



Training on Financing and Contracting Options for FSSM

Part C – Activity workbook

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**Center for Water and Sanitation
CRDF, CEPT University**

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About this training module on Financing and Contracting Options for FSSM

India has seen impressive sanitation achievements in making cities open defecation free and has largely succeeded in achieving the goal of **Swachh Bharat Mission**. However, achieving **Sustainable Development Goal 6.2 for moving towards “safely managed sanitation”** i.e. collecting and treating all faecal waste safely, will require greater effort.

For moving ‘beyond toilets’ we need to **focus on conveyance, treatment and also reuse**. Data suggests that nearly 80% of faecal waste in India remains untreated¹ and discharged in the domestic environment, agriculture fields or in water bodies

Conventionally, in India, this entails treatment plants connected to large scale sewerage systems, typically funded by central and state government programmes. As a result, out of 4700 cities, only around 400 cities have sewerage connections with treatment plant². **Most cities have on-site sanitation systems**, which are financially viable for smaller cities² to service and manage.

The need for **Faecal Sludge and Septage Management (FSSM)** is now recognized at the national level through **National FSSM policy** and missions and activities such as **Swachh Sarvekshan** and **AMRUT programme**.

Indian states are now evolving FSSM strategies and implementing them in their cities through various state programmes and funds. Government of India has also made available programmatic funding through AMRUT and certain SBM components.

This module on **“Financing and contracting options for FSSM”** focuses on how cities can leverage available public funds, augment these with private financing, encourage private sector role in service delivery and explore other blended and innovative financing mechanisms. It will provide guidance on potential service and operation models in FSSM for both conveyance and treatment.

¹ Central Pollution Control Board (2015). Inventorization of sewage treatment plants. Retrieved from: https://nrcd.nic.in/writereaddata/FileUpload/NewItem_210_Inventorization_of_Sewage-Treatment_Plant.pdf

² Mehta M, Mehta D and Yadav U (2019) Citywide Inclusive Sanitation Through Scheduled Desludging Services: Emerging Experience From India. *Front. Environ. Sci.* 7:188. doi: 10.3389/fenvs.2019.00188 . Retrieved from: <https://www.frontiersin.org/articles/10.3389/fenvs.2019.00188/full>.

What does this training expect the participants to learn?

- Become familiar with the FSSM finance scenario in India
- Understand components of different FSSM business models for conveyance and treatment
- Understanding processes for private sector engagement and building balanced contracts
- Understand financial requirements, potential sources and budgeting for operationalizing FSSM in a city
- Learn about emerging innovative mechanisms for FSSM projects

What can participants expect to do after this training?

- Select an appropriate model for providing FSSM services in their city
- Develop viable options for financing this model
- Select a private player for providing services
- Develop appropriate contracts for engaging private players

Structure of the training

	Session	Objectives	Topics and Activities
1	FSSM Finance in India	<ul style="list-style-type: none"> • To stress on the emerging importance and emphasis on FSSM in India • Refresh concepts of sanitation value chain, steps for operationalising FSSM in a city, financial requirements for FSSM and potential sources for CapEx and OpEx • Understand the current scenario of FSSM finance in India 	<ul style="list-style-type: none"> • Pre –assessment quiz • Presentation on basics of FSSM and financing requirements Exercise on FSSM cost estimation • Exercise on developing city and state budget estimation
2	Business models for conveyance	<ul style="list-style-type: none"> • Introduce the types of models for operationalizing scheduled/ demand based desludging • Understandg benefits, challenges, applicability for each model as well as operational and financial roles • Present national/international Case studies of business models in conveyance 	<ul style="list-style-type: none"> • Presentation on conveyance business models • Video Case study and Quiz on PLAM desludging service • Exercise on Building a model for a financially feasible desludging business in a city

3	Business models for treatment	<ul style="list-style-type: none"> • Introduce the types of models for treatment • Understand benefits, challenges, applicability for each model as well as operational and financial roles • Present National/international Case studies of business models in treatment 	<ul style="list-style-type: none"> • Presentation on treatment business models + integrated models • Exercise on developing business model canvas
4	Private Sector Partnerships and contract management	<ul style="list-style-type: none"> • Understand the need and scope of involving private sector in FSSM • Understand the procurement and contracting process • Understand the components of successful contracts for engaging the private sector – for conveyance of FS and for operation of FSTP 	<ul style="list-style-type: none"> • Presentation on assessment of private sector, potential roles, contract structures and tendering process, performance based contracts • Three part exercise on procurement process and building contracts
5	Innovative financing options	<ul style="list-style-type: none"> • Understand different innovative financing options like Blended finance, Development Impact Bond, Pooled funds, market borrowings, etc and how this can be used in FSSM sector. • Present case studies/videos to explain different innovative financing options 	<ul style="list-style-type: none"> • Presentation on innovative financing options • Video case study and quiz on new and emerging financing options

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Activity 1. Pre-Assessment Quiz

Pre-assessment quiz will help the participants in self evaluating the pre-existing knowledge of financing and contracting options in FSSM. The quiz covers all aspects of the training and will also give the participants an indication of material that will be covered and the depth of knowledge required, thus serving as a 'road map' for the topics.

1. Sanitation systems in urban India are:
 - a Predominantly underground networked sewerage leading to STPs
 - b Predominantly septic tanks and pit latrines.
 - c Predominantly twin pit systems
2. Which of the following are considered 'safely managed' sanitation as per JMP(select multiple options)?
 - a Open defecation
 - b Community toilet connected by sewage network to STP
 - c Household toilet connected by sewage network to STP
 - d Household toilet with septic tank. Septage is emptied and discharged in local water body
 - e Household toilet with septic tank. Septage is emptied and taken to FSTP
3. FSSM is a mandatory requirement to achieve which of the following statuses ?
 - a ODF
 - b ODF+
 - c ODF++
 - d Water+
4. The largest source of central government funding for FSSM for a state government is from (select multiple options)
 - a Swachh Bharat Mission Urban
 - b AMRUT
 - c Smart City Mission
 - d Finance commission
5. What are the major factors that influence the costs involved in FSSM plan
 - a Population and area of the city
 - b Desludging Service type adopted for the city (Demand/scheduled)
 - c Trucks for desludging
 - d Treatment plant (FSTP)
 - e All of the above
6. In most India cities, septic tank emptying service is provided by usually
 - a Provided by the ULB as per a predetermined schedule.
 - b Provided by both ULBs and private contractors as per a predetermined schedule.

- c Provided by both ULBs and private contractors when households request for desludging
 - d Manual scavenging labours
7. What period does the National FSSM policy recommend for desludging
- a Desludging septic tank regularly after every 5 years
 - b Desludging septic tank regularly after every 2-3 years
 - c Desludging only when the septic tank is full
 - d Desludging septic tank once in 8 years
8. The most common sources for CAPEX funding for emptying operations are (select multiple options)
- a Private operators
 - b Urban local body's own funds
 - c Donor funding
 - d State and Central grants
9. Potential sources for OPEX funding for emptying operations are (select multiple options):
- a Sanitation taxes from users
 - b Property tax from users
 - c Sale of compost and other by-products
 - d State and Central grants
 - e User charges
10. Different types of FSSM business models can be defined and categorized based on (select multiple options)
- a Service type (Desludging, treatment, integrated)
 - b Finance structure
 - c Institutional roles
 - d Strong environmental outcomes
11. Business models for FSSM (both conveyance and treatment) should be ____
- a Equitable, cover citywide sanitation, cost-effective and sustainable
 - b Only cost effective
 - c Only sustainable
 - d None of the above
12. The following precautions should be taken while using conveyance business models:
- a Ensure use of PPE by private and ULB staff.
 - b Have a good risk management plan while developing PPP/PSP contracts.
 - c Ensure safe disposal of collected sludge at designated treatment facility
 - d All of the above
13. What is the major source of funding for capex of FSTP? (select multiple options)
- a ULB funding
 - b State/ Central Government funds

