Citywide IFSM Services in Small towns, India

Meera Mehta and Dinesh Mehta

3rd International Faecal Sludge Management Conference, Jan 19 2015
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.

Support to cities in Maharashtra, India

City Sanitation plan options for the cities

<table>
<thead>
<tr>
<th>Access</th>
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<th>Conveyance</th>
<th>Treatment</th>
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<tbody>
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<td><strong>Option 1:</strong> Citywide settled sewerage system (INR ~28 million investment)</td>
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<td><strong>Option 2:</strong> Citywide onsite sanitation system (INR ~12 million investment)</td>
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Key Activities in City Sanitation Plans

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

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 (Nashik)**

Onsite systems with same outcomes identified through PIP tool

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

Comparing Performance and Financing for ‘sewerage versus onsite sanitation systems’

Onsite sanitation provided same performance at lower tariffs
Support to Citywide Strategies

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1. **Citywide Settled Sewerage System**
   - Rehabilitation of selected old community toilets
   - Construction of wastewater treatment facility
   - Reuse for agriculture and irrigation
   - Option 1: Citywide settled sewerage system (INR ~28 million investment)

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 model

Key Activities in City Sanitation Plans

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Areas for intervention

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  - 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
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 charge 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.

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.

Dependency on oversized septic tanks

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)

<table>
<thead>
<tr>
<th>Method</th>
<th>Wai</th>
<th>Sinnar</th>
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</thead>
<tbody>
<tr>
<td>Septic tanks</td>
<td>84%</td>
<td>72%</td>
</tr>
<tr>
<td>Latrines</td>
<td>16%</td>
<td>28%</td>
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</tbody>
</table>

Septic tanks ranged from undersized to oversized.

- The CPHEEO manual and 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.
- Septic tanks often overflow and faecal 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

Crude disposal at SW dump site

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

Location of the dumping ground in Wai

Location of dump site in Sinnar
## End-to-end IFSM solution – From red to green

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<tr>
<td>Pour flush toilets</td>
<td>Septic tanks</td>
<td>Suction emptier truck</td>
<td>No treatment facility</td>
<td>Disposed off on dumping site</td>
</tr>
</tbody>
</table>

### Current Situation
- Lack of universal access to improved toilets
- Lack of adequate data base on toilets for properties
- Septic tanks lack manhole covers
- Septic tanks are not of standard size
- No database on septic tanks for properties
- Only 2-4% of septic tanks cleaned annually
- No facility for fecal sludge treatment
- Septage disposed off on dumping site without treatment

### Proposed Approach
- Converting unimproved toilets to improved toilets
- Ensuring 100% access to improved toilets
- Data base on toilets for all properties
- Providing access manhole covers to allow regular cleaning
- Enforcing regulations on septic tanks design
- Data base of properties with septic tanks
- Preparing a schedule for period cleaning of septic tanks, to ensure that all septic tank are cleaned at least once in 3 years
- Installing fecal sludge drying beds for the treatment of fecal sludge
- Safe dumping of treated fecal matter and/or the sale of septage at a fixed rate to nearby farms or agro-businesses

- Revenue from compost
**Citywide - Integrated Fecal sludge Management Plan (1/2)**

**First, Refurbishment of Septic tanks**

- Details of proposal
  - Based on a sample technical assessment done in 2019, it was noticed that many septic tanks in Wai and Sinnar had sealed covers or faris (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 500-600 per tank.
  - The ULBs will conduct a household level assessment to assess the number of septic tanks that can be refurbished for access and also create awareness.

**Second, Regulated Cleaning of septic tanks and financing through taxation**

- **Current septage management practice**
  - ~2.4% of tanks cleaned per year (once in >5-10 years)
- **Recommended septage management practice**
  - ~35% of tanks cleaned per year (once in 3-5 years)

<table>
<thead>
<tr>
<th>Current barriers</th>
<th>Proposed solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Cleaning is done on-call by the household, who do not see the need for regular cleaning.</td>
<td>1. Septic tanks will be cleaned on a predetermined schedule.</td>
</tr>
<tr>
<td>2. The existing septage services of the ULBs are currently treated as a complaint redressal system for overflowing septic tanks rather than a regular cleaning and maintenance service.</td>
<td>2. Regulations and penalties will be set in place to ensure periodic cleaning.</td>
</tr>
<tr>
<td>3. Each town has only 1 truck owned and operated by the ULBs.</td>
<td>3. Awareness generation activities will educate households about the need for regular cleaning.</td>
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</table>

**Third, treatment / reuse**

- **Technical details of sludge drying bed**
  - Fecal sludge layer 30 cm
  - Sand layer 10 cm (d=0.7-0.8 mm)
  - Gravel layer 10 cm (d=2-15 mm)
  - Gravel layer 20 cm (d=15-30 mm)

- **Description of proposal**
  - The MoU between the city and the government recommends the use of unplanted sludge drying beds (SDB) for the treatment of collected septage.
  - The sludge will be allowed to dry for 35 days to form sludge cakes, which can be disposed of safely in the open.
  - In India, SDBs are being used in some villages in Punjab and the World Bank’s Punjab Rural Water supply & Sanitation schemes.
  - The total cost of construction would be INR 30 lakhs.

