Citywide IFSM Services in Small towns, India

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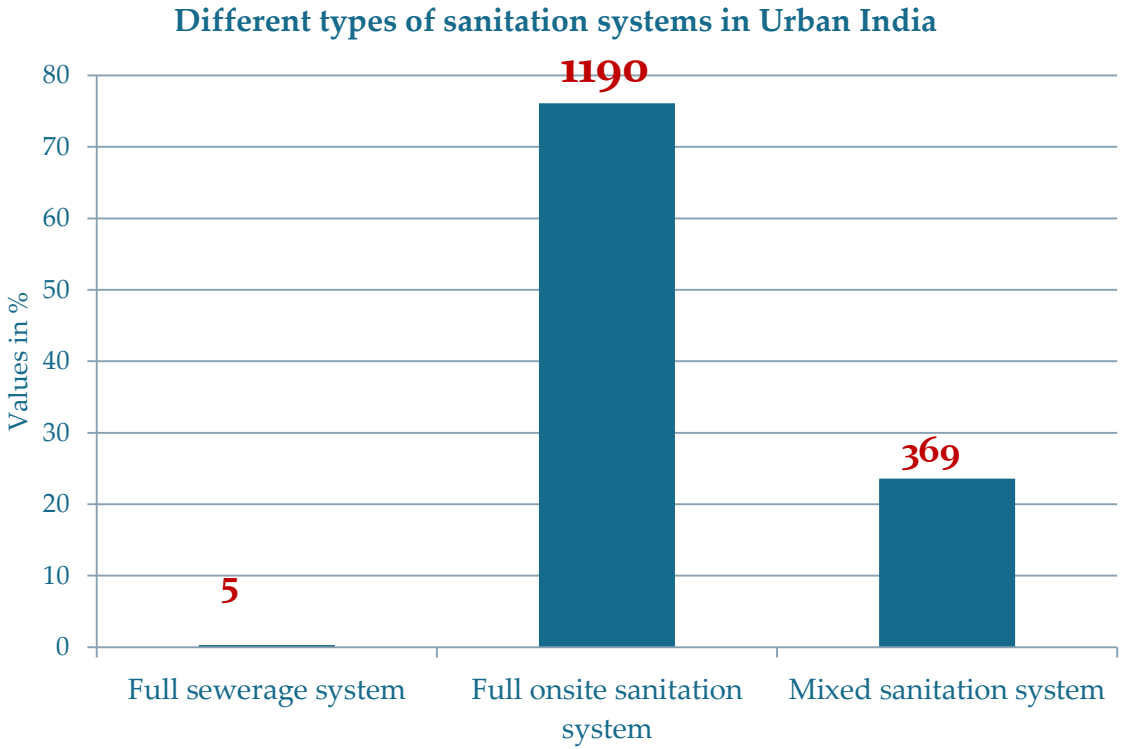
3rd International Faecal Sludge Management Conference, Jan 19 2015

pas performance assessment system

CEPT University, INDIA

FSM3

Sanitation systems in Urban India



- ✓ Only 5 cities are reported to have 100% sewerage system
- ✓ Nearly 1200 cities (76%) have only onsite sanitation systems

76% of cities in **India** are fully dependent on **on-site sanitation systems**

24% are dependent on **mixed sanitation systems** (45% sewerage system & 39% onsite sanitation system)

Source: Based on the SLB data submitted to GOI by 16 states covering 1564 cities

Ground realities of Sanitation Systems




Sewerage

- ✓ Requires high water demand
- ✓ Only 31% treatment capacities in cities
- ✓ 39% of STPs do not conform to discharge standards
- ✓ Require very high expenses and energy demand for operation and maintenance

Onsite Sanitation

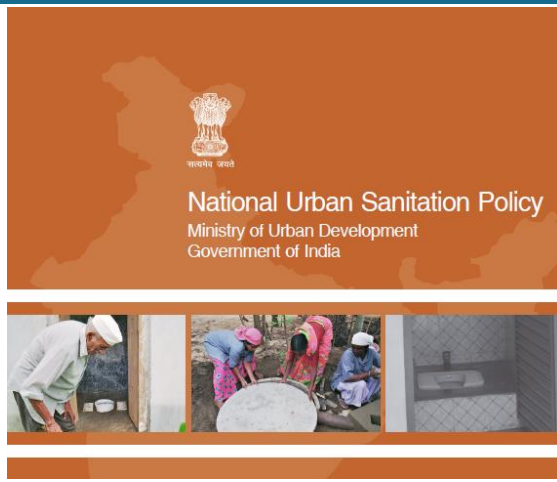
- ✓ Septic tanks are not connected to soak pits or drains for effluent flow, and are oversized /undersized
- ✓ Suffer from irregular cleaning due to a lack of awareness
- ✓ Improper disposal of septic tank effluents and septage- Environment pollution

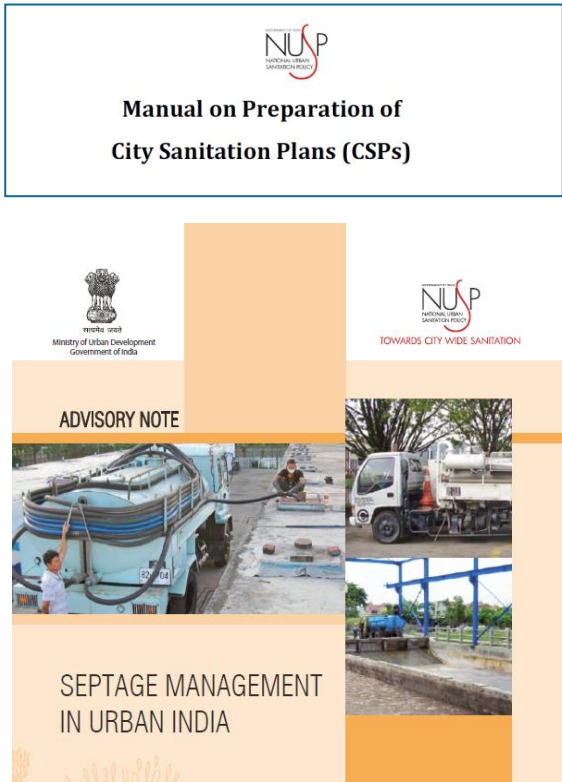
Increasing recognition of septage management

- National Urban Sanitation Policy (NUSP) 2008 has accorded high importance on-site sanitation systems. It highlights importance of safe and hygienic facilities with proper disposal.