- c Private sector funds
 - d Philanthropic funds
14. Arrange the following steps in the proper order for a typical procurement process in any ULB – (1) Draft contract approval (2) Request for proposals (3) Expression of Interest (4) Sanction work order (5) Bid evaluation and selection (6) Market Research
- a 2,3,6,5,1,4
 - b 6,3,1,2,5,4
 - c 3,2,1,5,6,4
15. “Is the private player willing to get its own desludging trucks?” This is a typical question under which aspect of developing a FSSM contract?
- a Operational role of private contractor
 - b Source of revenue
 - c Ownership of capital assets
 - d Payment structure
 - e Contract length and value
 - f Risk mitigation and performance monitoring
16. Risk of delayed payment is the biggest concern for private sector to engage with government bodies. Which of the following measures for addressing this are you familiar with? (select multiple options)
- a Escrow Mechanisms
 - b Delayed payment monitoring portal
 - c Bill Clearance Mechanisms and timeline
 - d Risk Mitigation Funds
17. Taxes, fees and user charges are an example of which type of finance for urban infrastructure?
- a Grants and transfers
 - b Repayable Finance
 - c Own sources
18. Which of the following innovative financing mechanisms are you aware of? (select multiple options)
- a Output based aid
 - b Blended finance
 - c Development Impact bonds
 - d Municipal bonds

Activity 2. FSSM infrastructure and budget estimation

2A - Infrastructure estimation for a city

This activity provides a model for initial estimations for infrastructure and budgetary requirements

Problem Statement

You are the head of the sanitation department at the municipality of City X. It has a population of 70,000 people and has a total of 18,000 households. There are 15,000 residential properties and 1,000 non-residential properties in the city. The city has achieved ODF+ status and now wants to move to ODF++. The city is completely dependent on onsite sanitation systems and has no plans for a sewerage network. The total number of septic tanks in the city are 16,000, including residential, non-residential/ community/ public toilet properties. These are currently services by the ULB's only suction truck on a demand basis. However, the septic tanks are not being desludged regularly. Your Sanitary Inspector estimates that the average desludging interval is 8-10 years. In order to achieve ODF++ status, this will need to be regularized to a cycle of 3 years. A Faecal Sludge Treatment Plant will also need to be set-up for the treatment of septage collected from these septic tanks as the suction truck is currently disposing the collected sludge on open ground at the solid waste site. Before discussing these plans in detail with the Chief Officer, you need to work out an estimate of what will be required.

Calculating infrastructure requirements

Use the following assumptions for calculating the infrastructure requirements of the city: -

- As per a sample survey in the city, the average volume septic tank is 5 kilo litres
- The municipality has 280 working days in one year
- Suction truck available with the municipality has a capacity of 5 kilo litres. Any new trucks that will be procured will be of similar size
- A suitable site for FSTP, identified by you, is situated on the outskirts of the city. Due to this distance, and keeping in mind average time to empty a tank, it is only feasible to make 7 trips per day with one truck

1. Calculating the number of septic tanks to be emptied in a day

$$= \left[\frac{\text{Total number of septic tanks in the city}}{\text{Number of working days in a year} \times \text{Regular interval at which septic tank is to be emptied in years}} \right]$$

2. Calculating the number of trips per day

$$= \left[\frac{\text{The number of septic tanks to be emptied in a day} \times \text{Average size of septic tanks in KL}}{\text{Truck capacity in KL}} \right]$$

3. Calculating the number of truck required

$$= \left[\frac{\text{Total number of trips per day}}{\text{Number of trips to be completed per truck per day}} \right]$$

For operational purposes, it is assumed that each truck requires one driver and two helpers and to monitor the overall project, one project officer/manager is appointed.

4. Calculating required capacity of FSTP (KLD)

$$= \left[\frac{\text{Total number of septic tanks to be emptied per day} \times \text{Average volume of septic tanks in KL}}{\text{}} \right]$$

2B - State budget estimation for FSSM services

While local governments can plan for FSSM at city level, state governments need to strategize for scalability. Such statewide strategies begin by identifying existing treatment capacity and additional requirements across all cities. Co-treatment opportunities with STPs and cluster based approaches, if possible, can be explored. For conveyance, the state will have to assess requirements for additional trucks and may need to procure wherever ULBs cannot do so through own funds. The following activity helps in identifying how a state can estimate the required allocation of funds for FSSM service to be provided in all its cities.

Problem Statement

State Z has 10 cities. It has decided to take make the state ODF++ and provide safe sanitation to all. Of these 10 cities, 3 cities have 100% sewerage connections and two cities have partial sewerage connection. All 5 have operational Sewage Treatment Plants. The rest 5 cities are fully dependent on onsite sanitation systems where all toilets are connected to

septic tanks. These cities have no treatment facilities and need to construct FSTPs for which the state has identified a simple non-mechanical technology. One of these cities is situated in close proximity to one of the fully sewerer cities.

The state government has directed all cities to plan for scheduled desludging services. If more trucks are required in some cities to do this, the state government has decided to procure them and provide to the cities. The desludging period decided by the government is of 3 years.

City	Sanitation status	Total Households	Treatment Facility	Own suction trucks
City A	Fully onsite	10,000	-	1
City B	Sewered city	60,000	STP	0
City C	Fully onsite	40,000	-	2
City D	Sewered city	150,000	STP	0
City E	Fully onsite	11,000	-	1
City F	Partially sewerer (60% sewerer)	44,000	STP	1
City G	Fully onsite	15,000	-	1
City H	Partially Sewerer (50% sewerer)	50,000	STP	1
City I	Sewerer city	80,000	STP	0
City J	Fully onsite (near STP city)	20,000	-	2

Infrastructure and funds required at state level

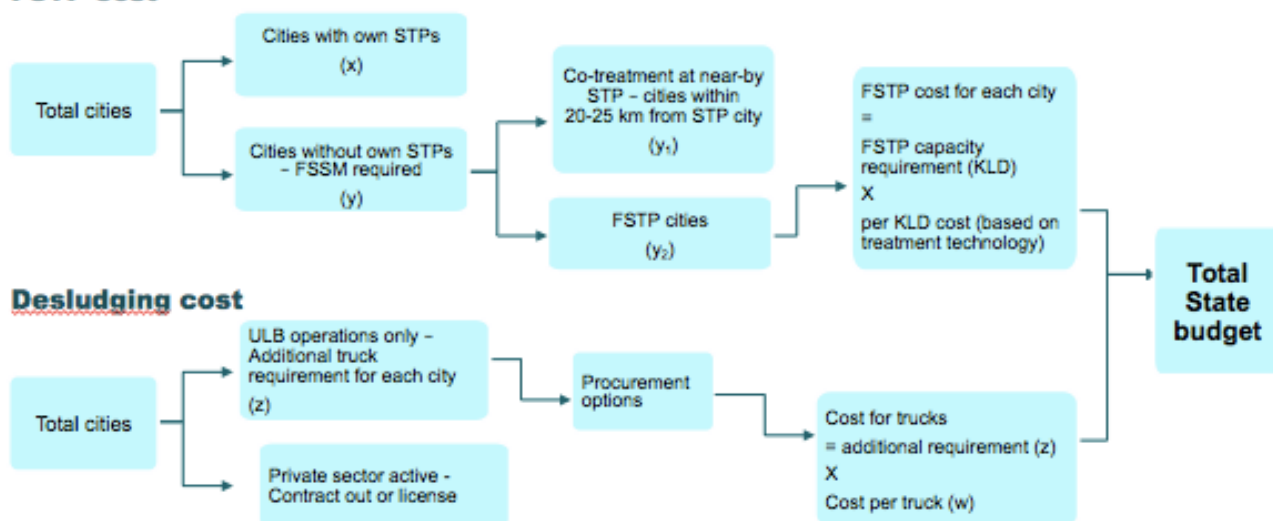
Using the methodology from activity 2A and the flow chart below, estimate the funds required at state level.