**Second, Regulated Cleaning of Septic tanks and financing through taxation**

- **Regulated schedule of three year septic tank cleaning cycle**
  - Wai requires 2 more additional suction tanker trucks.
  - ~1750 septic tanks need to be cleaned annually on scheduled basis.
  - Sinnar requires 3 more additional suction tanker truck.
  - ~2800 septic tanks need to be cleaned.
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 septic tank 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

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

Funding options for IFSM activities

Fifth, IEC and Awareness generation

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

Illustrative poster to generate awareness

- 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
Survey of private players for septage management services

**Proposed Approach**

- **A** Refurbishment of septic tanks with access manhole covers
- **B** Periodic cleaning of septic tanks along a regulated schedule
- **C** Construction of fecal sludge drying beds (SDBs)
- **D** Operation and maintenance of SDBs
- **E** Sale of septage at a fixed rate to nearby farms or agro-businesses

**Activities required**

1. **Labor contractors for septic tank cleaning**
2. **Septic tank cleaning companies**
3. **Pure-play treatment players**
4. **Integrated fecal sludge management providers**

**Buyers of septage**

- Maharashtra Organic Farming Association
- Agro-based industries
- Local farmers and growers associations

**Source:** Field visits, online business listings

- **Small scale players** (<10 employees)
- **Medium scale enterprises** (>10-50 employees)
Assessed work profile, interests and capacity of private sector

Labour contractors: These are small players that employ workers to operate rental trucks, and also offer other facility management services.

- **Name:** Niranjan Enterprises
  - **Geographic focus:** Pune
  - **Services offered:** General facility management, septic tank & stormwater cleaning
  - **Business model:** Scale: 2-3 trips per month
  - **Business model:** Scale: 8-10 trips per month
  - **Expected return:** ~20-25% per trip
  - **Expected return:** ~50-65% per trip
  - **Business model:** Operating margin of 30%-40%
  - **Interest in business opportunity:** Yes, but only if the T&EB provides the truck. Not interested in constructing them, because unlike the truck which I can use for other business in case the contract does not work out, I can’t take the bed with me.

- **Name:** Kadam Enterprises
  - **Geographic focus:** 15 km radius in the Pune and Pimpri districts
  - **Services offered:** Septic tank cleaning services
  - **Business model:** Scale: Operates one Tata 709 truck of 3.2 t capacity, that works ~70-80 tanks per month
  - **Payment structure:** On time cash payment ~INR 1700 per trip
  - **Expected return:** ~INR 50,000 ~75,000 in operating profit per truck per month

Septic tank cleaning companies: These small companies own 1-2 trucks and do not offer any other services (1/3)

- **Name:** Niranjan Enterprises
  - **Geographic focus:** Pune
  - **Services offered:** Septic tank & stormwater cleaning
  - **Business model:** Scale: 2-3 trips per month
  - **Customers:** Households and small retail establishments
  - **Payment structure:** INR 1000 - 1200 per trip
  - **Expected return:** Operating margin of 30%-40%
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  - **Expected return:** ~INR 50,000 ~75,000 in operating profit per truck per month
  
Pure-play treatment players: Traditional sewage treatment plant providers are focused on more advanced technologies than sludge drying beds

- **Name:** Emco Hydro-Biotech Energy Private Limited
  - **Geographic focus:** Pune
  - **Services offered:** Manufacturing and construction of water, wastewater and sewage treatment plants
  - **Interest in business opportunity:** Yes, we are interested in constructing sludge drying beds by themselves. The sludge will be handled, and the project will be completed. We recommend an aerated digester, attached to a biogas plant, which can be used for electricity generation.
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Integrated fecal sludge management providers: 3S Shramik constructs toilets, cleans tanks and constructs treatment plants

- **Name:** 3S Shramik
  - **Geographic focus:** Maharashtra, Karnataka, Tamil Nadu, Goa and Delhi NCR
  - **Services offered:** 3S Shramik’s core business is the manufacture and supply of modular portable toilets, but they also offer commercial and residential septic tank cleaning and septic tank treatment
  - **Business model:** Scale: HO Mercedes-Benz suction pumps, each operated by a driver and a technician
  - **Customers:** Mostly residential, but also some commercial clients
  - **Payment structure:** Charges INR 400 - 1000 per trip, runs trucks on a regulated “DHIL line” schedule, but also take emergency calls
  - **Expected return:** 20% - 25% EBITDA margin

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Six processes in structuring a PSP option for IFSM

1. Operational role of the private contractor
2. Source of revenue
3. Investment/ownership of capital asset
4. Payment structure
5. Contract length and value
6. Risk mitigation and allocation

- Bundled or Unbundled contract?
- Revenue stream enough to meet private players’ return expectations?
- Who should invest in capital assets?
- What is the appropriate contract duration for private and ULB?
- What is the appropriate payment structure for the private player?
## Contract options for citywide IFSM

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

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

<table>
<thead>
<tr>
<th>Project planning and development</th>
<th>Construction phase (SDB construction and septic tank refurbishment)</th>
<th>Operation (Cleaning of septic tanks and operation of SDBs)</th>
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<tbody>
<tr>
<td>Commissioning risk</td>
<td>Demand risk</td>
<td>Performance risk</td>
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<td>Performance risk</td>
<td>Cost escalation</td>
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<td>Design risk</td>
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<td>Payment delay and default</td>
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<tr>
<td><strong>Termination (at cause and at will)</strong></td>
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<td></td>
<td>Legal risks, including dispute resolution</td>
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<td></td>
<td>Force majeure risk</td>
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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 Sena, "Risks in PPP projects in Western India"

#### 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 9% 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."  
  - Enviicare

- **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

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Concerns about addressing these risks were raised by private sector during interactions.
Addressing the risks involved in PPP engagement for IFSM activities

Managing performance risk through performance based monitoring and payment

Managing termination risk

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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