual operating costs of the FSTP we visited were fairly low and none of them was anywhere near even Rupees Ten Lakh. Note that these costs included the labour costs of all people working in the plants and the profit that the plant makes may be a small fraction of these costs.

TABLE 1 - Capital and Operating Costs of FSTPs



Location	Technology	Capacity (KLD)	Total Capex (Rs. Lakh)	Estimated operating costs in Rs Lakhs per year
Warangal	Pyrolysis	15	110	12.45
Devanhalli	DEWATS	6	111	5.10
Phulera	DEWATS	20	239	6.49
Jabalpur	MBBR	50	50	7.92
Bhubaneswar	DEWATS inspired	75	168	14.4
Puri		50	74	11.49
Leh	HPGF	12	52	6.96
Tenali	MBBR	20	20	5.04

SOURCE: Cost Analysis of Faecal Sludge Treatment plants in India - National Institute of Urban Affairs, 2019

### 3.1.3 Comparison of business sizes

The sizes of both conveyance and treatment businesses is much smaller than typical businesses in other infrastructure sectors. Here are few comparisons. The project size of an FSTP (with its own small transport fleet) is very small com-

pared to even urban infrastructure projects which tend to be smaller than other infrastructure sectors.

The annual revenues of an FSSM operation are also much lower than infrastructure sectors, and even lower than the GST threshold (which is Rs 40 lakhs per annum).

A relatively small operation, such as a sewage treatment plant for a city with a population of 2 lakhs will also have operating costs of approximately Rs 6.4 crores per annum. Compared to this, the operating costs of an FSSM operation are likely to be less than 20 lakhs.