Assumptions -

- One household accounts for one septic tank
- 280 annual working days
- Average trips made by one truck to FSTP is 5.
- Average volume of septic tanks is 5KL.
- Cost of one 5000L truck is Rs 20 Lakhs

- Rough cost for FSTP construction is Rs 2.2 Lakhs per KLD capacity

FSTP cost



City	Sanitation status	Total HH	HH that require desludging	No. of septic tanks to be emptied per day	No. of trucks required for scheduled desludging	No. of trucks to be procured	FSTP capacity required
City A	Fully onsite	10,000					
City B	Sewered city	60,000					
City C	Fully onsite	40,000					
City D	Sewered city	150,000					
City E	Fully onsite	11,000					
City F	60% sewerred	44,000					
City G	Fully onsite	15,000					
City H	50% sewerred	50,000					
City I	Sewered city	80,000					
City J	Fully onsite (near STP city)	20,000					

Total requirement of infrastructure		
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Based on infrastructure requirement and cost for treatment technology and trucks, estimate the state Z budget allocation for FSSM:

1	Budget for trucks = Infrastructure requirement of trucks * Cost of one desludging truck	
2	Budget for FSTPs = Total FSTP capacity requirement * per KLD cost (as per technology selection)	
3	Total state budget fund allocation = 1+2	

Activity 3. PLAM desludging service

Video Case study for PLAM desludging model in Wai, Maharashtra

Wai is a small town in Maharashtra, which has implemented scheduled desludging of septic tanks. This was done by engaging a private operator through a Performance Linked Annuity Model.

This contract is a service level agreement, which protects the interests of all parties—private sector, city governments, and citizens. Good quality service is ensured by linking payments to performance - payments are made against the number of septic tanks emptied and safe discharge at the designated treatment site. While the private service providers make investments in trucks, they also get assured business and fixed monthly payments. Risk of late payment by local governments is mitigated through an escrow account mechanism—a tripartite agreement between the local government, private sector, and a local bank—was introduced. The local government is required to keep 3 months of contract payment as a reserve fund to safeguard against risk of payment. To finance this service, sanitation tax is levied in the city.

[Watch this video to know more about the PLAM model before taking the quiz.](#)



Figure 1: Video case study on PLAM model for conveyance

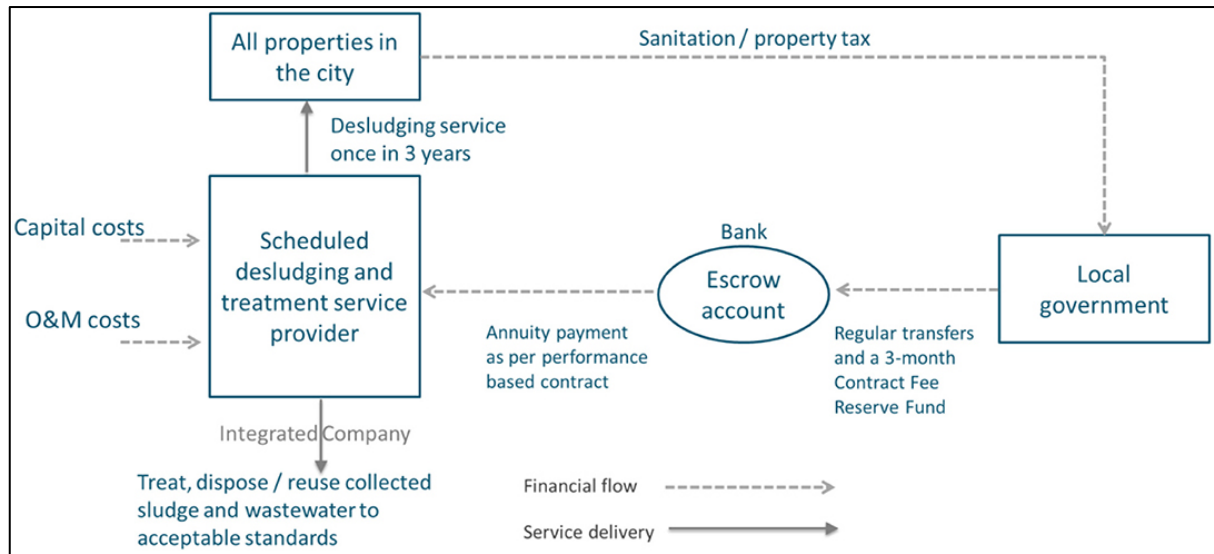


Figure 2 Performance Linked Annuity Model in Wai

Quiz on Performance Linked Annuity Model (PLAM)

- Which of the following is a major challenge in implementation of PLAM model?
 - Requirement of administrative resources
 - Protection against risk of delayed payments to the private player
 - Adherence to standards and quality of service
 - Assured business for the private player
- State whether the statement is True or False : Outcome based financing is an important part of the PLAM model
 - True
 - False
- Which of the following conditions should the desludger fulfil to get paid?
 - Forms signed by customer and FSTP operator
 - Maintaining records
 - Adhere to standards – PPE, spillage, damages, etc.
 - All of the above
- For which of the following is adopting PLAM model more challenging?
 - Scheduled desludging
 - Demand desludging
 - Both of the above

- d None of the above
5. _____ months of reserve fund is advisable, that the private company can draw if there is delay in processing payment any month.
- a Six
 - b Four
 - c Three
 - d One
6. How is risk of delayed payment mitigated in this model?
- a Escrow mechanism
 - b Tripartite agreement
 - c Maintaining reserve funds
 - d All of the above
7. State whether the statement is True or False: Sanitation tax cannot be paid along with property tax
- a True
 - b False
8. Which of the following is not an advantage of introducing sanitation tax?
- a More citizens are encouraged and willing to get their tanks emptied
 - b Citizens can receive service without any fees
 - c Lesser cost per household as compared to individual desludging fee per household
 - d Easier to collect with property tax

Activity 4. Building a model for a financially feasible desludging business in a city

This activity, as a continuation of the exercise under activity 2, will help the participants in understanding various steps involved in building a model for a financially feasible desludging business. It helps identify financing investments for implementing desludging services through various approaches and business models. The business model calculations are based on the inputs provided about population of city, number of septic tanks, service provider, etc.

Problem statement

In City X, based on the estimates and rough proposal from the head of the sanitation department at the municipality, developed under Activity 2 in this module, the Chief Officer and the General Body has agreed to implement a scheduled desludging service for septic tanks in the city. However, it was decided that this will be done by hiring a private company on contract basis. This implies that the truck procurement agency as well as the service provider will be a private player. The city is floating a tender for this. As a potential bidder, your job is to figure out a feasible financial plan and a contract amount for your bid.

Infrastructure requirements (Result of Activity 2)

1. Number of septic tanks to be emptied in a day = _____
2. Number of trips per day = _____
3. Number of trucks required = _____

Calculating business costs

Based on these infrastructure requirements, this section focuses on deriving the costs that would be incurred for establishing the business, operations and maintenance.

