India: Market Insights for the Omni Processor

Landscape report

April 3, 2018
Executive Summary

FSM Coverage

- While access to IHHLs and containment systems is increasing, emptying-transport-treatment face multiple challenges
  - While most (86%) of the households in urban India have access to individual toilets, only one-third of them are connected to a sewerage system
  - From the waste generated in these sewers, only ~two-fifth is treated due to very few operational Sewage Treatment Plants (STPs) across India
  - While a higher percentage of the households are connected to a septic tank (38%) compared to sewers, almost none of the septage collected is currently treated

- Onsite collection, unsafe transportation and irregular cleaning are dominant FSSM trends, with little to no treatment even for states with advanced FSM practices
  - Maharashtra: Large proportion of households have access to IHHLs, with most houses having access to sewerage facilities or septic tanks, with less than 10% using less advanced methods for collection. However, the cleaning of septic tanks is highly irregular, with vast majority of septage being untreated
  - Tamil Nadu: IHHL coverage is high, septic tanks are the dominant model, with ~50% of the waste safely collected. However, the transport is are poorly regulated, leading to unsafe methods of transportation, but almost nothing treated
  - Odisha: A higher proportion of the population practices OD, with onsite collection (45% septic tanks, and 36% poor systems) and unsafe disposal being predominant practices, very limited facilities for treatment of septage exist
  - Andhra Pradesh: Large households have access to IHHLs, with a really high proportion of septic tanks (57%), and limited sewerage connectivity. 40% of the waste is safely transported through sewers/ trucks with very high participation of the private sector. However, only 6% of the sewage is currently being treated.

- Four drivers contribute to FSM gaps across the value chain
  - Policy implementation ongoing: ULBs and states have traditionally prioritized sewer networks, private operators are not regularized or monitored, there are no designated dumping sites, and limited policy provision for treatment facilities, but efforts to enhance the policy environment are ongoing
  - Limited private sector engagement: Significant capacity gaps exist for private players across containment, emptying and transport and the market is highly fragmented, for treatment, lack of market-linked revenue streams is a challenge
  - Sub-optimal consumer behavior: Incomplete information coupled with informal service provision network, on-demand and infrequent desludging, and limited interest in treatment solutions, lead to limited FSM engagement by households
  - Limited financing: Remunerative private sector models exist, but most participants are small and unorganized, while revenue streams are typically missing in treatment or the amount recovered is insufficient
Executive Summary

- Innovative approaches (including Omniprocessor) can help bridge this gap

HIGH-LEVEL FINANCING LANDSCAPE FOR FSM

- Financing is required across different components of the value chain to meet the delivery gap for FSM services
  - Emptying and transport is mostly commercially viable, however, on-demand sludging makes it difficult to predict revenue, in addition to the market being unregulated
  - Treatment solutions usually have a high capex, with few options to fund operational costs, and limited potential for market-linked revenue generation
  - For reuse, while capital and operating expenditure are low, lack of revenue potential make this unviable

- Despite the need, FSM financing has been limited due to lack of demand and unfavourable risk-return situation for business models
  - Government has mostly focused on access to toilets, and private interest has been muted due to poor business economics and lack of understanding

- Recently, FSM has seen increasing focus from different stakeholders
  - Government allocation is increasing, through direct or proximate funding (e.g. state budgetary allocations increasing for FSSM (e.g. AP allocation for construction of 78 FSTPs)
  - Within public funding, financing sources for FSM can be direct, proximate, or distant: (i) Direct funding covers financing specific to FSSM needs along the value chain; (ii) Proximate funds pertain to financing for sub-components within sanitation including access to sanitation, solid and liquid waste management; and (iii) Distant funds cover a range of development sectors including sanitation, and ULB-specific projects
  - Organized private sector has demonstrated interest in FS collection and treatment. Players such as Blue Water Company (BWC) and Tide Technocrat are active in FS treatment
  - There is philanthropic interest in integrated FSM services and treatment solutions (e.g. BMGF is providing funding support for construction of select FSTPs)

- Our estimates suggest that the funding required for improved FSM in India over the next ten years is ~5% of the entire universe of available funds, requiring successful advocacy efforts and mobilization
- Potential options for future financing mechanisms can be of three kinds, public finance, blended or pooled finance, and innovative financing mechanisms
Executive Summary