FIGURE 4 – Comparison of average projects costs in infrastructure sectors

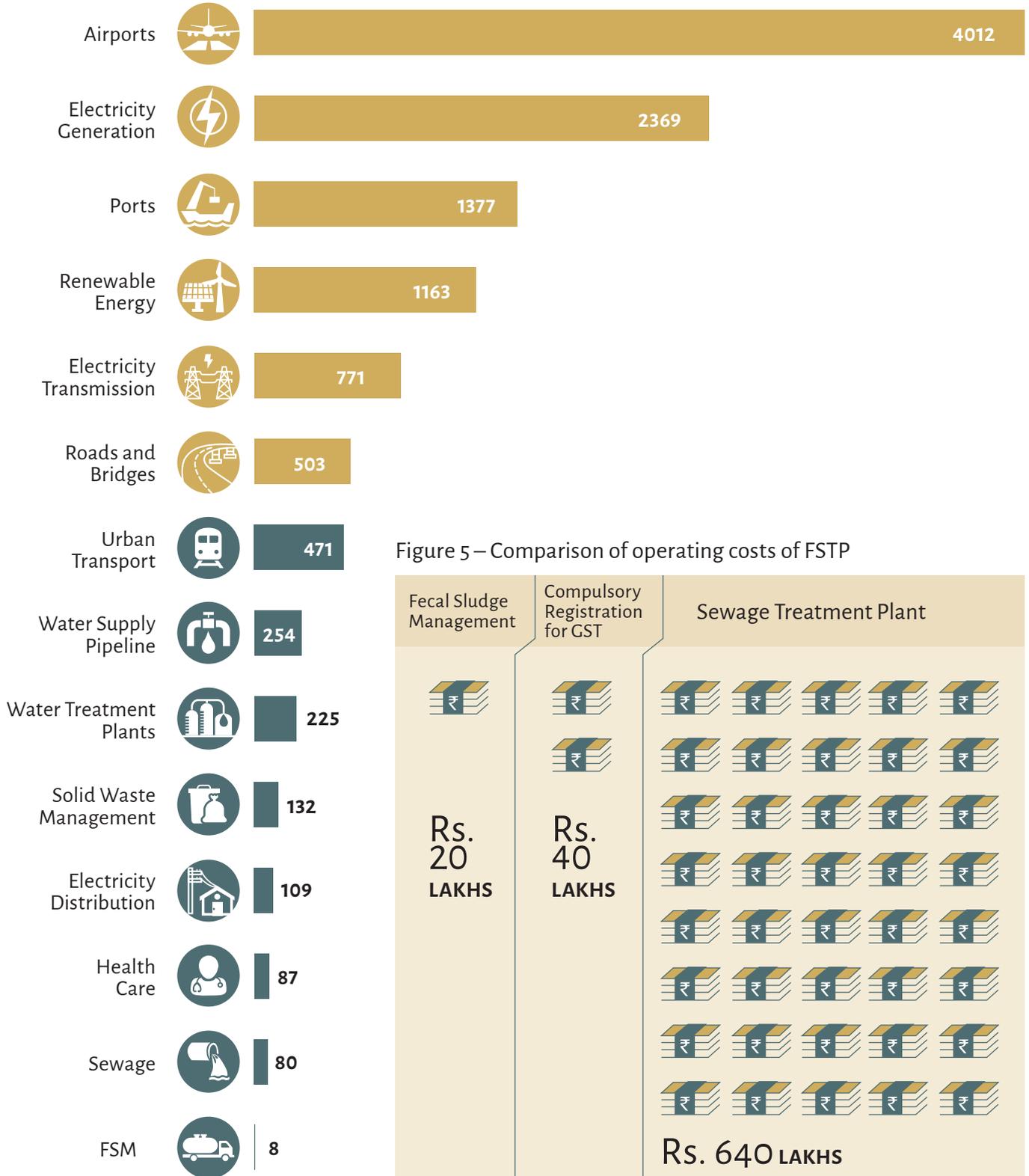
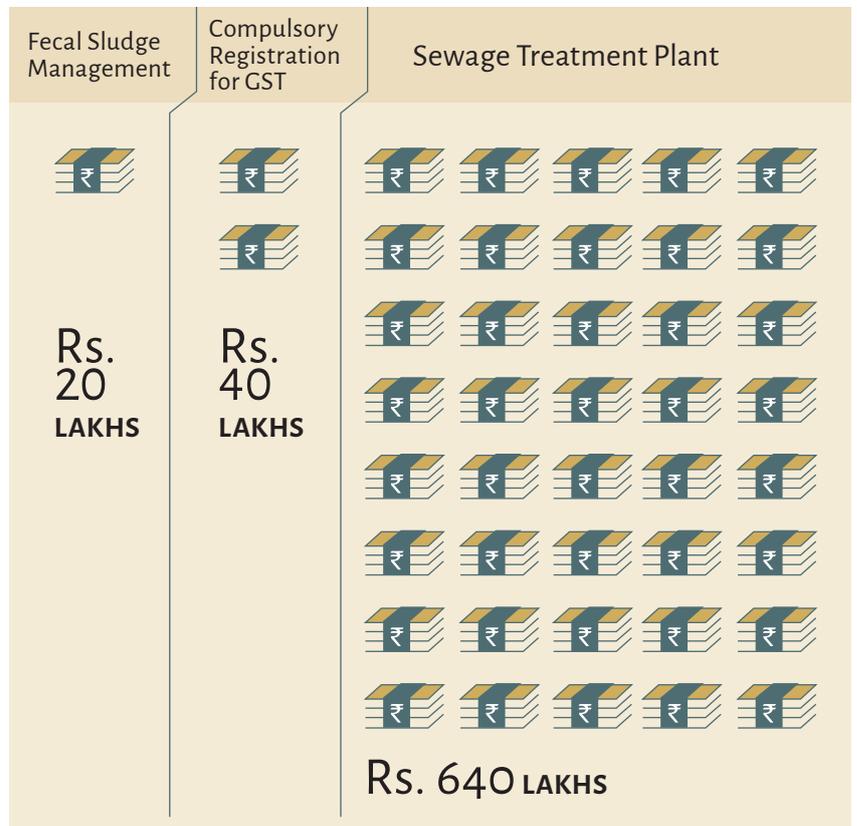


Figure 5 – Comparison of operating costs of FSTP



SOURCE: [pppinindia.gov.in](http://pppinindia.gov.in)

SOURCE: Authors

### 3.1.4 Implications

1. Private sector participation in Faecal Sludge Management will be unlike that in other sectors. It cannot involve formal, organised companies; the business size in FSTP and conveyance is too small to attract those companies.
2. The entrepreneur this business is likely to attract, especially in FSTP, is a very small business person who also works as the plant manager and for whom a profit of Rs. 30,000 per month is aspirational. This could be a not so highly educated person who stays on premises with family.
3. It would definitely not be a business whose name is known across the country.