You can use the following assumptions-

Table 1: Cost assumptions for desludging business

A. Capital Investment Including Business Setup Cost			
1	Average cost of truck	Rs per truck	17,00,000
2	Personal protective equipment and Uniform	Rs per employee	5000
3	Business establishment expenses (including tender fees, registration fees, legal fees etc)	Rs	10000
4	Security deposit (% of cost of procurement of trucks)	Percentage	3%
5	Contingencies (% of cost of initial investment)	Percentage	10%
B. Operation and Maintenance Cost (Per Annum)			
i. Human Resource Capital (Per Annum)			
1	Salary for Driver (Rs/Month)	Rs	10000
2	Salary for Cleaner (Rs/Month)	Rs	10000
3	Salary for Project officer/manager (Rs/Month)	Rs per month	25000
ii. Office Establishment Cost (Per Annum)			
1	Office Establishment (Rs per month) (Rent including Telephone/Water/Electricity/Parking fees, stationary etc)	Rs	35000
2	Leasing value (Rs per truck per annum)	Rs	0
iii. Maintenance Works			
1	Routine maintenance cost per annum (% of cost of trucks)	Percentage	10%
2	Periodic maintenance cost (% of cost of trucks)	Percentage	5%
3	Periodic maintenance interval	Months	6
iv. Health Insurance			
1	Health Insurance (Rs/Employee/ year)	Rs in Lakhs	0.2
v. Office overhead cost			
1	Office Overhead (% of total Fixed O&M)	Percentage	10%
vi. Fuel Cost (Per Annum)			
1	One trip average distance (round trip)	Km	10
2	Fuel cost (Rs/liter)	Rs	70
3	Fuel efficiency of truck	Km/l	8
4	Fuel cost per trip (Rs per trip) = $\frac{\text{Fuel cost (Rs. Per litre)} * \text{One trip average distance}}{\text{Fuel efficiency of the truck}}$	Rs	

1. Calculating the total capital investment required in Rs. Lakhs

$$= \left(\frac{\begin{aligned} &(\text{Average cost of truck} \times \text{Number of trucks required}) + (\text{Cost of Personal protective} \\ &\text{equipment and uniform per employee} \times (\text{Total no. of drivers} + \text{Total number of helpers})) + \\ &\text{Business establishment expenses} + (\text{Security deposit}(\%) \times \text{Average cost of truck}) + \\ &(\text{Contingencies}(\%) \times \text{Average cost of truck} \times \text{Number of Trucks Required}) + \\ &\text{Cost of Personal protective equipment and uniform per employee} \times (\text{Total no. of} \\ &\text{drivers} + \text{Total number of helpers} + \text{Business establishment expenses}) + \\ &(\text{Security deposit}(\%) \times \text{Average cost of truck}) \end{aligned}}{100000} \right)$$

2. Calculating Human Resource Capital (Per Annum) in Rs. Lakhs

$$= \left[\frac{\begin{aligned} &(\text{Salary for Driver (Rs/Month)} \times \text{Total number of drivers}) + \\ &(\text{Salary for Cleaner (Rs/Month)} \times \text{Total number of helpers}) + \\ &(\text{Salary for Project officer/manager (Rs/Month)} \times \\ &\text{Total number of Project officers/managers}) \end{aligned} \times 12}{100000} \right]$$

3. Calculating Office Establishment Cost (Per Annum) in Rs. Lakhs

$$= \left[\frac{\begin{aligned} &(\text{Office Establishment cost (Rs per month)} \times 12) + \\ &(\text{Number of Trucks Required} \times \text{Leasing value (Rs per truck per annum)}) \end{aligned}}{100000} \right]$$

4. Calculating Maintenance Works (Per Annum) in Rs. Lakhs

$$= \left[\frac{\begin{aligned} &(\text{Routine maintenance cost per annum (\% cost of trucks)} \\ &\times \text{Average cost of truck} \times \text{Number of Trucks Required}) + \\ &((\text{Periodic maintenance cost (\% cost of trucks)} \times \\ &(\text{Periodic maintenance interval}/12) \times \text{average cost of truck} \times \\ &\text{Number of Trucks Required}) \end{aligned}}{100000} \right]$$

5. Calculating Health Insurance (Per Annum) in Rs. Lakhs

$$= \left[\text{Health Insurance (Rs. lakhs/Employee/year)} \times (\text{Number of drivers} + \text{Number of helpers} + \text{Number of Project officers/managers}) \right]$$

6. Calculating Office Overhead (Per Annum) in Rs. Lakhs

$$= \left[\frac{(\text{Human Resource Capital (Per Annum)} + \text{Office Establishment (Per Annum)} + \text{Maintenance Works} + \text{Health Insurance (Per Annum)}) \times \text{Overhead (\% of total Fixed O\&M)}}{100000} \right]$$

7. Calculating Fuel Cost (Per Annum) in Rs. Lakhs

$$= \left[\frac{\text{Fuel cost per trip (Rs per trip)} \times \text{Number of trips per day} \times \text{Number of working days in a year}}{100000} \right]$$

Fill the table given below based on the calculations made above: -

Table 2 Total capital investment and O&M costs

Description		Unit	Value
A	Capital Investment Including Business Setup Cost	Rs in Lakh	
B	Operation and Maintenance Cost (Per Annum)	Rs in Lakh	
i	Human Resource Capital (Per Annum)	Rs in Lakh	
ii	Office Establishment Cost (Per Annum)	Rs in Lakh	
iii	Maintenance Works	Rs in Lakh	
iv	Health Insurance (Per Annum)	Rs in Lakh	
v	Office Overhead (Per Annum)	Rs in Lakh	
vi	Fuel Cost (Per Annum)	Rs in Lakh	

Financially feasible contract value

This section provides the financial feasibility of various scenarios depending on the contract type and method of cost recovery as per inputs.

1. Calculating the yearly operation and maintenance cost

For the first year, the total operation and maintenance cost would be equal to the cost calculated above. For the next four years, inflation will also be required to be taken into consideration. Consider an annual inflation rate of 7% and fill up the table given below based on the given formula: -

Operation and maintenance cost for year “X”

= Operation and Maintenance Cost for the previous year $X (1 + \text{Inflation rate (in \%)})$

Table 3 Annual operation and maintenance cost

Description	Unit	Year				
		1	2	3	4	5
Operation and Maintenance Cost (Per Annum)	Rs in Lakhs					

2. Non-operating expenses

For purchasing the trucks required for this project, if you are selected, you will need to take out a loan. Non-operating expenses generally comprise of the value paid as interest on the loan taken. After a discussion with your bank, you come up with the following estimates for non-operating expenses: -

Table 4 Annual non-operating expenses

Description	Unit	Year				
		1	2	3	4	5
Non-operating Expenses (Per Annum)	Rs in Lakhs	6.05	5.02	3.84	2.49	0.93

3. Calculating total expenses made in a particular year

= (Operation and maintenance cost of that year + Non-operating expenses of that year)

4. Calculating operating revenue including GST

$$= \left[\frac{\text{Total expenses made in a particular year} \times (1 + \text{Calculated operating ratio margin for NPV} = 0 (\%))}{\text{}} \right]$$

Note: Consider the operating ratio margin for NPV³ = 0 to be 42%. This is the value at which the Net Present Value becomes 0 for a discount rate of 20%.

Fill in the values of total expenses and operating revenue based on the calculations made above in the table given below: -

Table 5 Total expenses and operating revenue including GST

Description	Unit	Year				
		1	2	3	4	5
Total expenses	Rs in Lakhs					
Operating revenue including GST	Rs in Lakhs					

5. Annual depreciation

Considering the rate of depreciation at 14%, following are the yearly values of annual depreciation. Annual depreciation is the yearly reduction of a fixed asset in a systematic manner. In this case the depreciation is related to the value of trucks.

Table 6 Annual depreciation

Depreciation						
Description	Unit	Year				
		1	2	3	4	5

³ Net present value (NPV) is the difference between the present value of cash inflows and the present value of cash outflows over a period of time. NPV is used in capital budgeting and investment planning to analyze the profitability of a projected investment or project.

Annual Depreciation	Rs in Lakhs	6.48	5.57	4.79	4.12	3.54
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6. Calculating potential contract value in Rs. Lakhs

$$= \sum \text{Operating revenue including GST over the years}$$

7. Calculating cost per septic tank desludging

$$= \left[\frac{\text{Potential contract value in Rs. Lakhs} \times 100000}{\text{Number of septic tank to be emptied in a day} \times \text{Number of working days in a year} \times \text{Contract cycle in years}} \right]$$

Cost recovery

The ULB has decided to recover the cost of this contract by levying a sanitation tax on all properties. Calculate the minimum amount of annual tax the ULB must collect

8. Calculating sanitation tax per property

$$= \left[\frac{\text{Potential contract values in Rs. Lakhs} \times 100000}{\text{Contract cycle in years} \times \text{Total number of properties}} \right]$$

Summary

Fill the table given below based on the calculations made above: -

Table 7 Potential contract value, cost per septic tank desludging and sanitation tax per property

Sr. no.	Description	Unit	Value
1	Potential contract value	Rs in Lakhs	
2	Cost per septic tank desludging	Rs.	
3	Sanitation Tax per property	Rs.	