TECHNOLOGY PROCUREMENT

- Infrastructural solutions can be procured in four different ways for cities:
  - Traditional procurement, or business as usual procurement, where a city or an institution has a need and procures good internally, or through tender
  - Programmatic procurement, a large national or state level program, which facilitates procurement in cities
  - Developmental procurement, or donors and innovators partnering with cities to implement innovative infrastructural projects
  - Private sector driven procurement, or push by the private sector because of the value proposition / positive economics, innovation, and then partnerships with the government
- Additionally, institutional procurement might have elements of each one of these
- Different cities experience these procurement processes differently, based on their relative autonomy and capacity
- This can have implications on OP procurement, both on processes and the type of cities engaging with OP (preliminary hypotheses)

LEVEL OF BUSINESS ACTIVITY

- Around nine business model archetypes are most prevalent along the FSM value chain:
  - (i) Private, recovery sourced from HHs (Integrated) ; (ii) Private, with indirect recovery from HHs; (iii) Govt. vehicles, private operator, indirect recovery from HHs; (iv) Govt., with indirect recovery from HHs; (v) Private, with direct recovery from HHs; (vi) Govt. vehicles, private operator, direct recovery from HHs; (vii) Private, recovery from commercial sources/market (viii) Philanthropic, CapEx, private operator, recovery from commercial sources/market: (ix) Philanthropic, CapEx, private operator, recovery from non-commercial sources
- These models vary along the dimensions of both financial flow, and the mix of components they engage with
- For most archetypes, set out below are the major learnings:
  - ULB governments will often outsource treatment to private players, due to their own limited resources and capacity
  - Non-profit and government funding dominant, as a result of limited commercial return potential and presence of early-stage, high-risk technologies
  - Opex for treatment are 2-4x larger than amortized capex, and crucial to recover through value recovery (reuse), tipping fees, or integrated mechanisms, however tipping fees are hard to recover, and market linkages for reuse revenue are very early stage
  - Only a few direct players exist, with many potential small players that are interested in FSTP contracts, and have technical capacity, but no concrete plans to expand. A few large players that typically undertake large infrastructure projects are interested in FS treatment projects at scale especially through state-level partnerships
While access to IHHLs and containment systems is increasing, emptying-transport-treatment face multiple challenges

<table>
<thead>
<tr>
<th>Access to toilets for HH in urban India (% of HH)</th>
<th>Type of sanitation facility by HH in urban India (% of HH)</th>
<th>Transportation of fecal sludge in urban India (% of total FS)</th>
<th>Status of wastewater treatment in urban India (% in MLD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Household toilets: 86%</td>
<td>None: 13%</td>
<td>Unsafely transported*: 67%</td>
<td>Partial/ No treatment: 63%</td>
</tr>
<tr>
<td>Community toilets: 6%</td>
<td>Others: 9%</td>
<td>Safely transported: 33%</td>
<td>Treatment through STPs: 38%</td>
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<tr>
<td>Open defecation: 8%</td>
<td>Pit toilets: 7%</td>
<td>Only ~33% of the fecal waste is safely transported in urban India, while the rest either leaks and/or is not transported safely</td>
<td>Current treatment capacity is available only for 38% of total 62,000 MLD of wastewater generated; FS treatment is almost nil</td>
</tr>
<tr>
<td>~86% households in urban India have access to individual toilets</td>
<td>Sewerage: 33%</td>
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<tr>
<td>~38% of the HHs are connected to septic tanks, while 33% are connected to sewers</td>
<td>Septic Tanks: 38%</td>
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</table>

*Includes FS that is unsafely transported, leaks, and/or not known where it goes

Four drivers contribute to FSM gaps across the value chain

1. **Policy Implementation ongoing**
   - **Containment:** ULBs and states have traditionally prioritized sewer networks and poor enforcement of standards by ULBs
   - **Emptying and transport:** Private operators are not regularized or monitored, there are no designated dumping sites or treatment facilities
   - **Treatment:** National policy on FSM recognizes treatment to be severely inadequate, hardly any FSTPs and limited co-treatment at STPs, although new tenders are being issued