- NUSP recommends developing a Septage Management Plan (SMP) as a part of city sanitation plans (CSP)

- Septage Management Advisory of Government of India provides references to CPHEEO guidelines, BIS standards, and other resources for preparing SMP / FSM plan.





Support to Citywide Strategies

CSP– Support to small and mid-sized cities

These cities were selected by the Maharashtra Jeevan Pradhikaran and the Water Supply and Sanitation Department of Maharashtra for the development of City Sanitation Plans (CSPs) with the support of CEPT University

Sinnar
Located in the Nashik district, with a population of ~65,000 that has more than doubled in size since 2001 mainly due to expansion of city boundaries and an industrial and manufacturing boom in nearby Nashik.

Wai
Located in the Satara district, 90 km away from Pune, with a

Hingoli
Located in the Hingoli district, the town has a population of ~85,000.Its primarily a pilgrimage destination

Ambajogai
Located in the Beed district, the town has a population of ~74,000 that has grown at 3% p.a. since 2001. Its

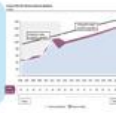
Support to cities in Maharashtra, India

Assessment of Sanitation situation in cities using the framework

Development of sanitation options

Key activities

Analysis of city budgets



Continuous stakeholder engagement

Institutional Capacity assessment

Key Activities in City Sanitation Plans

City Sanitation plan options for the cities

Access | Collection | Conveyance | Treatment | Disposal/Reuse

Option 1: Citywide settled sewerage system (INR ~284 million investment)

1. Citywide Settled Sewerage System

2. Citywide Onsite Sanitation System

Option 2: Citywide onsite sanitation system with treatment (INR ~129 million investment)

3. Mix of Settled Sewerage and Onsite Sanitation system

Onsite systems with same outcomes identified through PIP tool

Based on local priorities the following solutions have been short-listed for each city

Areas for intervention

Access | Collection | Conveyance | Treatment | Disposal/Reuse

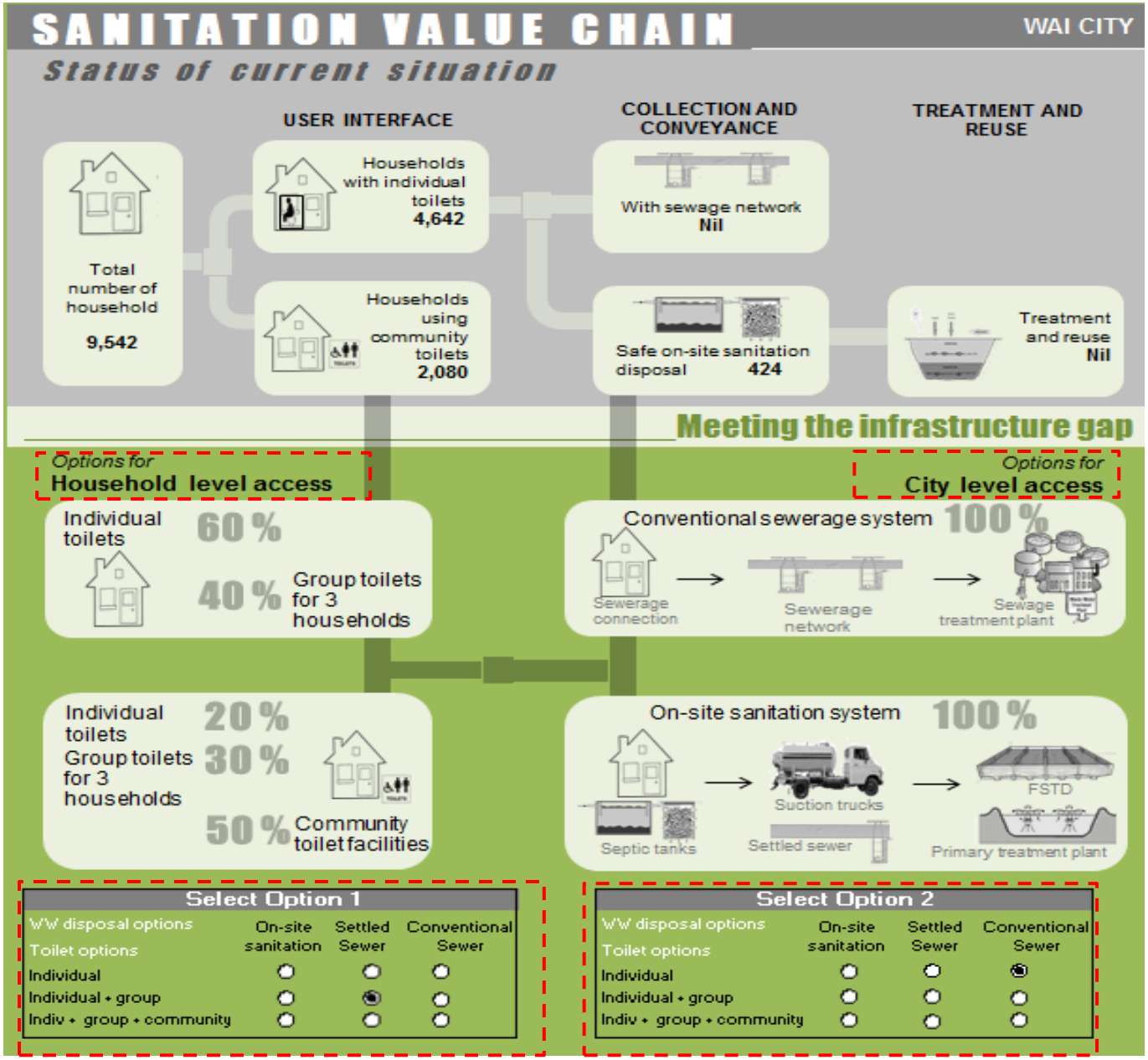
1. **Integrated fecal sludge management**
(Wai and Sinnar)
Regular (in a 3-year cycle) collection and disposal of fecal waste from septic tanks, along with the necessary refurbishment of septic tanks, construction of a treatment facility for septage and reuse of treated septage