Do note that it is not easy to combine many such businesses, especially in Faecal Sludge Treatment, for economies of scale. This is because one key part of the business is liaising and coordinating with local municipal authorities. Relationship established in one town will not work in another, even in the same state. The importance of relationships in the business becomes even more important because the plants are not technically very complex. An electrical pump may be the most complex machinery in many plants and some plants may not even have that.

The conveyance business can be consolidated within a town. That is, the operator may have more than one truck. But, even five trucks would give the operator a business size of less than a Crore in most cases.

Furthermore, not much prevents a new entrant with a single truck to compete with the incumbent.

The corollary of small business size of treatment and transport is that the level / grade of the officer in a municipality responsible for an FSSM facility will be the junior most grade. A senior engineer may be involved during construction stage. However, the FSSM scale is

too small for it to have a dedicated engineer even at junior level, leave alone a senior engineer. Therefore even if organised private sector is interested in FSSM, they would have far better capacity to deal with contractual issues and negotiations; the ULB side would be relatively far underprepared. Not only will organised sector be not interested but also ULB counterpart would be underprepared.

#### BOX 1 – Profile of an FSTP Operator

The FSTP operator at a plant near Bangalore belongs to a village which is 100 km from Bidar. He has studied till class IV. He was working on a farm for a few years and his income was Rs. 60,000 per year. A friend suggested that he come with him to Bengaluru to see the city. Once in the city, the operator got work as a construction worker when the FSTP (where he currently works) was coming up. His initiative impressed the people in charge and he was employed by the plant when it was commissioned. Over the period of time, he became intimately aware of all aspects of running the plant and he was put in charge of it. He has the literacy to do basic record keeping.

The operator earns Rs. 15,000 a month and lives on site with his wife. He likes the fact that he has responsibilities and the training and skills to execute those responsibilities. He does feel that the money on offer does not make the job a long term prospect. Especially, when his family becomes bigger. As a family, he and his wife can take up additional responsibilities in the FSTP which gives them some prospects of increased income.



### 3.2 Market characteristics of the sector

The market for the two services, conveyance and treatment, is characterised by two features

- ▶ Relative domination of ‘Bulk Customers’
- ▶ Demand can vary a lot

We will explain the two in detail and then consider the implications of the same.