2. **Limited private sector engagement**
   - **Containment:** Significant capacity gaps of those constructing/installing systems, as a result, systems do not conform to quality standards
   - **Emptying and transport:** Private sector operations highly fragmented, operate with very little regulation
   - **Treatment:** Lack of proven, market-linked revenue streams as a result of the nascent end product market

3. **Sub-optimal consumer behavior**
   - **Containment:** Incomplete information and lack of space within the households coupled with an informal service provision network lead to poorly constructed systems
   - **Emptying and transport:** Cleaning is on demand and infrequent, with gaps as long as 8-10 years, resulting in seepage and environment hazards
   - **Treatment:** Households are typically against treatment systems located in close proximity

4. **Limited financing**
   - **Containment:** While operating costs are low, opportunities to improve ROI and make revenue more predictable
   - **Emptying and transport:** Remunerative private sector models exist, but most participants are small and unorganized. Irregular cleaning makes revenue streams unpredictable.
   - **Treatment:** Allocation of public finances for FSM is still nascent, revenue streams are typically missing or the amount recovered is insufficient if present (e.g. revenues from sale of compost)

Source: Dalberg Report on FSM Landscape for CEPT; “Septage Management A Practitioner’s Guide”, CSE (2017); “Operative Guidelines for Septage Management for Local Bodies” (2014); Survekshan Survey Book 2018; Guidelines for Septage Management in Maharashtra (2016); MAWS Policy Note 2015-16; HPEC; Dalberg interviews
Innovative approaches such as the Omniprocessor can help bridge this gap

Promoting sustainable business models integrated across the value chain

Sanergy, a Kenyan social enterprise, has adopted a franchise model to operate its Fresh life toilets, which are operated by Fresh Life Operators from the community, who are also responsible for creating demand for toilets in their community. Sanergy collects the waste from these toilets daily, which is then converted into sellable products at a centralized facility and sold to Kenyan farmers.

Improving civic participation in septage management

To deal with its disposal of septage problem, Alandur, a municipality in Tamilnadu, conducted a public awareness campaign to motivate the public to participate in a septage management improvement project. A ‘willingness to pay study’ indicated that 97% residents were willing to pay up to INR 2000 per connection to install a sewerage system. The project cost was financed through a 23% public contribution, and implemented under a ‘build-own-operate, and transfer arrangement’ with a private player.

Developing technologies that improve revenue potential of treatment

Existing waste processing methods are inefficient and hardly profitable, and extracting value out of waste can turn the waste processing business into a profitable one. This will increase the demand for waste and reduce risks of untreated fecal waste. Omniprocessor, a class of technologies, seeks to use heat or other processes to break down waste into useful components like manure, water, and energy.

Mobilizing private capital

Water and Sanitation Pooled Fund is a Trust managed by the Government of Tamil Nadu to mobilize capital market resources by issuing bonds to finance infrastructure projects. The bonds are guaranteed by state government funds in an escrow account and a partial credit guarantee from USAID. This model allows small and medium sized ULBs with poor credit ratings to access debt markets and crowd-in otherwise risk-averse private capital.

EXECUTIVE SUMMARY

FSM COVERAGE

HIGH-LEVEL FINANCING LANDSCAPE FOR FSM

TECHNOLOGY PROCUREMENT

BUSINESS MODELS IN FSM
Financing is required across the value chain to meet the FSM delivery gap

### Emptying and transport
- **Investment required:** Trucks (INR 5-20 lakh) and emptying equipment (INR 15 lakh)
- **Status:** Opportunity to improve ROI by using trucks for other operations
- **Expenses:** Fuel and maintenance
- **Status:** Limiting catchment area to a service range of 10-15 kms make the economics favorable
- **Source:** Un-sewered HHs, ULBs
- **Status:** On-demand sludging makes it difficult to predict revenue, market is mostly unregulated, where households pay private operators anything from Rs 500 to Rs 5000

### Treatment
- **Investment required:** STP (Rs 1300 per capita) and FSTP (Rs 360 per capita)
- **Status:** High capital expenditure without visible revenue sources
- **Expenses:** Utility, consumables and maintenance; STP (Rs. 220 per capita per year) and FSTP (Rs. 100 per capita per year)
- **Status:** There are limited options to fund these operational costs
- **Source:** General public or ULB
- **Status:** Because waste management behaves like a public good, ULBs fund these services mostly through sanitation and property taxes; other sources of revenue are mostly absent