2. Own Toilets + Septic Tanks
(Wai and Sinnar)
Construction of own toilets, individual or shared by 2-4 households, along with attached septic tanks

3. Settled sewers attached to DEWATS

Identify local priorities

Decision support tool for citywide sanitation options



Performance Improvement Planning tool was used to compare options of sanitation systems…

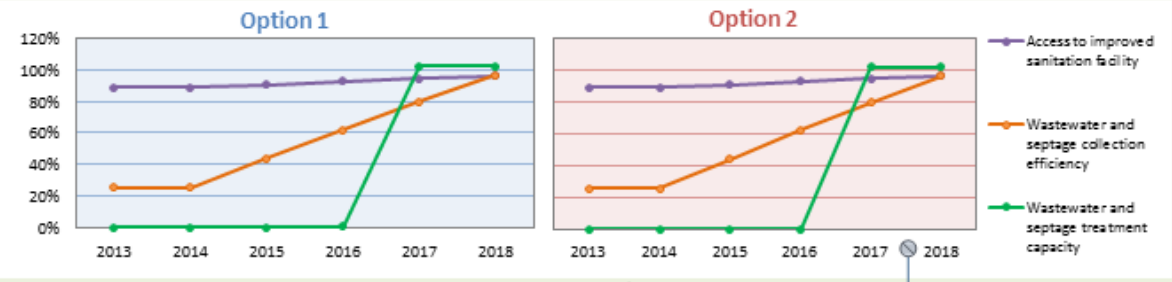
Dashboard to compare different sanitation options

Sanitation options for comparison

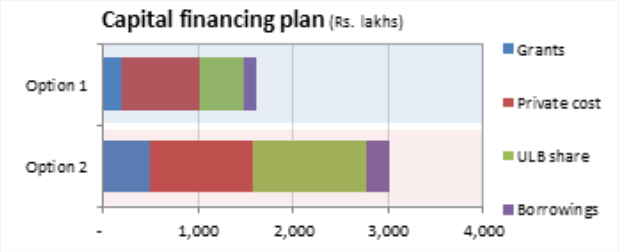
	OPTION 1	OPTION 2
Toilet	Individual + Group toilets	Individual
WW disposal	Settled sewer	Conventional sewerage system
CapEx	1611	3007
O&M	15	43
Revenue	8	31

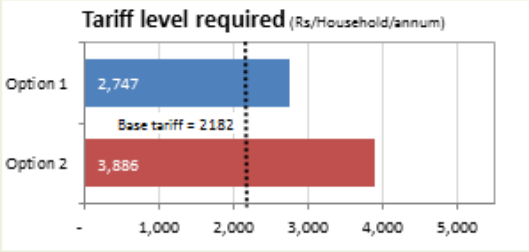
All figures are in Rs. Lakhs

Impact on service levels



Financial implications





Summary of Action plan

Select mode: CAPITAL EXPENDITURE

Option 1	2014	2015	2016	2017	2018
Refurbish individual toilets	18	19	21	22	-
Refurbish septic tanks	12	13	-	-	-
New individual toilets	118	126	135	144	154
Construct new group toilets	26	28	30	32	34
Construct new public toilet	3	3	-	-	-
Improve septage collection	1	-	-	-	-
New settled sewer	98	105	113	121	129
New suction emptier trucks	-	11	-	-	-
Fecal sludge treatment plants	5	6	-	-	-
Primary treatment plant	26	28	30	-	-

Option 2	2014	2015	2016	2017	2018
Refurbish individual toilets	16	17	18	19	-
New individual toilets	163	175	187	200	214
Construct new public toilet	2	3	-	-	-
Expand/New sewerage network	291	311	333	356	381
Sewage treatment plant	100	107	114	-	-
	-	-	-	-	-
	-	-	-	-	-
	-	-	-	-	-
	-	-	-	-	-

Comparing Performance and Financing for 'sewerage versus 'onsite sanitation systems '

Onsite sanitation provided same performance at lower tariffs

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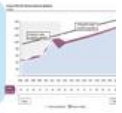

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Septage management situation in small towns

Both towns rely on a single vacuum emptier truck which is owned and operated by the ULB, and cleans both personal and community toilets

Existing septage conveyance mechanism in Wai and Sinnar

- Both Wai and Sinnar **have only one suction emptier truck** each with a capacity of 5kl and 3kl respectively
- The trucks are **owned and operated by the ULBs**, and also clean septic tanks connected to **community and public toilets once a week**
- The ULBs charges households ~**INR 400 - 800** in Sinnar and ~**INR 1000** in Wai per cleaning
- There is **no regulated schedule for cleaning**, and households call the ULB when required, once in >8-10 years
- **Each tank emptier can clean ~4-5 septic tanks per day**, just enough to clean the community and public toilets each week

Existing septage conveyance mechanism

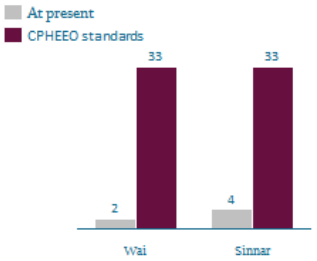
Suction emptier truck of 5KL capacity in Wai

Suction emptier truck of 3KL capacity in Sinnar

Complaint redressal by ULB

Consequently, households get their septic tanks cleaned only once in 8-10 years, resulting in the release of effluent with solids into the drainage system

Estimated number of septic tanks cleaned annually by the local ULBs *(As a % of total septic tanks)*



- The CPHEEO[3] manual and the MoUD septage management advisory recommend that household septic tanks be cleaned **every ~2-3 years, i.e. ~33% of them should be cleaned each year**

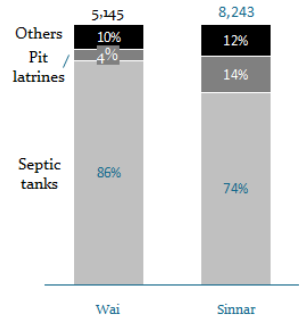
Resulting issues

- Septic tanks **often overflow** and fecal matter along with effluent is released into drains
- In addition, **septage hardens and cannot be easily suctioned off**, often requiring manual intervention or