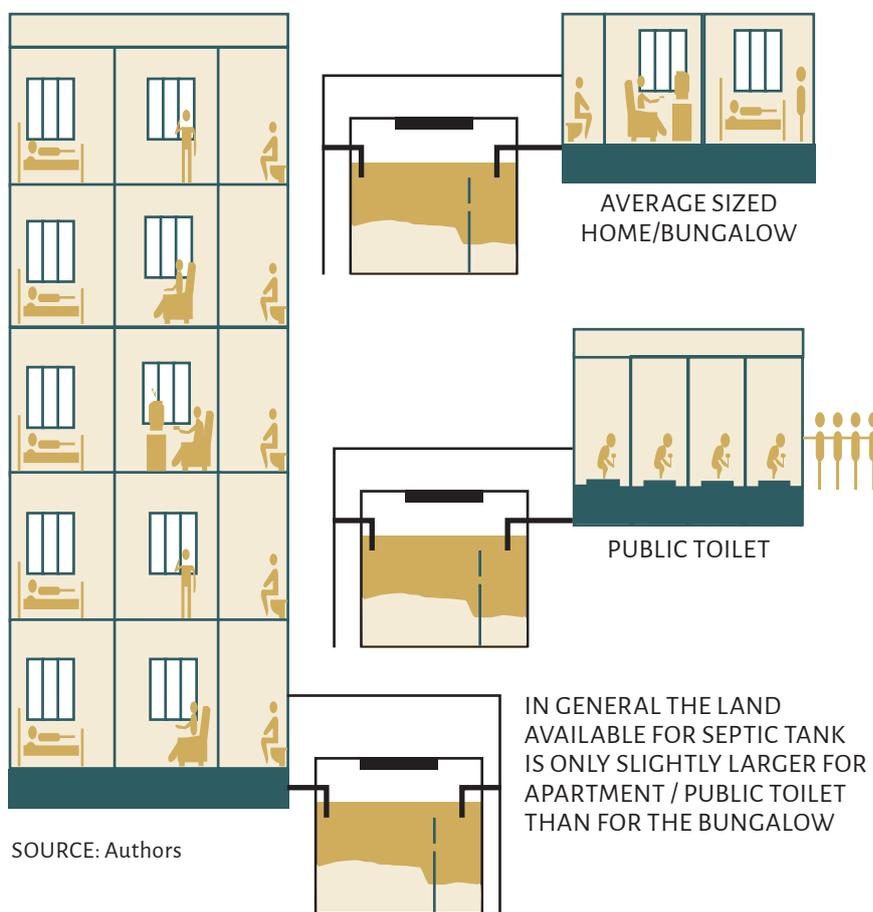
#### 3.2.1 Bulk customers

We define bulk customers as any premises that has relatively small space for Septic Tank when compared to the number of people using restrooms. Offices, high rise complexes and hotels are typical bulk customers. The quintessential bulk customer is a Public Toilet. In all of these, the space available for constructing the septic tank (ST) is small and the number of users is very large.

One implication of this is that the ST for a bulk customer may be emptied at a much higher frequency than that of a stand-alone residence. Hence, bulk customers can form a very significant part of the customers of treatment as well as conveyance services. Here are the share of bulk customers for treatment plants for some cities.

The experience of CPR shows that in cities as different as Ujjain, Chennai and Goa, the ratio of trip to bulk customers to retail customers is anywhere between 9 : 1 to 18: 1

FIGURE 5 – Comparison of operating costs of FSTP



SOURCE: Authors

TABLE 2 – Share of bulk customers in an FSTP

City	Ujjain	Jabalpur	Chennai	Goa
Bulk trips	139+336*	1081+153*	1096	600
Retail trips	25	133	104	52
Ratio	19:1	19:1	10:1	11: 1

\* The second figure is from non-revenue bulk customer. However, in any market based scenario someone would need to pay the conveyance operator for emptying these Septic Tanks.

### 3.3 Variation in demand

In all cities today, there are existing private sector operators engaged in emptying and transport. In absence of a FSTP, a transporter might be dumping sludge in fields or even near water bodies. When a FSTP is set up, it is not necessary that all residents and conveyance operators would use those services. Some factors which would determine the usage of FSTP facilities could be

- ▶ **Distance of facility from resident's home:** If the distance is too much, it is likely that the conveyance operator would dump the sludge illegally somewhere to save on fuel costs.
- ▶ **Tipping fees if any:** Tipping fees at FSTP would discourage a conveyance operator from using those facilities.
- ▶ **Wait times:** Higher wait times would discourage conveyance operator from using these facilities.
- ▶ **Enforcement of pollution norms:** Stricter enforcement of pollution norms and a greater understanding of them by citizens would encourage more safe disposal in FSTP.
- ▶ **Enforcement of manual scavenging norms:** Residents may use unsafe conveyance including manual scavenging for emptying Septic Tanks if the enforcement of manual scavenging laws and awareness of them in citizens is low.
- ▶ **Awareness of safe conveyance services:** If citizens are not aware of availability of safe conveyance and transport facilities, then they cannot connect with them when they have a requirement.

As the above factors would differ from state to state and even city to city and would significantly change the demand for a newly setup FSTP as well as for safe conveyance options. Furthermore, the conveyance and FSTP operators have very little control over these factors.

As a result, any model where the private sector invests in treatment facilities will be risky and could lead to disputes if volumes don't build up.

At the same time, if a private sector invests in a project, the ULB is locked up with the private operator till the investment is recovered. This makes it difficult to replace an operator who is non performing (even if the contract allows so). Since public health is a higher priority, the ULB should have the flexibility to replace operators easily; and for this reason, a model where private sector is only responsible for operations is preferred.

#### BOX 2 – Benefit of scheduled desludging

Scheduled desludging has been discussed as a means of assuring demand for FSTP and transport operators. We believe that given the challenges in scheduling, this will not be effective for private operators at least in the short term. Furthermore, as we have discussed, we could not find any health benefit of scheduled desludging.

There is one important benefit of timely desludging though. If a ST is not emptied for a long time, there is a danger that the sludge could crust which cannot be then tackled by vacuum pumps and creates a demand for manual scavenging. A regularly emptied tank would not have this problem.