### Reuse or disposal
- **Investment required:** Infrastructure to transport end products to markets
- **Status:** Additional capital expenditure is small compared to the original asset cost
- **Expenses:** Fuel and maintenance
- **Status:** Low operating costs are countered by lack of viable sources of revenue
- **Source:** Farmers and state utilities
- **Status:** Sources of revenue are absent, except farmers who sometimes pay for the sludge to be used as soil enrichers; however, this is countered by fertilizer subsidies; in some cases, state utilities pay for treated water

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Note (1) Assuming 120 litres of waste per person per day; (2) Based on average numbers for FSTPs in India; (3) Average treatment costs calculated by HPEC in its report on Indian Urban Infrastructure and Services

Source: Dalberg Report on FSM Landscape for CEPT
Despite the need, FSM financing has been limited due to lack of demand and unfavourable risk-return situation for business models

The public and non-urgent nature of FSM results in a lack of demand from the end-user

- **FSM is considered to be a public good**, given its non-rivalrous and non-excludable nature, where its benefits cannot be limited to a set of people, and services are not contingent on the number of people accessing treatment services

- **Low visibility and limited awareness make improved FSM a limited priority for households**, specifically, with fecal waste being contained in septic tanks or passing through sewerage, coupled with limited understanding of health and environmental implications of poor FSM

- **Price elasticity is high**, since households do not prioritize FSM as a priority and competing needs due to limited ability to pay

Perceived high risk and low return result in a lack of viable business models, and hence private players

<table>
<thead>
<tr>
<th>Low return</th>
<th>High risk</th>
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<tbody>
<tr>
<td>- With low demand for FSM, revenue streams are limited&lt;br&gt; - The technology for reuse is limited and hence, by-products cannot compete with existing products&lt;br&gt; - Investments are typically small-ticket, and are not scale generating mega projects</td>
<td>- Data is limited, contributing to limited understanding of the sector&lt;br&gt; - Businesses cannot predict demand because of on-demand collection&lt;br&gt; - The re-use technology is nascent and not proven, thus increasing risks&lt;br&gt; - The emptying and transport components are unorganized, thus increasing reliance on ULBs to enforce regulations</td>
</tr>
</tbody>
</table>

Source: Dalberg Report on FSM Landscape for CEPT and Dalberg Report on FSM Business Models for CEPT
As a result, both government focus and private sector investment in FSM are limited

Government has mostly focused on access to toilets...

<table>
<thead>
<tr>
<th>SBM – Urban component-wise expenditure</th>
<th>Overall expenditure in percentage</th>
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</thead>
<tbody>
<tr>
<td>2014-15</td>
<td>16% 33% 51%</td>
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<tr>
<td>2015-16</td>
<td>5% 25% 70%</td>
</tr>
<tr>
<td>2016-17</td>
<td>12% 44% 44%</td>
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<tr>
<td>2017-18*</td>
<td>10% 46% 44%</td>
</tr>
</tbody>
</table>

Majority of SBM funding is towards toilet construction and solid waste management, with no earmarked funds for FSM

...and private interest has been muted due to poor business economics and lack of understanding

1. **Large banks/FIs**: Typically do not fund or fully understand the FSSM sector; some schemes exist e.g. developed by the Safai Karamchari Finance & Development Corporation, but operators are not aware

2. **Commercial capital**: Low return potential of FS treatment makes it unviable for PE, VC, impact funds etc; dependencies on govt. are also a deterrent

3. **CSR and MFIs**: Fund providers are not aware of or do not fully understand FSSM e.g. most CSR funds and MFIs in WASH focus on toilet construction

Within public funding, financing sources for FSM can be direct, proximate, or distant

**DIRECT**
Financing specific to FSM needs along the value chain
- **AMRUT**: Urban infrastructure development programme particularly aimed at water supply and sewerage
- **Smart Cities Mission**: Identify 'smart solutions' to improve urban infrastructure incl. water and sanitation, electricity, transport, housing, education etc
- **HRIDAY**: Planned development to ensure sustainable growth of heritage cities development of water supply, sanitation, drainage, waste management, and other citizen infrastructure
- **Namami Gange**: Abate pollution and rejuvenate River Ganga by investing in STP capacity, river-front development, river surface cleaning, bio-diversity conservation etc.