8-10 Year cleaning frequency

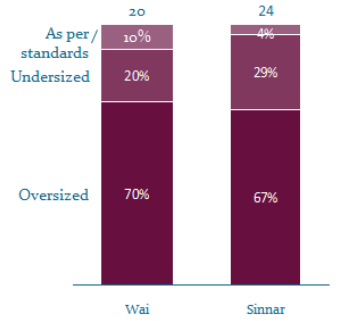
A majority of personal toilets in Wai and Sinnar are connected to septic tanks, which are larger than recommended standards

Method of collection of waste for all households *(HH)*



- ~75-85% of households in these cities depend on septic tanks

Assessment of size of septic tanks connected to personal toilets *(Number of toilets)*



- A sample survey conducted in Wai and Sinnar found that septic tanks connected to individual toilets are **largely**

Dependency on oversized septic tanks

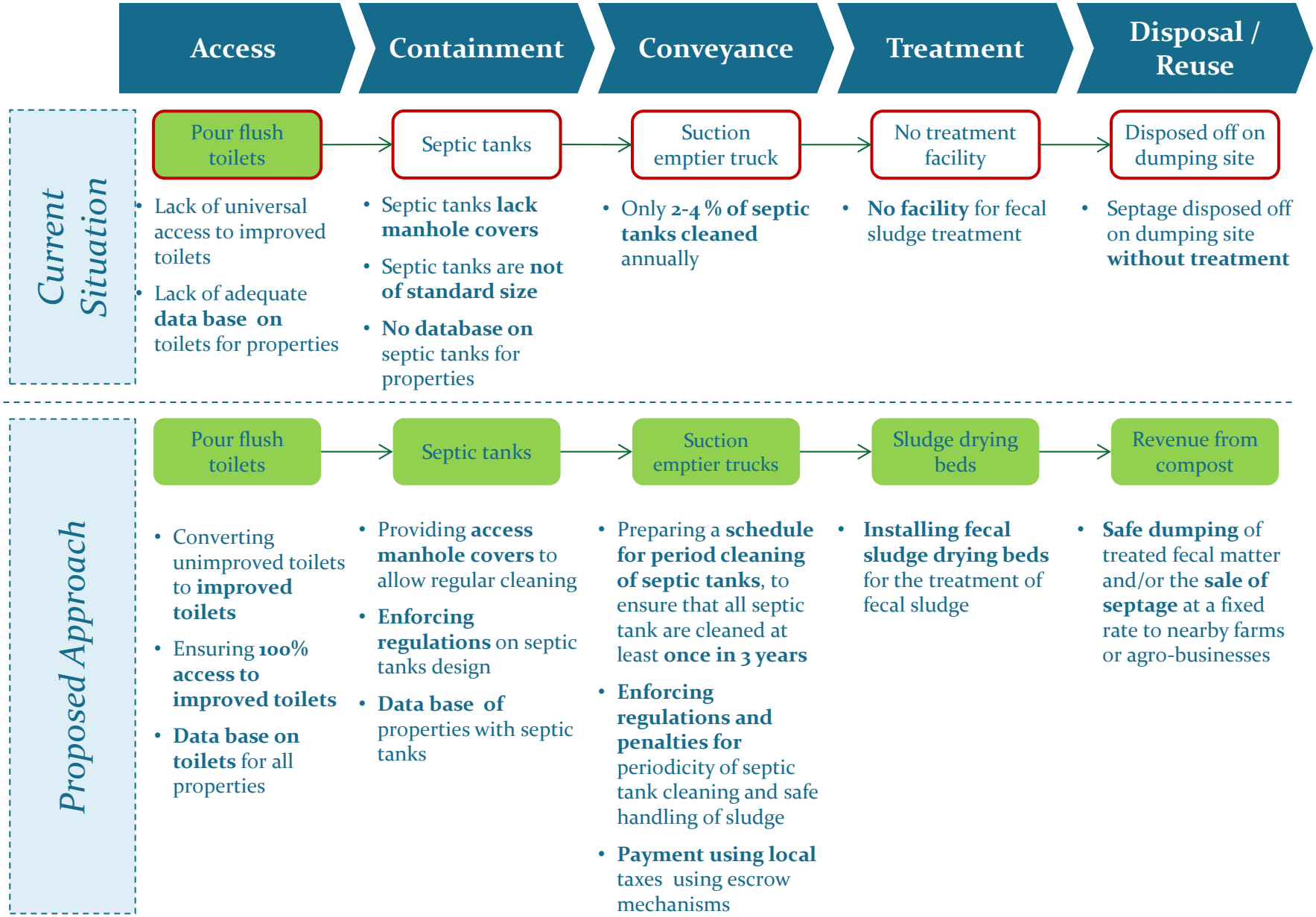
Septage is disposed off at the solid waste dump site without treatment in both towns

Location of the dumping ground in Wai

Location of dump site in Sinnar

Crude disposal at SW dump site

End-to-end IFSM solution – From red to green



Citywide - Integrated Fecal sludge Management Plan (1/2)

First, septic tanks will be refurbished to enable easy access for cleaning

Details of proposal

- Based on a sample technical assessment done in 2013, it was noticed that many **septic tanks in Wai and Sinnar had sealed covers or *farsis* (tiles) placed over** them
- This **prevented regular cleaning**, as the seal had to be broken each time to access the septic tanks
- **RCC access manhole covers** (60 cm X 45 cm) can be constructed to allow easy access during emptying, at a cost of **INR 500-800 per tank**
- The ULBs will do a **household level assessment** to assess the number of septic tanks that can be refurbished for access and also create

Location of manhole of cover

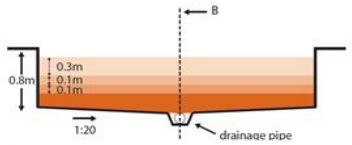
RCC access manhole cover

First, Refurbishment of Septic tanks

Third, treatment facility will be constructed for the treatment of sludge

Technical details of sludge drying bed

Technical illustration of a sludge drying bed

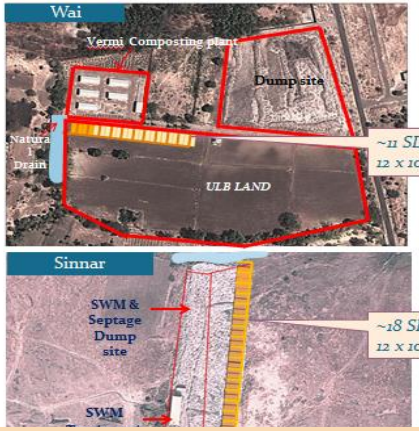


- Faecal sludge layer 30 cm
- Sand layer 10 cm; d=0.2-0.6 mm
- Gravel layer 10 cm; d=7-15 mm
- Gravel layer 20 cm; d=15-30 mm