Activity 5. FSSM business model canvas for identifying suitable service in a city

This activity illustrates the applicability of the conveyance and treatment business models introduced in Sessions 3 and 4 of the training module. It introduces different scenarios for which the participant has to identify suitable FSSM business model based on benefits, challenges as well as operational and financial roles.

Problem statement

City Y is a small municipal council with a population of 55,000 with 11,500 households. The average household size is 4.7. The city has 5 notified slums with total 2000 households. The city is dependent on surface water and groundwater for its drinking water supply. It is reported to supply 100 litres of water per capita everyday.

In terms of the sanitation scenario, the city is fully dependent on on-site sanitation systems. A total of 10,500 households have individual toilets which are connected to septic tanks, rest 1000 households are dependent on community toilets which are also connected to septic tanks. These septic tanks are connected to soak pits. At present, the septage collected from the septic tanks is collected by the municipal council using its own emptier truck of 3000 liters capacity. Citizens pay a fee of Rs 1000 for each desludging. It is taken to the solid waste dumping site and is dumped in open without any primary treatment. On an average only one septic tank is emptied every day. The ULB has a solid waste treatment facility at the dump site where 50% of the solid waste is treated through composting. The compost is then further sold to farmers at the rate of Rs. 5-6 /kg.

Considering the national policy on Faecal Sludge and Septage Management and national guidelines, the Chief Officer (CO) of the city is envisaging to provide regular desludging of septic tank and treatment of faecal sludge. The CO is working towards achieving the ODF++ status for city Y.

ODF	ODF+	ODF++	Water +
A city / ward can be notified/declared as ODF city/ ODF ward if, at any point of the day, not a single person is found defecating in the open.	Not a single person is found defecating and/or urinating in the open, and all community & public toilets are functional and well maintained	ODF+ AND Faecal sludge/septage and sewage is safely managed and treated, with no discharging and/or dumping of untreated faecal sludge/septage and sewage in drains/water bodies/open areas	All wastewater released from households, commercial establishments ,drains, nallahs etc. is treated to a satisfactory level before releasing the treated wastewater to the environment

There are two possible scenarios for the city : -

Scenario 1: In the first scenario, the ULB is lacking technical capacity to implement scheduled desludging of septic tanks. It has limited local finances, hence will require an additional support from an external source for funding. The major source of income for the ULB is grants and transfers from the state and central government, i.e. 70% source of revenue income. The ULB is looking for various stakeholders who can help the ULB in implementing the desludging service. It is also looking for stakeholders to build and operate the Faecal Sludge Treatment Plant.

Scenario 2: In the second scenario, the ULB has managed to procure 2 additional vacuum emptier trucks. The city has **strong local finances**. It has good funding capacity but limited operating capacity. The ULB lacks in human resources. The ULB is envisioning self-sustainability to run these services in the future. They are looking forward to increase their own revenue and depend on it only to run the services. The ULB is open to involve various stakeholder including private operators to run the services.

FSSM model canvas

For both of the above given scenarios identify a suitable FSSM business model. The blank business model canvas given below can be used to identify the options for funding and identify the responsibilities of various stakeholders. It includes various stakeholders like the local government, service providers and the households.