**PROXIMATE**
Financing for sub-components within sanitation including access to sanitation, solid and liquid waste management
- **Swachh Bharat Mission (SBM)**
- **14th Finance Commission**
- **Capital grants**
- **Inceptive to ULB**
- **State specific schemes like Maharashtra Nagarothan Maha-abhiyan (Maharashtra)**

**DISTANT**
Funds cover a range of development sectors including sanitation, and ULB-specific projects
- **Provisions for pilgrim places, tribal development and hill stations**
- **Schemes for urban infrastructure (typically focus on roads, transport)**
- **Capital grants for lake/river conservation**
- **ADB funds**
- **JICA**
- **Assistance for development work**

Note: The list is not comprehensive; there are many other funds specific to the state in proximate and distant categories

Source: Dalberg Report on FSM Business Models for CEPT
Our estimates suggest that the funding required for improved FSM in India is ~5% of the entire universe of funds.

Rough estimate of funding pools and required funding for FSSM in India for the next 10 years

*Amounts in INR crore*

<table>
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<tr>
<th>Central funds&lt;sup&gt;1&lt;/sup&gt;</th>
<th>State funds&lt;sup&gt;2&lt;/sup&gt;</th>
<th>ULB finances&lt;sup&gt;3&lt;/sup&gt;</th>
<th>Philanthropic funding&lt;sup&gt;4&lt;/sup&gt;</th>
<th>Private investment&lt;sup&gt;5&lt;/sup&gt;</th>
<th>Total funds available</th>
<th>Funding required&lt;sup&gt;6&lt;/sup&gt;</th>
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<td>1,63,680</td>
<td>10,000</td>
<td>3,250</td>
<td>8,78,931</td>
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<td>2,81,000</td>
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<td>4,21,001</td>
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Notes: (1) Includes SBM – Urban, AMRUT, SCM, Namami Gange and HRIDAY; funding numbers sourced from respective websites; (2) Includes a part of state budget for urban development and housing, state contribution to smart city, and the grant from the 14th Finance Commission; (3) Calculated by aggregating income from property tax; (4) Calculated for Multilateral and bilateral funding; (5) Calculated by aggregating CSR funding; (6) EPA estimates for average septage production per person, and KPMG estimates for FSTP costs.

Assumptions: All funds: Based on the data for next 5 years, similar funding will be available for ensuing 5 years; State funds: 10% of state budget for urban development and housing will be used for sanitation; state will contribute equally as the center towards smart cities.

Required funding: 2/3 of India is unsewered; capex per capita for FSM treatment services is Rs 360 and opex per capita per year of FSM treatment services is Rs 20; average septage production per person per day is 0.6 litres.
Contents

EXECUTIVE SUMMARY

FSM COVERAGE

HIGH-LEVEL FINANCING LANDSCAPE FOR FSM

TECHNOLOGY PROCUREMENT

BUSINESS MODELS IN FSM
Infrastructural solutions are typically procured in four different ways for cities, and separately for institutions

<table>
<thead>
<tr>
<th></th>
<th>TRADITIONAL PROCUREMENT</th>
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<th>PROGRAMMATIC PROCUREMENT</th>
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<th>DEVELOPMENTAL PROCUREMENT</th>
<th></th>
<th>PRIVATE SECTOR DRIVEN PROCUREMENT</th>
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<th>INSTITUTIONAL PROCUREMENT</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Business as usual procurement, where a city or autonomous institution has a need and either procures goods and services internally, or invites tenders; tends to be a prescriptive process with limited flexibility for parties to negotiate</td>
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<td></td>
<td>Example: Most common route for infrastructure procurement, with most STPs procured by this method, using either government funding or private investment</td>
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<td>2</td>
<td>A large national or state level program, often backed by international development financing or national and donor funding, which leads to procurement decisions by several cities within certain parameters</td>
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<td></td>
<td>Example: Andhra Pradesh plans to install 78 FSTPs in its ULBs through a state level RFP</td>
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<td>3</td>
<td>Procurement driven by donors or innovators that partner with cities, by providing both financing and technical support to implement innovative infrastructural projects</td>
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<td>Example: Leh FSTP and Devanahalli FSTP are both executed by local governments and supported by NGOs for funding and design (CDD, BORDA and Gates Foundation)</td>
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<td>4</td>
<td>Procurement driven by private sector players given the value proposition / positive economics/ innovative nature of the product, and proactively encouraging partnerships with the government</td>
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<td>Example: Gujarat, MP, Rajasthan, AP are states that have formally adopted the ‘swiss challenge’ method, where the procurement is driven by the supplier</td>
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<td>5</td>
<td>Procurement driven by the institution, with a need for goods and services, is similar to the process of ‘business as usual’ procurement by government bodies in its most prescriptive form, or can also involve elements of other procurement approaches</td>
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<td></td>
<td>Example: Ministry of Railways has used swiss challenge method for redevelopment of 400 stations</td>
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</table>
Different cities experience these procurement processes differently, based on their relative autonomy and capacity (1 of 2).