- The MoUD advisory recommends the use of unplanted **sludge drying beds (SDB)** for the treatment of collected septage
- The sludge will be allowed to dry for **15 days to form sludge cakes**, which can be disposed safely in the open
- In India, SDBs are being used in **100 villages in Punjab** the World Bank's **Punjab Rural Water supply & Sanitation scheme**

The total cost of construction would be INR 22 lakhs

Description of proposal



Third, treatment / reuse

Second, tanks will be cleaned on a regulated schedule, and financed through taxation to ensure periodic cleaning

Current septage management practice

~2-4% of tanks cleaned per year (once in >8-10 years)

Recommended septage management practice

~33% of tanks cleaned per year (once in 3 -5 years)

Current barriers

1. Cleaning is done **on-call** by the household, who do not see the need for regular cleaning

   The **cleaning services** of the ULB are currently treated as a **complaint redressal** system for overflowing septic tanks rather than a regular cleaning and maintenance service
2. Each town has only **1 truck, owned and operated by the ULB**

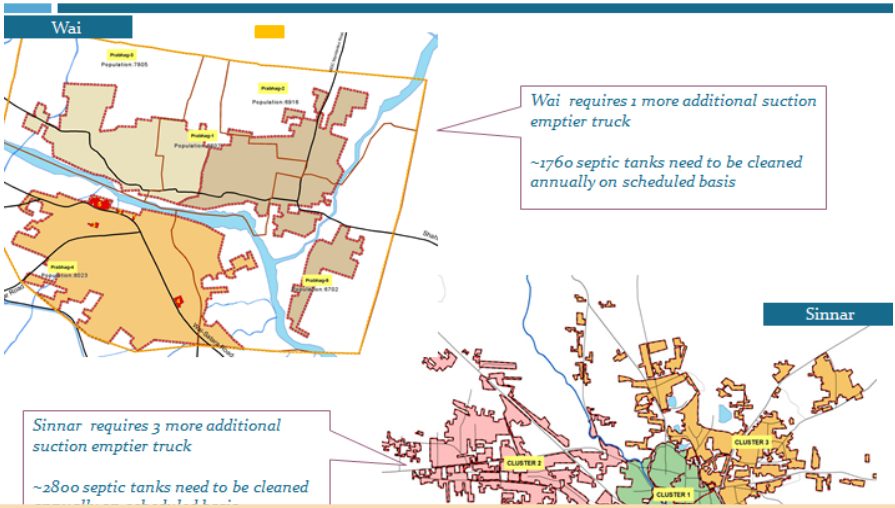
Proposed solution

1. Septic tanks will be cleaned on a **pre-determined schedule**

   Regulations and **penalties** will be set in place to **ensure periodic cleaning**

   Awareness generation activities will educate households about the need for regular cleaning
2. Each town will get an additional **1- 3 trucks to meet service standards**, which will be **operated by a private player**

Regulated schedule of three year septic tank cleaning cycle



Second, Regulated Cleaning of septic tanks and financing through taxation

Citywide - Integrated Fecal sludge Management Plan (2/2)

To ensure adoption of the integrated fecal sludge management plan, the ULB has to make regulatory changes

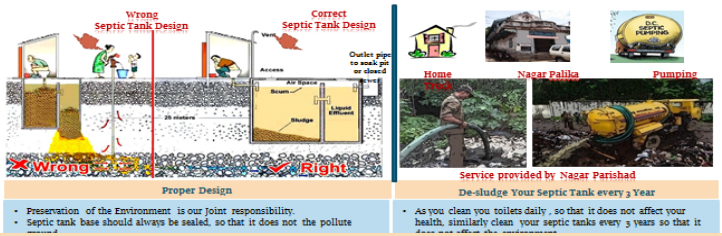
- The key issue in ensuring regular and safe septage management is **lack of implementation of government regulations and advisories**
- This will need the **formulation of ULB bye-laws** and rules to ensure implementation of each aspect of the IFSM plan
- The rules should address:
  1. **Septic tank design**: to ensure septic tanks of standard size are installed in new constructions
  2. **Periodicity of de-sludging**: to ensure septic tanks are cleaned every 3 years as per the MoUD's advisory
  3. **De-sludging procedures**: to ensure safe handling of fecal sludge
  4. **Sanitation tax**: to persuade households to clean septic tanks regularly
  5. **Penalties:** to deter irregular cleaning and use of substandard septic tanks

Fourth, regulation and implementation

These activities also need to be supported by campaigns for awareness generation

- To ensure **adoption of government regulations and ULB bye-laws**, there is a need to **generate awareness** about regular septic tanks emptying
- **To educate people about IFSM** we can involve :
  1. Print and electronic media
  2. Civil Society organizations such as NGOs and RWAs
  3. Academic institutions such as schools and colleges
  4. Opinion influencers such as doctors and religious leaders

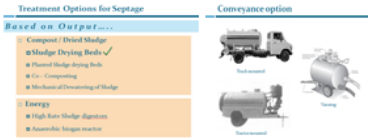
Illustrative posters to generate awareness



Fifth, IEC and Awareness generation

Financial analysis for funding IFSM activities

- **Financial Analysis** of **options** for **conveyance** and **treatment** need to be carried out and **linked** to the **ULB budget** for financing



- **Analysis** of **ULB budget** needs to be undertaken, to **understand ULB** capacity to **fund** the **IFSM activities**.