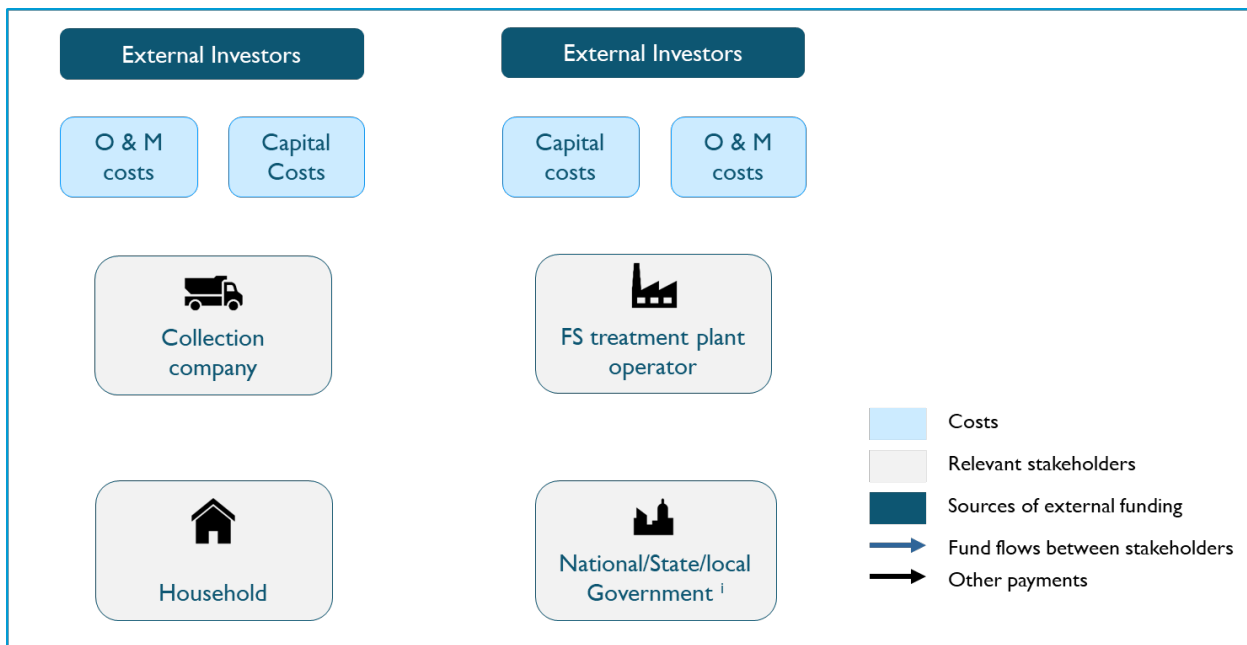


Figure 3 Blank FSSM Model Canvas for scenario 1

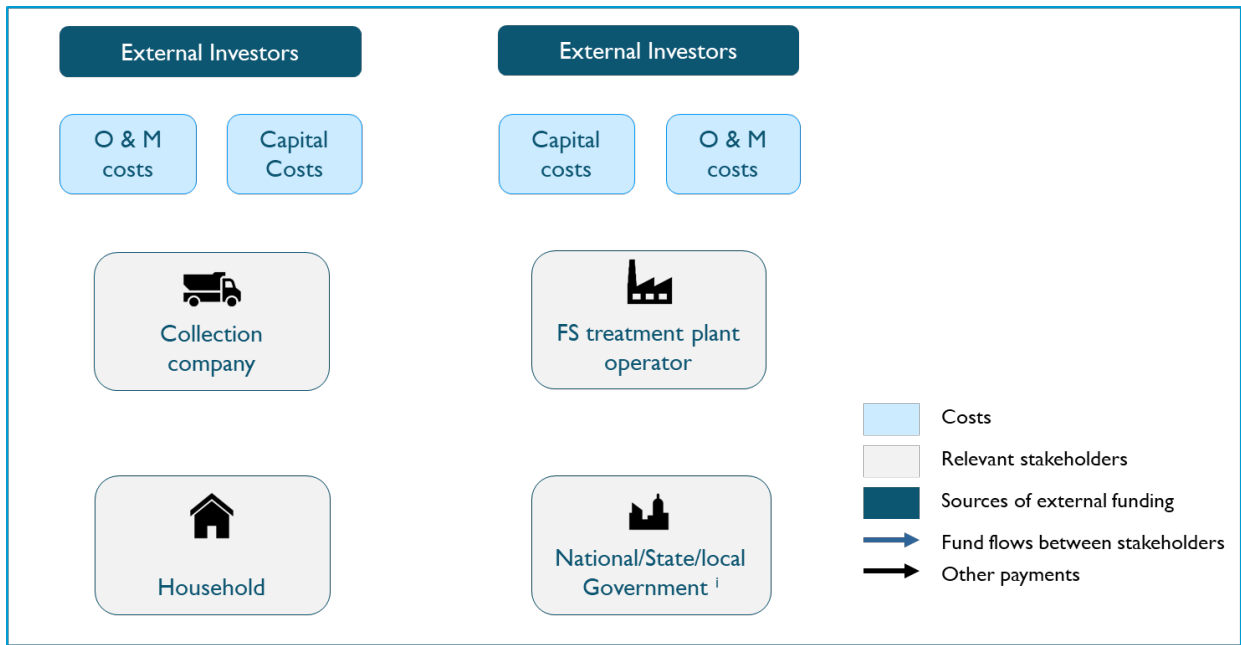


Figure 4 Blank FSSM Model Canvas for scenario 2

This is an example for FSSM model canvas based on current scenario in the city –

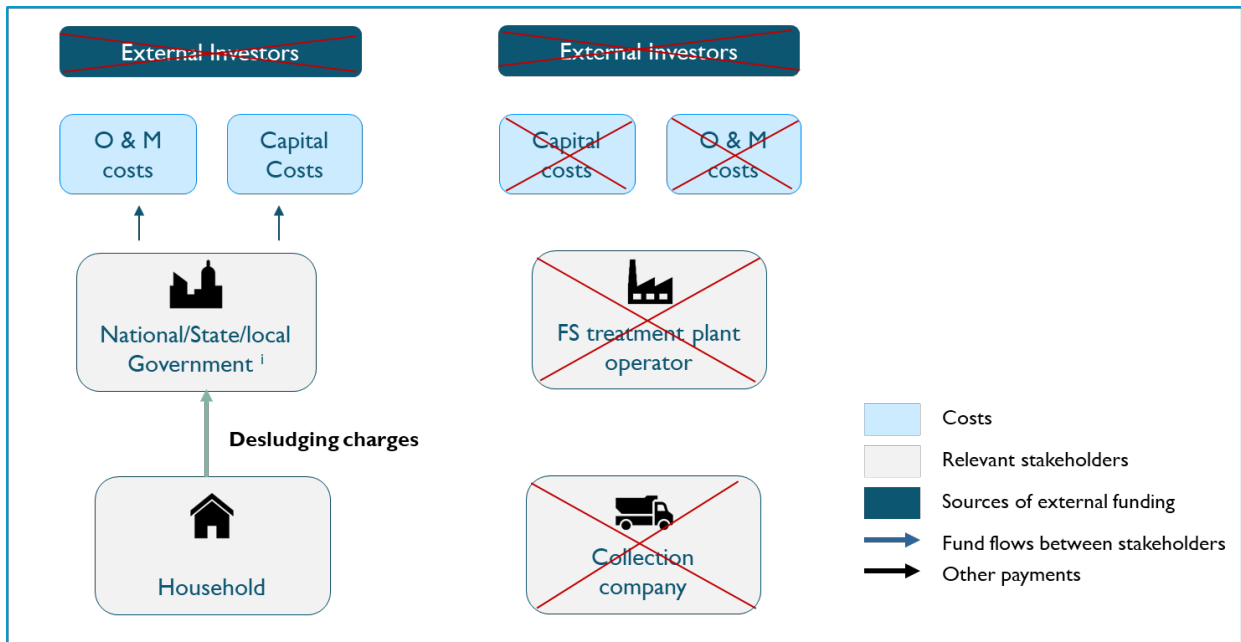


Figure 5: FSSM model canvas for current situation in the city

FSSM business model for both the scenarios should answer the following questions given below in the table: -

Table 8 FSSM business model canvas solution

Sr. no.	Question	Scenario 1: Answer	Scenario 2: Answer	Current situation
1	Which is the most suitable conveyance business model that the city can adopt?			On-Demand services by ULB.
2	Who will fund for the capex and opex of conveyance operations?			ULB already owns and operates truck.
3	Who will carry out the operations of the desludging services?			ULB staff
4	What will be the sources of funding for building and operating FSTPs?			-
5	Who will carry out the FSTP operations?			-
6	How will the city manage and generate revenue for conveyance operations?			Desludging fee from HHs
7.	How will the city manage and generate revenue for treatment operations?			No FSTP but model of selling compost to farmers under SWM

Activity 6. Procedures for involving private players

The activity will help the participants in understanding the benefits and scope of private sector in FSSM through identifying possible ways of involvement in various stages of preparing FSSM action plan for a given scenario.

Problem statement

The Municipality of City Z had received its ODF+ certification. Now it wants to move towards ODF++ through FSSM. The Municipal Council arranged a discussion on this in the general body meeting. Here are some comments from the attendees-

Agenda: Planning for Faecal Sludge and Septage Management to achieve ODF++ status

- **Chief Officer:** Our city has sustained ODF status and has also successfully achieved ODF+. The next step is to move towards ODF++ for which we will need to think about planning for sanitation beyond toilets.
- **Admin HoD:** As per the Comment List compiled by us, the city needs to arrange for (1) regular emptying of septic tanks (2) safe emptying of septic tanks (3) safe treatment (4) safe disposal or reuse
- **Sanitation Engineer:** The city is completely reliant on septic tanks and we do not have - or have future plans for - sewer network. In such a scenario, improving our emptying services seems to be the best option for our city. Also, the city has grown a lot in recent years and based on our calculations, if we want to achieve regular emptying as per the ODF++ protocol, we will require more suction trucks as well as staff to handle increased load. However, the sanitation department is already responsible for many other aspects of city sanitation planning and will not be able to spare an exclusive team for FSSM.
- **Finance HoD:** We also do not have the capital budget to buy so many suction trucks upfront. Hiring a private operator to do this with smaller monthly payments will be easier.
- **Councilor 1:** How will we ensure that there will be enough demand and that all households will get their tanks emptied regularly? I am given to understand that the protocol requires emptying at 3 years but that is not the standard in the minds of the citizens!

- **Sanitation Engineer:** I suggest we float a scheme for “Scheduled septic tank emptying” where all tanks will be emptied mandatorily by the private desludger in 3 years.
- **Sanitation Committee Head:** Four years ago when we hired a company for door-to-door garbage collection, we received many complaints about their service. They did not come on time or as regularly. Moreover, they were not disposing the collected garbage at the designated site. We had to terminate their contract for non-performance and there was a messy dispute. Thus in this case, we should ensure before-hand that we will receive good quality services and that we pay reasonably for whatever service we receive. We do not want to get into more disputes.
- **Councilor 2:** We should also ensure adherence to laws! My ward has a lot of population from the Valmiki community who have moved away from manual scavenging which is now forbidden by law. All desludgers must ensure use of proper equipment to avoid this.
- **City Engineer:** Do we know of any companies who are suitable for taking up a city-wide contract? Before floating a tender we must do some market research. How do we find out if there is interest from private companies?
- **Sanitation Engineer:** in the past, our contractor for CT/PT cleaning has complained a lot about delay in payments. Due to this other companies also have low interest in working with the Municipality. We should address this in our next contract if we want good competition.
- **Councilor 3:** How will we finance these monthly payments? If we want to adhere to a schedule and cover all properties in the city, we should avoid a situation where O&M expenses come from desludging charges. Inability or hesitation in paying these charges will disrupt our schedule.
- **Finance HoD:** We can explore the possibility of levying a small tax on all properties in the city. Municipal laws in our state laws allow for a “sanitation tax”. This can be paid along with annual property tax. In this way we can provide this service without an upfront desludging fee.
- **Chief Officer:** There is also the issue of where we will dump all this collected sludge? Currently we are disposing on open land near our solid waste dump site. We need to think for safe treatment and disposal also. Do we have funds for constructing a treatment plant?
- **Finance HoD:** We have received directives from our state government that we can use upto 50% of 14th FC funds for sanitation activities. We can use those funds.