De facto Autonomy tells us who the real decision makers are and whether it is advantageous to engage at the ULB level or at the State/Central level.

Capacity tells us whether these entities can afford to a. finance these solutions and/or b. conduct the process by themselves or if they need handholding.

**Capacity v. autonomy for cities (mapped to our ingoing segments)**

- **Low (State run)**
  - Low Autonomy + Low Capacity
    - 6. Small and Meek
  - Low Autonomy + Medium Capacity
    - 3. Nurtured Stars

- **Middle**
  - High Autonomy Medium Capacity
    - 2. Rising Metro
    - 5. Dry and Arid
    - 10. United Sisters
    - 12. Institutions
  - Low Autonomy + High Capacity
    - 9. Little Prodigy

- **High (Self/ULB run)**
  - High Autonomy Low Capacity
    - 4. Unruly Survivor
    - 8. Hilly City
    - 12. Institutions
  - High Autonomy High Capacity
    - 1. Sprawling Megacity
    - 7. Steady Rollers
    - 12. Institutions
  - Low Autonomy + High Capacity
    - 11. New and Shiny

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18
Different cities experience these procurement processes differently, based on their relative autonomy and capacity (2 of 2)

<table>
<thead>
<tr>
<th>Segment Archetype</th>
<th>Traditional</th>
<th>Programmatic</th>
<th>Developmental</th>
<th>Private Sector Driven</th>
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<tbody>
<tr>
<td>High Autonomy High Capacity</td>
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<td>Sprawling Megacity, Steady Rollers, Institutions</td>
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<td>Unruly Survivor, Hilly City, Institutions</td>
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<td>Nurtured Star</td>
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Source: Dalberg analysis
This can have implications on OP procurement, both on processes and the type of cities engaging with OP

Our early hypotheses on implications on OP procurement

**Procurement approach**

- A traditional procurement approach, where a city/institution identifies a well-established need for products or services, might not be suitable for OP, given its early-stage, high-risk nature
- Developmental and programmatic procurement can help fund the capex, however, relying on philanthropic/donor/program funding for ongoing operations might not be sustainable (opex 2-4 times), thus needing revenue generating approaches
- Private sector driven procurement might be most suitable for OP, once it has been tested in the market, as private sector players would have a greater incentive to promote sustainability through operational efficiencies and enhancing market linkages for reuse revenue, however, finding collaborators might be a challenge
- A combination of developmental/programmatic procurement, followed by a private sector driven procurement, once the service/product has been successfully tested and proven viability, might be the best approach

**Relevant segments**

- In cases of programmatic procurement, cities with low autonomy but medium or high capacity might be the best candidates for OP, as programmatic procurement might be limited only to funding, and not capacity building
- For developmental procurement, cities with low capacity but medium or high autonomy might be more suited for OP as philanthropic/donor engagement can help them build capacity to sustain operations, in addition to funding
- For cities where we can have a combination of developmental/programmatic procurement followed by a private sector driven procurement, cities with high autonomy and medium capacity will work best
- Once OP is tested and proven its viability, private sector procurement for cities with high autonomy and high capacity will be high-potential
## Contents

<table>
<thead>
<tr>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXECUTIVE SUMMARY</td>
</tr>
<tr>
<td>FSM COVERAGE</td>
</tr>
<tr>
<td>HIGH-LEVEL FINANCING LANDSCAPE FOR FSM</td>
</tr>
<tr>
<td>TECHNOLOGY PROCUREMENT</td>
</tr>
<tr>
<td>BUSINESS MODELS IN FSM</td>
</tr>
</tbody>
</table>
### Around nine business models are most prevalent along the FSM value chain