There is also a high risk of scheduled desludging crowding out a free market of truck operators discussed separately.



### 3.4 Low calorific and nutrient content of sludge

Some FSTPs are made with the idea that a significant part of their running costs would be recouped from selling resources generated in the treatment plant. Implicit in this approach is an assumption that such projects are attractive for private sector investment, since resource recovery can recover investments also. This is not practicable. The primary resources in Faecal Sludge are

- ▶ **Energy:** Which may be recovered in the form of bio gas which may later be burnt to generate electricity.
- ▶ **Nutrition:** Treated sludge may be composted and used for fertilization of crops.

The challenge in this resource recovery is that both the energy and macronutrient content in Faecal Sludge are low and economic projections that consider significant

revenues from these sources have a high risk of not being realized.

The energy density of food and common fuels is given below

In a [study published in Gates Open Research](#)<sup>1</sup>, the authors have measured the Calorific value of Dried Faecal as well as the dried Bio Solids (generated after treatment) from the Treatment Plants. The study was carried over three different cities. Here are the main findings.

TABLE 3– Energy Density comparison

Ranking	Examples	Energy Density (MJ / kg)
<b>Foodstuffs</b>		
Very low	Vegetables, fruits	0.8-2.5
Low	Tubers, milk	2.5-5.0
Medium	Meats	5.0-12.0
High	Cereal and legume grains	12.0-35.0
Very high	Oils and animal fats	25.0-35.0
<b>Fuels</b>		
Very low	Peats, green wood grasses	5.0-10.0
Low	Crop residues, air-dried wood	12.0-15.0
Medium	Dry wood,	17.0-21.0
	bituminous coals	18.0-25.0
High	Charcoal, Anthracite	28.0-32.0
Very High	Crude Oils	40.0-44.0

Source: EROIs: Energy and Civilization a History, Vaclav Smil, Page 17 Energy Density, ibid Page 12

<sup>1</sup> Barani V, Hegarty-Craver M, Rosario P et al. Characterization of faecal sludge as biomass feedstock in the southern Indian state of Tamil Nadu. Gates Open Res 2018.

TABLE 4 – FAECAL SLUDGE CHARACTERIZATION

Parameter	Measure	Value (range)
Total Solids (Proportion of solids in fresh sludge)	Percentage (%)	1-3
HHV (Faecal Sludge)	MJ / KG	5.4 to 13.4
HHV (Bio solids)	MJ / KG	10 to 12.2

As can be seen the Calorific value of dried faecal Sludge or of Bio Solids is less than that of crop residue. The study also found that there is significant variation in the quality of sludge across location and also across different batches in the same location.

► **Nutrient content of Faecal Sludge and why that is important**

For agriculture, the soil must have both, Macro and Micro nutrients. There are only three Macronutrients, Nitrogen, Phosphorus and Potassium (N, P and K) and Nitrogen is the most important of these. Here is the Nitrogen content of common organic material recycled in China.

For comparison, urea, the leading modern synthetic fertilizer contains 46% Nitrogen.

The NP and K content of human urine is much higher but it is not clear how much would remain in the septic tank and how much of it will flow away in the over flow.

The low energy density of sludge means that it would be an inferior fuel as compared to fossil fuels. The

TABLE 5 – NUTRIENT CONTENT

Material	Nitrogen content (% of Nitrogen in fresh weight)
Pig Manure	0.5-0.6
Night soil (human waste)	0.5-0.6
Green Manures (vetches and beans)	0.5-0.3
Oil Cakes (soybean, peanuts, rapeseed)	4.5-7.0
River and Lake silt	0.1-0.2

Source: Energy and Civilization a History, Vaclav Smil, Page 93

low energy density would mean that any plant attempting to recover energy would have a high capital costs as well as more equipment which would mean more chances of failure as compared to simple treatment technology. This would be in addition to the plant being very small compared to the grid. Power purchasers (large electricity companies) are not enthusiastic about signing an agreement with small plants which only provide intermittent unpredictable supply.

Also, as there is a variation in Faecal Sludge quality across location as well as across source (individual residences versus Apartment buildings, etc.), any plant recovering energy would have to take into account this variation.