- Various **other sources** of **finances** needs to be looked into for **funding**

Funding options for IFSM activities

Create citywide information for successful implementation of PPP and improving monitoring by ULB for IFSM activities

Present system

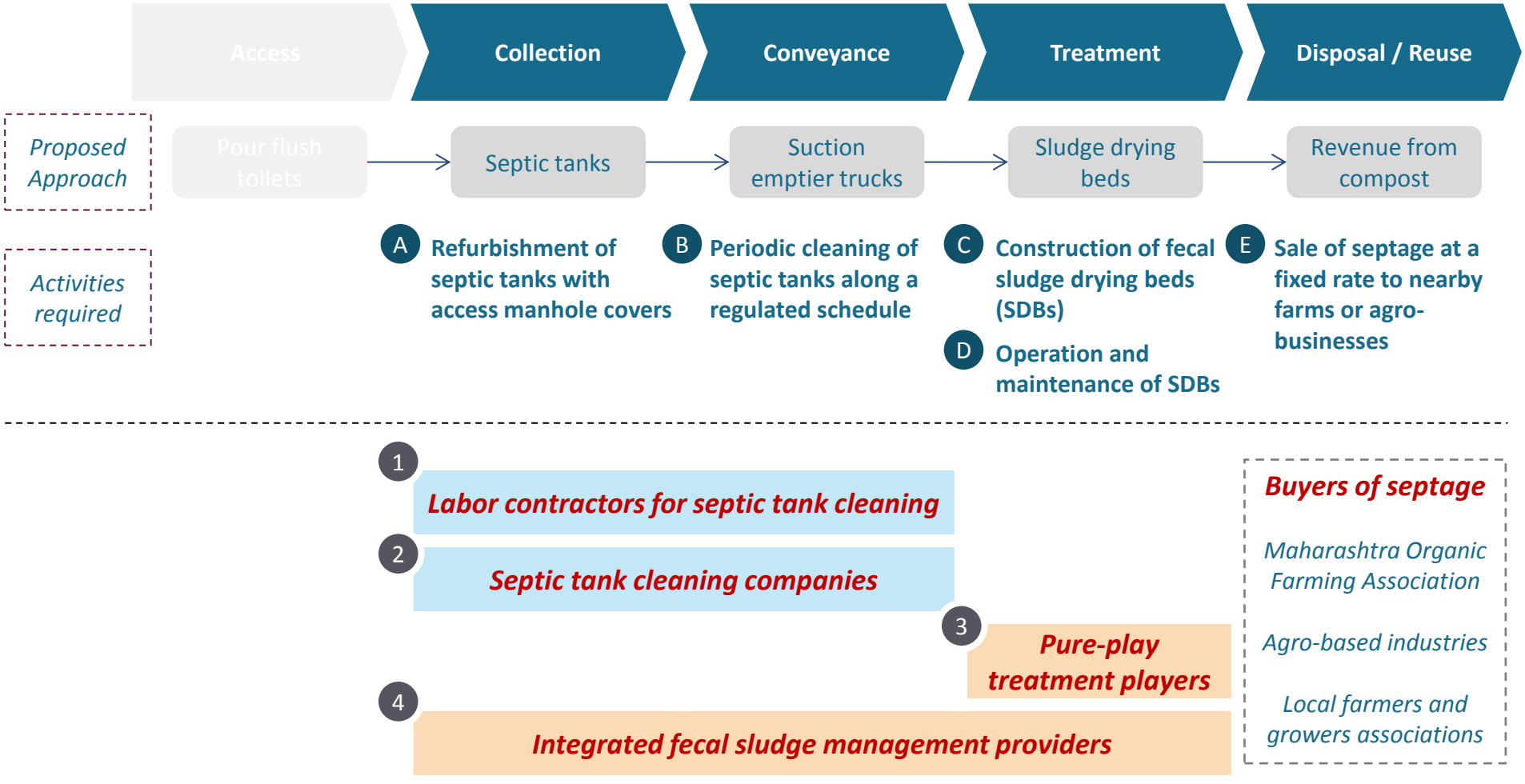
- **No database** of toilets, septic tanks for HHs
- **No ready database** to show how often a septic tank is being cleaned and at which location in the city

Creating database and improving monitoring :

- **Create GIS database** for each HHs / property depicting **details** on **Toilets, septic tanks**, soak pits details
- **Update of HHs / property** on server through mobile application or reporting systems **once** the **septic tank** is **cleaned**

Citywide database and MIS

Survey of private players for septage management services



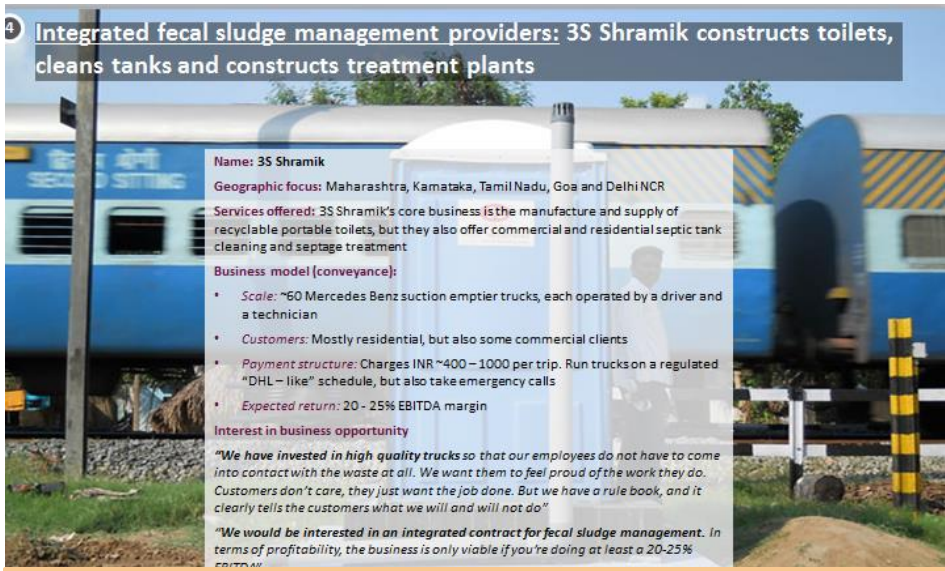
Source: Field visits, online business listings