- **Councilor 4:** We should get a well-experienced company to design and construct our treatment plant. It would also be good if they operate it also for the initial period before handing it over to us.
- **Town Planning HoD:** We will need to identify a land parcel to build this treatment plant. The only suitable land the Municipality owns is very near to a housing society. This might receive opposition from residents due to the NIMBY effect – Not-In-My-Backyard ! If we want to explore other sites, then we will need to look at land acquisition....
- **Chief officer:** We will also need to consider performance standards for construction and treatment also...

6A – Procurement plan

As the Sanitation Engineer, you have been tasked with handling both projects for desludging and FSTP. Based on discussion in the meeting, you have to put together a procurement plan for FSSM. Sort the list of activities given below, in appropriate stages procurement in Table 9. Also work out the order of conducting each activity by giving them serial numbers.

- a. Award contracts to selected company for desludging
- b. Award work order to selected company for FSTP construction and operation
- c. Stakeholder consultations with all municipality departments, interested private companies, SHGs to understand interests
- d. Developing both contract documents in consultation with legal advisors
- e. Inviting bids through government tender site / newspapers
- f. Procedures for land acquisition
- g. Opening ESCROW account with bank for payments
- h. Request selected FSTP bidder for Detailed Project Report
- i. Citizen/stakeholder consultations about FSTP site and private sector involvement
- j. Administrative sanction from state government
- k. Evaluating received EoIs (Expression of Interest) and inviting pre-bid meeting of interested parties
- l. Evaluating received bids based on technical criteria and financial criteria and informing ULB general body about lowest bidder i.e. L1 for selection
- m. Invite Expression of Interest for Scheduled emptying contract
- n. Invite Expression of Interest for FSTP construction and 3 year operation contract – Design-Build-Operate-Transfer basis
- o. Apply to appropriate state authority for technical sanitation of DPR and receive technical sanction
- p. Bid submission along with Earnest Money deposit and tender fee
- q. License other independent desludgers to operate outside contract zone and unload at FSTP only

- r. Market research for available private service providers
- s. Awareness activities for scheduled desludging
- t. Monthly performance reviews / Milestone based performance reviews

Table 9 Procurement process action plan

	Market research stage	>	Project planning and contract building stage	>	Tendering stage	>	Post work order and monitoring stage
1.	(First activity goes here) Example: Invite Expression of Interest for Scheduled desludging contract				Example: Award work order to selected private company		
2.							
3.							
							(Last activity goes here)

6B – Setting goals for drafting contracts

As per the procure plan, Municipality of City Z, invited Expression of Interest and received applications from 5 interested parties. Now, the ULB needs to prepare a tender document and invite bids for both desludging and FSTP projects –

Before drafting the contract clauses, legal advisors have asked the decision makers to prepare a brief for the goals they want to achieve with both contracts the covers the following points.

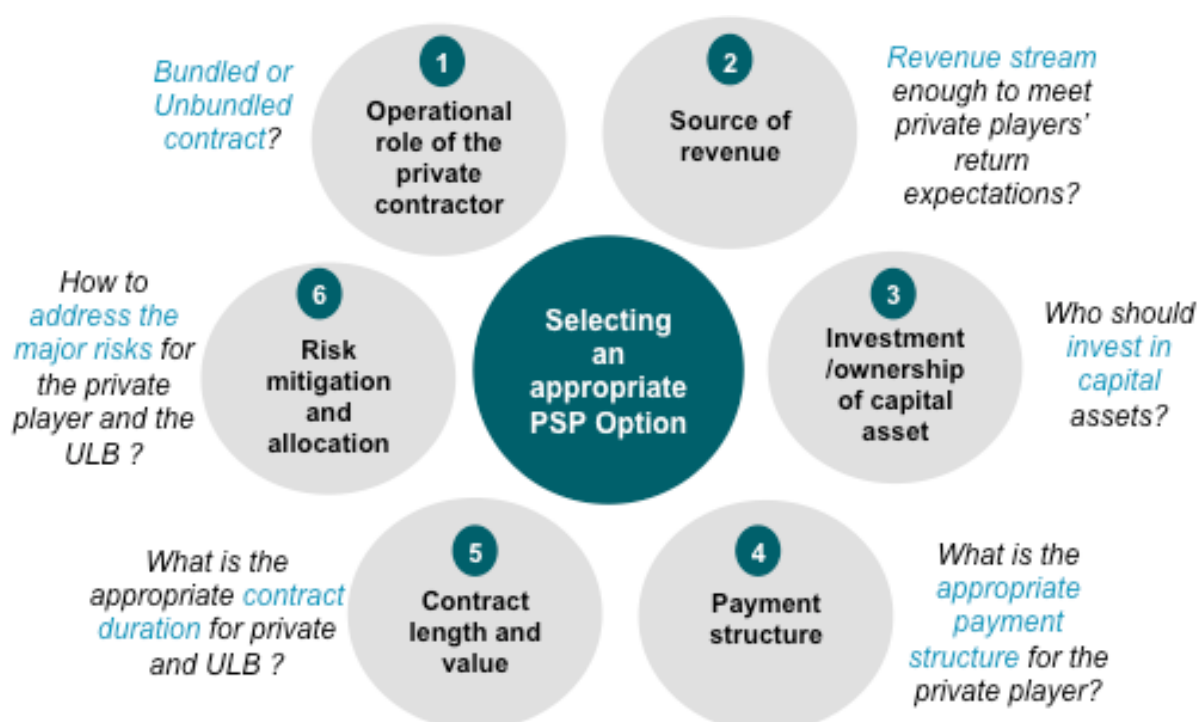


Figure 6: Decision areas for contract structuring

Fill the following questionnaire to create the required brief for legal advisors –

Operational role of private sector

1. As per discussions in meeting, FSTP project will be a _____ contract
 - a. Bundled
 - b. Unbundled
2. Scheduled emptying project will be a _____ contract
 - a. Turnkey
 - b. Service

Sources of revenue and investment

3. Construction cost (capital expenditure) in FSTP project will be borne by

- a. ULB
- b. Private contractor
4. For scheduled emptying, trucks (capital expenditure) are to be procured by
 - a. ULB
 - b. Private contractor
5. Operating expenditure for FSTP (O&M) will be borne by
 - a. ULB
 - b. Private contractor
6. Operating expenditure for desludging will be borne by
 - a. ULB
 - b. Private contractor
7. FSTP contract will be financed through
 - a. Taxes
 - b. Finance commission grant funds
 - c. External grant

Ownership of capital assets

8. After contract period, FSTP will be owned by
 - a. ULB
 - b. Private contractor
9. After contract period trucks will be owned by
 - a. ULB
 - b. Private contractor

Payment structure

10. Payment to desludger is to be
 - a. As per “actuals” – based on bills of costs incurred
 - b. Fixed fee per septic tank, paid monthly
 - c. Fixed monthly amount
11. Payment for FSTP construction is to be done
 - a. As per “actuals” – based on bills of costs incurred
 - b. As per % of bid amount on completion of milestones
 - c. Fixed monthly amount
12. Payment for FSTP operation is to be done
 - a. As per “actuals” – based on bills of costs incurred
 - b. Fixed monthly amount, as agreed in contract
 - c. As per % of bid amount on completion of milestones
13. Salaries, health insurance, EPF etc of staff hired for operations are to be paid by
 - a. ULB
 - b. Private contractor

14. Work stations and amenities such as water, electricity, phone connections, machinery, safety gear etc are to be provided and maintained by
- ULB
 - Private contractor

Contract length and value

15. For scheduled desludging as per discussion in ULB, appropriate length for desludging contract is
- One month
 - One year
 - Three years
16. Assuming technical qualifications are satisfied, desludging contract will be awarded to
- Lowest bid per septic tank desludging
 - Lowest bid for fixed monthly fee
 - Lowest cost for procurement of new trucks
17. Assuming technical qualifications are satisfied, FSTP contract will be awarded to
- Lowest construction cost
 - Lowest monthly operating cost
 - Lowest construction cost + total operating cost for contract period