Faecal sludge or treated sludge is inferior to fossil fuel based fertilizers when compared on the basis of Macronutrients. Additionally, the nutritional content of Faecal Sludge

would vary batch to batch unlike that of fossil fuel based fertilizer. Although it is possible that Faecal Sludge or its derivatives have a more balanced Micronutrient profile than chemical fertilizers, the low Macronutrient density and variable quality would always place an upper limit of price that a farmer would be willing to pay for Faecal Sludge. This upper limit would also be influenced by the cost of transportation that the farmer would have to incur to take the sludge or its derivatives, which in turn is higher on a per kg basis given the low nutrient density of the sludge.

### 3.5 Implications

As discussed, the demand for FSTP and conveyance services can vary significantly. More importantly, the FSTP operator may only see a very slow increase in the demand. If the operator is responsible for discharging the capital expenses (interest and loan repayment) of

the facility, then there is a good chance that he would not be able to do so because the demand for the services is very low.

Moreover, the domination of bulk customers means that conveyance operators would cater more and more to those instead of residents. This could mean that residents are serviced by less safe operators and / or have to live with unfit Septic Tanks.

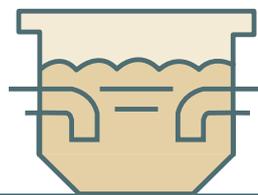
Scheduled desludging has been suggested as a means of ensuring demand for the FSTP and conveyance operators. We are not convinced that this is a viable strategy for private operators. This is because

- ▶ In many cases, municipal authorities do not have accurate records of residences and household sizes within their limits.
- ▶ Even if the records of residences and number of residents are good, municipal authorities

would not know about the location and state of Septic Tanks. The STs could be behind the house or even below it. These difficult to reach STs make it impossible to schedule accurately as a conveyance operator could take a lot of time just to deal with one particular household.

- ▶ The effectiveness of Municipal authorities to persuade or coerce a resident to follow a schedule may vary from city to city or even locality to locality in a city.
- ▶ A transport operator may prefer to go to a Bulk customer with an assured business rather than a resident whose ST is difficult to reach.
- ▶ Most importantly, implementing scheduled desludging depends on municipal authorities and not private operators and it would be unfair to tie their revenues and profitability to something that they cannot control.

## 4 HEALTH IMPACT OF SEPTIC TANK OVERFLOW



A Septic Tank is designed to hold the solids coming out of a toilet. Liquids overflow into a soak pit or into drains. If anyone in a household suffers from an infectious disease that is transferred via faecal matter then the overflow or supernatant of the STP could have

disease causing pathogens. Even when a new ST is built it is filled with water. So the ST would have this overflow from day 1. In any case a typical ST does not have the capacity of more than 50-60 days of water that comes from a toilet.

Safe conveyance and disposal facilities are necessary but not at all sufficient from a health perspective. Ensuring that the overflow is not contaminating ground or surface water which is used for drinking is more critical. This is a complex task which requires an understanding of factors such as local soil conditions and water sources including ground water.

## 5 OTHER ACTIVITIES



The privatisation efforts in the sector have focused on Conveyance and Faecal Sludge Treatment till now. However, we believe that this ignores many possibilities where private sector participation could be encouraged. For example,

- ▶ Many urban toilets are not sanitary. That is, they may not have any on site storage and the output from them may directly feed into open drains. Municipal authorities should use private sector participation to persuade the households and build on-site ST.
- ▶ It is believed that a significant amount of on-site storage is not as per design recommendation. For example, many STs may just

be large concrete boxes without any baffles. Such structures do not digest the sludge efficiently. Many STs do not have manholes and that can be very unsafe for sanitary workers. Private sector participation – at the level of individual masons – can be used by Municipal authorities to remedy these structures.

- ▶ Many states are putting up FSTP in their towns and cities. As discussed in this report, it is likely that the plant operators would be small entrepreneurs or members of Self Help Groups. In either case, they could need a lot of training to get the skills to run their business. Additionally,

although FSTPs are simple to run, they still need basic technical training. There is room for state level training institutes and private sector could setup and run them.

- ▶ As discussed earlier, even regular emptying of Septic Tanks is not enough to control spread of infectious diseases as the overflow or supernatant fluid can contain disease causing pathogens. It is the responsibility of municipal authorities to identify all such overflow specially if it is contaminating water sources. Private sector can be a very able partner in such identification and remediation.