Assessed work profile, interests and capacity of private sector

Labour contractors

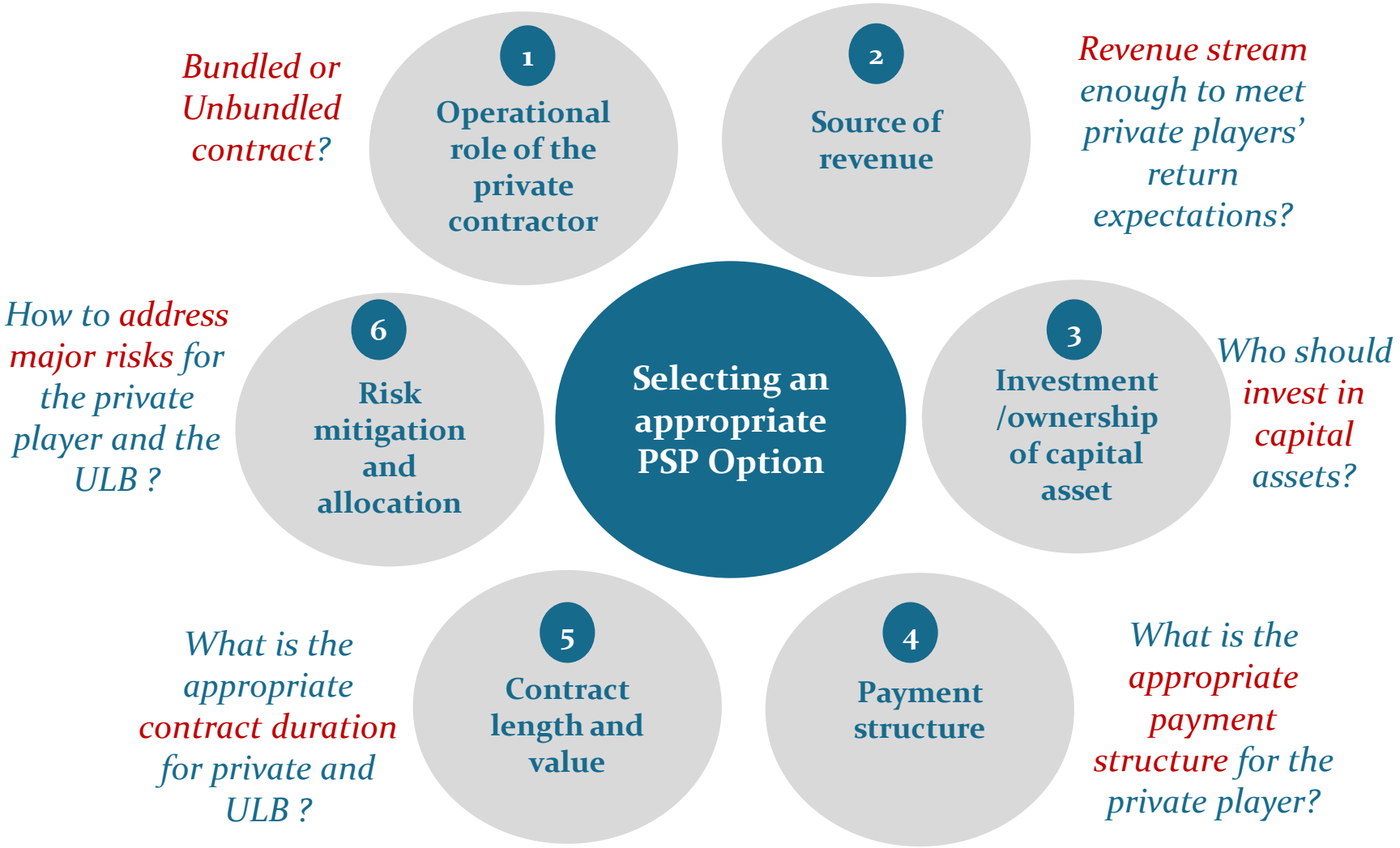
Septic tank cleaning companies

Pure play treatment players



IFSM service providers

Six processes in structuring a PSP option for IFSM



Contract options for citywide IFSM

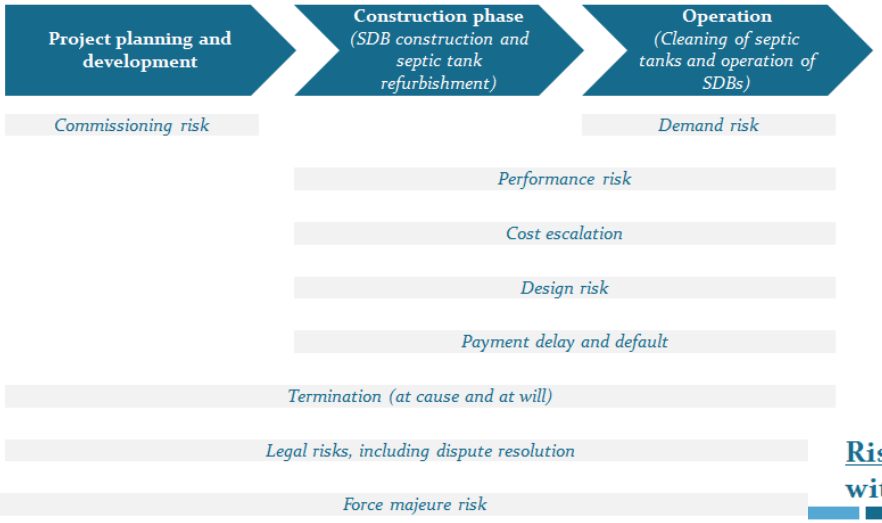
Contracts	Source of revenue	Ownership of asset	Payment method	Contract length and value
1A Refurbishment and cleaning of septic tanks + O&M of SDBs	*ULB*	Private player	Recurring fixed fee with Fixed fee per unit for refurbishment	2-3 year, ~INR 32-36 lakhs in Sinnar and ~INR 15-17 lakhs in Wai
1B Construction of SDBs	*ULB*	ULB	Overall fixed fee on a pre-decided schedule	~ INR 40-45 lakhs in Sinnar and ~24-28 lakhs in Wai lasting the time period of construction
2A Refurbishment and cleaning of septic tanks				
2B Construction and O&M of SDBs				
3A Integrated contract involving refurbishment, cleaning of septic tanks, construction and O&M of SDBs				refurbishment