Risk mitigation and allocation

18. Responsibility for getting technical and administrative sanction for FSTP lies on
- ULB
 - Private contractor
19. Responsibility of land acquisition lies on
- ULB
 - Private contractor
20. Responsibility of producing “proof of safe desludging” lies on
- ULB
 - Private contractor
21. “safe desludging” constitutes
- Refurbishment of septic tanks
 - Extraction of complete volume of septage from septic tank barring last 2 inches
 - Treatment upto sufficient disposal standards
 - No damage to tank
 - No spillage at property or on the way to FSTP
 - Unloading only at FSTP
 - No human contact with septage. No manual scavenging. Use of PPE
 - Disposal of treated products in safe manner

22. Responsibility for opening Escrow account lies on
 - a. ULB
 - b. Private contractor
23. Responsibility of producing lab reports for quality testing of treated septage lies on
 - a. ULB
 - b. Private contractor
24. Responsibility of ensuring adherence to design, construction and treatment standards lies on
 - a. ULB
 - b. Private contractor
25. Getting technical sanction from appropriate state authority is a clause for mitigating _____ risk
 - a. Commissioning
 - b. Performance
 - c. Cost escalation
 - d. Design
 - e. Payment delay and default
 - f. Termination
 - g. Force majeure

6C - Options for overcoming case specific contracting challenges

Looking at the success of City Z in implementing their FSSM plan through private sector participation, other cities are also coming forward with similar plans. However, each faces a different scenario and must customize their FSSM plan to their needs. For the procurement scenarios provided below, select appropriate solutions (one or multiple) from the list provided at the end.

1. City A wants to engage private players for FSSM. However, the municipality does not have the resources to do an in-depth market research to gauge the landscape of players. What can the city do instead?
2. City B wants to engage a private company to build a high capacity FSTP due to which the municipality had floated a tender with the condition that bidders be experienced companies with high turnovers. However, due to this they did not receive any bids. What change could they make when re-inviting bids?
3. City C has some experience in engaging private sector for sanitation services. However, in the past they have faced issues where the private company could not give satisfactory service as per expected standards. The municipality is now looking to engage private players to provide services for (1)scheduled desludging (2)FSTP construction (3)FSTP O&M. What contract clauses can address this?

4. City D has an active private desludger market with multiple companies running business. The city has now set up an FSTP and is ensuring that its own truck is unloading septage only at the designated site. However, private players are used to unloading in agricultural fields and vacant land. How can the city regulate them?
5. City E has invited bids to engage private players in FSSM operations. However, companies are hesitant to come forward due to the municipality's history with delayed payments. How can this be addressed in the contract?
6. City F has set up a simple non-mechanical FSTP through donor funding. The partners also require that the grant project also have a component of community development. What is a good option in this scenario?
7. City G wants to set up a FSTP with support of a private player and has identified a suitable land parcel for this. However, the land does not belong to the government and is also relatively close to urbanized area. In this context, what two activities should the ULB complete BEFORE signing a contract with the private player?
8. City H is an industrial town looking to engage private players to improve service across the sanitation service chain. It was found that due to the industries, daily sludge loads are highly variable in terms of quality and quantity leading to issues between the desludgers and treatment plant operators. What kind of FSSM contract is best suited in this context?
9. City J wants to engage a private player to refurbish septic tanks across the city and desludge them for the next one year. What would be a suitable payment structure for both activities?

Possible solutions for listed scenarios-

- a. Land acquisition
- b. Late payment fee
- c. Fixed fee per unit
- d. Performance based payments - Monthly payment is done only when desludger produces proof of emptying for agreed number of tanks as per required protocol. Payment on achieving construction milestones – 30% on plinth completion, 20% on completion of certain units, etc. Treatment plant operator has to submit regular samples of treated water and solid products for testing. Quality parameters should be within allowed limits
- e. Bundled contract for desludging as well as O&M of FSTP
- f. Engaging local Self Help Groups for O&M of FSTP
- g. Stakeholder consultation to address NIMBY and private sector engagement
- h. Escrow mechanism with reserve fund
- i. Dispute resolution terms
- j. Termination terms and notice period

- k. Invite Expression of Interest with details on experience, technical know-how and financials
- l. Licence all desludgers to operate independently with the condition that they can only unload at FSTP. Violations lead to cancellation of business licence
- m. Allow joint venture

Activity 7. Video case studies – Innovative Finance options

Case study 1 - Results based financing to deliver urban sanitation services

The video explains the concept of output based aid and results based financing and gives examples of results based financing for sanitation. It showcases a case study of Nairobi and Accra, Ghana who implemented output based aid for providing toilets to urban poor and also provided Desludging services under this project.

[Video link: Results based financing to deliver urban sanitation services](#)



Figure 7: Video - Results based financing to deliver urban sanitation services

Case study 2 - Development Impact Bonds (DIB) for urban sanitation in India

The video explains the concept of Development Impact Bond for urban sanitation and the need and the importance of such innovative financing mechanism. It describes the role played by various stakeholders in implementing the DIB structure in India.

[Video link: Development Impact Bond for urban sanitation in India](#)



Figure 8: Video - Development Impact Bond for urban sanitation in India

[Video link: What is Development Impact Bond?](#)

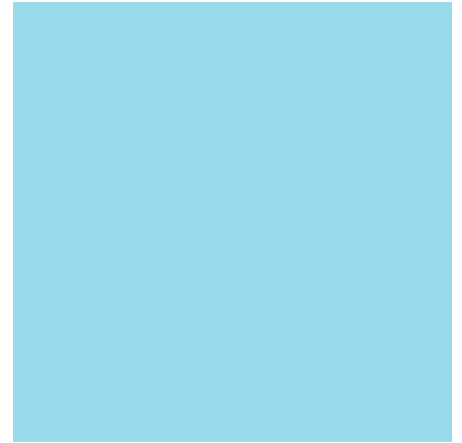
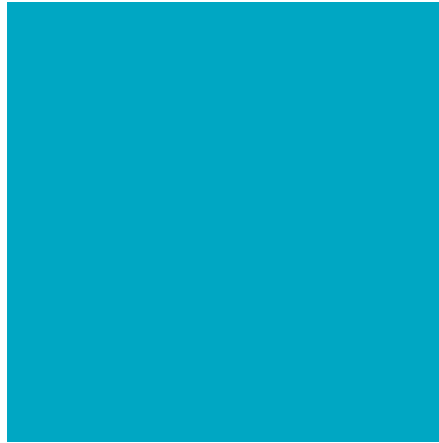


Figure 9: Video - What is Development Impact Bond?

Quiz on video case studies in innovative finance options

1. Which of the following is/are advantages of innovative financing mechanism in FSSM?
 - a There is a large scope as the financiers are now talking about outcome/results based financing
 - b Sanitation sector has very bold and measurable outcomes
 - c Public funds can be used to leverage additional private sector
 - d All of the above
2. State whether the statement is True or False : Providing incentives for improved performance and effectiveness by using performance linked approaches is not advisable in FSSM financing

- a True
 - b False
3. Fill in the blanks: Innovative financing mechanisms work effectively with _____ transactions cost and _____ investments in monitoring and supervision.
- a Low, High
 - b High, Low
 - c High, High
 - d Low, Low
4. What can be measurable outcomes, if output based/ results based financing mechanisms are adopted for your city?
- a No. of septic tanks desludged over a defined period, especially poor and low income households
 - b Amount of faecal sludge treated at the treatment plant
 - c Effluent characteristics of treatment plant meeting the environmental discharge standards
 - d All of the above
5. Which of the following stakeholders will cannot be involved in innovative financing mechanism?
- a State government
 - b Multilateral agencies
 - c Donor agencies
 - d None of the above



CENTER FOR WATER AND SANITATION

The Center for Water and Sanitation (CWAS) is a part of CEPT Research and Development Foundation (CRDF) at CEPT University. CWAS undertakes action-research, implementation support, capacity building and advocacy in the field of urban water and sanitation. Acting as a thought catalyst and facilitator, CWAS works closely with all levels of governments - national, state and local to support them in delivering water and sanitation services in an efficient, effective and equitable manner.