## 6 CONCLUSION

THE FACTORS INFLUENCING THE FSSM BUSINESSES ALONG WITH THEIR IMPLICATIONS HAVE BEEN SUMMARISED BELOW:

TABLE 6 – SUMMARY OF FSSM FEATURES AND CHARACTERISTICS THAT IMPACT PRIVATE BUSINESS

Sector Pillars	Implications
1. Given the small size of business, it is likely to attract very small entrepreneurs. It would be virtually impossible to attract large and established business houses to this business.	<p>The relationship and contract (if any) between the ULB and the private operator should reflect this reality.</p> <p>The relationship may not be anything like the relationship with power producers, road builders or even STP operators. Very junior engineers or non engineers with inadequate skills may be overseeing the operation. Attention and support from senior decision makers will be limited.</p>
2. Most of the volume for treatment plants and conveyance operators would come from 'bulk customers'. These are premises which only have a small footprint of land available for Septic Tank relative to the number of its inhabitants. For example, public toilets, hotels, offices, hostels, etc. This segment is also easier for the private operators to serve because of the repeat nature and relative standardisation.	<p>Serving this segment is useful but does nothing for residential segment whose Septic Tanks may pose more of Public Health hazard</p> <p>Any relationship which incentivises volumes would push private operators to cater more to this segment.</p>
3. The business ramp up for FSTP is very uncertain and lot of factors influencing this ramp up may not be under the control of the operator	<p>Any contract which requires the operator to meet the capital cost of the facility is very uncertain.</p> <p>The ULB also should not be locked into an operator who cannot meet public health needs; ability to replace the operator easily is a priority.</p>
4. Safe transportation and treatment do not mitigate the risk of spread of disease. The supernatant from STs would have pathogens.	<p>Public health is the responsibility of the Municipal authorities. Setting up safe transport and Treatment Plants is necessary but not sufficient for meeting this objective.</p>

Sector Pillars	Implications
5. Many other potential areas for private sector participation exist other than transport and treatment.	
6. The calorific value of Faecal Sludge is not high. The nutrient content (NPK) of Faecal sludge is not high. Additionally, unlike traditional fuels and fertilizers, the calorific value and the nutrient content of sludge could vary a lot from batch to batch.	Resource recovery - either energy or nutrients from sludge - would not form a significant part of an operator's revenue and profits. In fact, depending on the distance to the final user, this could easily be a drain on the operator's profits.

It is evident that the FSSM sector, in particular the collection and conveyance segment, remains extremely heterogeneous and dominated by small-scale operators subjected to a gamut of risks. Further, uncertainty due to lack of standardisation – both in service

provision and the typologies of OSS systems – restricts efforts to scale-up the business operations, thereby fostering informality in the sector.

Based on our understanding of the features of the FSSM sector and

the opportunities for private sector participation across the value chain, in the next policy brief of the series, we evaluate the third part of the FSSM framework – the “business needs” for successful private-led operations in this sector.

## ACKNOWLEDGEMENT

The Policy Brief Series is prepared under the research programme, Scaling City Institutions for India (SCI FI) funded by the Bill and Melinda Gates Foundation (BMGF).

The authors are appreciative of the varied contributions by fellow CPR researchers towards the completion of the Policy Brief. In particular, the authors wish to thank Anindita Mukherjee, Arushi Gupta, Kshitij Jaiswal and Shaurya Gupta for providing comprehensive support on finalization of the series of Policy Briefs.

The series has been designed by Ms. Sristi Bhatt and Atul Verma.

SCI-FI, CPR is responsible for the content of this publication.

## SCALING CITY INSTITUTIONS FOR INDIA (SCI-FI)

Sanitation programme at the Centre for Policy Research (CPR) is a multi-disciplinary research, outreach and policy support initiative. The programme seeks to improve the understanding of the reasons for poor sanitation, and to examine how these might be related to technology and service delivery models, institutions, governance and financial issues, and socio-economic dimensions. Based on research findings, it seeks to support national, state and city authorities develop policies and programmes for intervention with the goal of increasing access to inclusive, safe and sustainable sanitation. Initiated in 2013, the programme is primarily funded by the Bill and Melinda Gates Foundation (BMGF).



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