Property owners currently have to pay local taxes of about Rs 2600/annum in Wai and Sinnar

To cover the costs of a cleaning cycle of ~3 years would require **an increase** in annual tax spend for a household of about **7% in Wai and 11% in Sinnar.**

Risk management to attract good contractors and reduce contract price

Risk mitigation: There are several types of risks that must be managed across the lifecycle of any public private partnership



Source: ADB, "Toolkit for Public Private Partnerships in Urban Water Supply for the State of Maharashtra, India; Ministry of Finance, Government of India, "PPP Toolkit for Improving PPP decision-making processes in water and sanitation, PPIAF, Vijay Sarma, 'Risks in PPP projects in Western India'"

Need to address several **risks** involved during **lifecycle of the PPP project**

Concerns about addressing these risks were raised by private sector during interactions

Risk mitigation: Private players highlighted a number of concerns with public private partnerships that need to be addressed

Termination

"The contract should have a clause defining a 3 month notification period in case of termination. It should also have a dispute resolution mechanism."
– Kadam Enterprises

Delayed payments

"Ideally, bills should be cleared in 30 days, and for late payments, interest should be paid at the rate of 8% per annum."
– Manisha Enterprises

Transparent procurement

"We would rather not deal with the ULB directly, there are always issues with internal politics. If there is a mediator in between then we would be interested."
- Envicare

Cost escalation

"For a fixed-fee contract for regulated schedule, we cannot offer 24 hour emergency service. We will only work 8 hours a day, otherwise it is likely that we will over-use our truck."
- Aditya Enterprises

"Another key issue is the escalation of fuel costs. The contract should clearly account for that."
– ZR Enterprises

Performance risks

"If we work on a regulated schedule, it will be difficult to get household signatures. That will become complicated, and I don't want my payment to suffer."
– Ugale Septic Tank Cleaning Services

"I have tried to do a regulated schedule on my route, but that has been difficult. People always say, "come back later", and it falls apart."
– Aditya Enterprises

Addressing the risks involved in PPP engagement for IFSM activities

Risk mitigation: Building a strong system for performance based monitoring and payment is critical to managing performance risk (1/2)

	Risk	Mitigation	Allocation of remaining risk
Cleaning of septic tanks	Private player uses manual scavenging for cleaning septic tanks or sludge drying beds	• Require safety gear for all personnel • Include a clear description of activities that constitute manual scavenging	• Contract terminated if complaints of manual scavenging are received from households or ULB staff
	Private player does not clean household tanks as per the schedule	• Portion of the monthly payment should be tied to the number of household signatures collected from households whose septic tanks have been cleaned satisfactorily • ULB to undertake random inspections of households whose signatures have been submitted • A complaint redress mechanism to be opened where grievances can be lodged by the HH with the ULB	• Penalties to be imposed if the reported number of cleanings is lower than specified in the contract, or if discrepancies are found during random sampling, or if complaints are not dealt with in a timely manner • Large or persistent breaches can lead to termination
	Private player	• As above	• Work on faulty septic tanks would have to
	Private player dumps septage at places other than the treatment site	• A portion of monthly payment is tied to signatures collected from the SDB operator	• In case the number of complaints exceeds a specified number in a given time period, the contract can be terminated

Risk mitigation: Building a strong system for performance based monitoring and payment is critical to managing performance risk (2/2)

	Risk	Mitigation	Allocation of remaining risk
Refurbishment of septic tanks	Septic tanks are damaged during or as a result of refurbishment	• Specify the type of materials required • Payment tied to the number of signatures from households whose septic tanks have been repaired to their satisfaction • ULB to undertake random inspections of households whose signatures have been submitted • A complaint redress mechanism to be opened where grievances can be lodged by the HH with the ULB	• Damaged septic tanks must be repaired within a specified period days of complaint and the cost shall be borne by the private player • Penalties will be imposed if discrepancies are found during random sampling, or if complaints are not dealt with in a timely manner • Persistent breaches may lead to termination
Construction of SDBs	Sludge drying beds do not meet specified design	• The ULB will specify the design and materials to be used in consultation with town consultants • Payment made in installments on the completion of specific construction	• If the work is found to be faulty at any stage, the payment will be withheld until the corrections are made
		• X% of O&M payment to be conditional on the sludge meeting specified qualities	• Persistent breaches may lead to termination

Managing performance risk through performance based monitoring and payment

Risk mitigation: Contracts must also clearly manage at will and at cause termination by the private player and the ULB

	Risk	Mitigation	Allocation of remaining risk
Termination at cause	• ULB does not fulfill contract conditions	• Establishing a clear reporting and monitoring mechanism to ensure transparent contract execution • Ensuring that disputes are handled amicably through frequent communication and by appointing an agreed upon third party meditator	• Private player compensated for investments, the cost of winding down and foregone profits
	• Private player is unable to meet service standards	• As above	• ULB can compensate the private player for some portion of its capital investments but seize the performance bank guarantee[1]
At will	• ULB decides discontinue the	• Up-front discussions with key stakeholders to create buy-in for	• X month notice period required • Private player compensated for
	to terminate the contract due to reasons unrelated to ULB compliance with contract terms	and private player	• Private player forfeits the performance bank guarantee

Managing termination risk

Risk mitigation: Provisions need to be made for payment delays and cost escalation to protect private player and public interests

	Risk	Mitigation	Allocation of remaining risk
Payment delays	• ULB is unable to make timely payments towards the project	• Ensuring budgetary allocation for contracts before procurement • Establishment of an escrow account for payment	• ULB to pay interest for the payment, delayed by X months or more, at a negotiated rate of interest
	• Cost of inputs increase over the course of contract	• Adjustment of contract value annually for inflation	• Private player would be responsible for bearing the cost escalations within

Managing payment and cost escalation risk

Summary

From complaint Redressal → To Regular IFSM service

Governance

- Planning and regulation for the full service chain – from toilets to reuse, and municipal finances
- Develop a private sector contract with good risk management and monitoring
- Set up citywide information system and strengthen local capacity for contract management and monitoring
- Awareness generation among residents about IFSM service and implementation of regulation

Financing

- Link contract payment to management fees from local government through taxes
- Ensure capital financing for treatment facility, explore business model around reuse

Thank you

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