<table>
<thead>
<tr>
<th>Model Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Scheduled desludging</strong></td>
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<tr>
<td>1</td>
<td>Private, recovery sourced from HHs (Integrated): Private operator funds plant CapEx and recovers from the govt. through a PPP contract or from desludging charges. Same player operates the plant and collects desludging charges from the HHs to finance OpEx, either indirectly or directly through the govt.</td>
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<td>2</td>
<td>Private, with indirect recovery from HHs: Private operators buy own equipment, operate through a city license and are paid fixed fees per HH, collected by the city as special tax from HHs</td>
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<td>3</td>
<td>Govt. vehicles, private operator, indirect recovery from HHs: Private operators lease vehicles from govt. and are paid fixed fees per HH, collected by the city through standalone or clubbed utility bills</td>
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<tr>
<td>4</td>
<td>Govt., with indirect recovery from HHs: Govt. purchases own trucks that carry out zone-wise descheduling, and collects tariff from HHs through standalone or clubbed utility bills</td>
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<tr>
<td>5</td>
<td>Private, with direct recovery from HHs: Private operators buy own equipment, undertake cleaning on-demand and collect market-based charges from HHs that depend on distance and accessibility of tanks</td>
</tr>
<tr>
<td>6</td>
<td>Govt. vehicles, private operator, direct recovery from HHs: Private operators lease vehicles from govt., clean/dump FS, and collect market-based charges from HHs dependent on distance and accessibility of tanks</td>
</tr>
</tbody>
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| **On-demand desludging** | |
| 7 | Private, recovery from commercial sources/market: Private operator funds CapEx fully or partially, operates the plant and collects revenue from sale of reuse products and potentially tipping fees paid by C&T operators to finance OpEx |
| 8 | Phil. CapEx, private operator, recovery from commercial sources/market: Philanthropic funders support CapEx, private player operates and collects revenue from sale of reuse products and potentially tipping fees to finance OpEx |
| 9 | Phil. CapEx, private operator, recovery from non-commercial sources: Philanthropic funders support CapEx, private player operates the plant and OpEx is finances through non-commercial sources such as government or philanthropic funders |

Key learnings: For most of these archetypes, treatment is outsourced, opex funding is a challenge and limited players exist

- ULB governments will often outsource treatment to private players, due to their own limited resources and capacity (e.g. existing and upcoming FSTPs in India)

- Non-profit and government funding dominant, as a result of limited commercial return potential and early-stage, high-risk technologies

- Treatment is almost always outsourced

- Government and philanthropic funding dominate; opex funding for treatment is critical and needs attention

- Opex for treatment 2-4x larger than amortized capex, and crucial to recover through value recovery (reuse), tipping fees, or integrated mechanisms

- Tipping fees hard to recover or price appropriately, without strong enforcement and proximity of treatment plants

- Market linkages for reuse revenue very early stage, more advocacy and innovation needed currently

- Hybrid annuity models beginning to put in place to provide ongoing opex to private operators

- Philanthropic organizations frequently provide opex support, but usually for pilot demonstration

- Operational innovation needed to drive down opex costs of treatment plants; plant selection (through tendering) should emphasize low opex

- FSTP markets nascent, with a few direct players, with strong technical capacity; some have financial capacity for large projects e.g. Ion Exchange, Panse Consultants, Shivam Water Treaters, AIGA Engineers

- Interest levels high in further engagement and geographic expansion

- Direct players

- Most proximate players interested in FSTP contracts, and have technical capacity, but no concrete plans to expand, mostly due to lack of detailed understanding of FSSM (e.g. of SWM players) and financial capacity for projects at scale

- Small players include STP, ETP and SWM plant operators active within states or nationally (e.g. Kings Industries), project viability reduces above INR 1 crore

- Large proximate players include large established companies such as L&T, Gammon, usually active in wastewater, sewage and effluent treatment e.g. L&T, but not FS treatment

- Large proximate players typically undertake large infrastructure projects (transport, power); likely to be interested in FS treatment projects at scale especially through state-level partnerships

Source: CEPT / Dalberg Report on FSM Business Model Landscape