Training of Trainers On Faecal Sludge and Septage Management

Prepared for
Sanitation Capacity Building Platform (SCBP) of National Institute of Urban Affairs (NIUA)

17-18th August 2017
Starottel Hotel, Ahmedabad

CEPT UNIVERSITY

Centre for Water and Sanitation (C-WAS), CEPT University

Session 1 : FSSM need of the hour

Objective of the session . . .

- To highlight the need of FSSM in the context of sanitation situation in the country
- Understanding components of FSSM service chain
- Highlight factors that enable implementation of citywide FSSM services

Key Sanitation facts from CENSUS 2011 - INDIA

18.6% URBAN HHs HAVE REPORTED **NO** TOILETS

32.7% OF URBAN HHs HAVE ACCESS TO **PIPED SEWER**

38.2% HHs HAVE **SEPTIC TANKS**

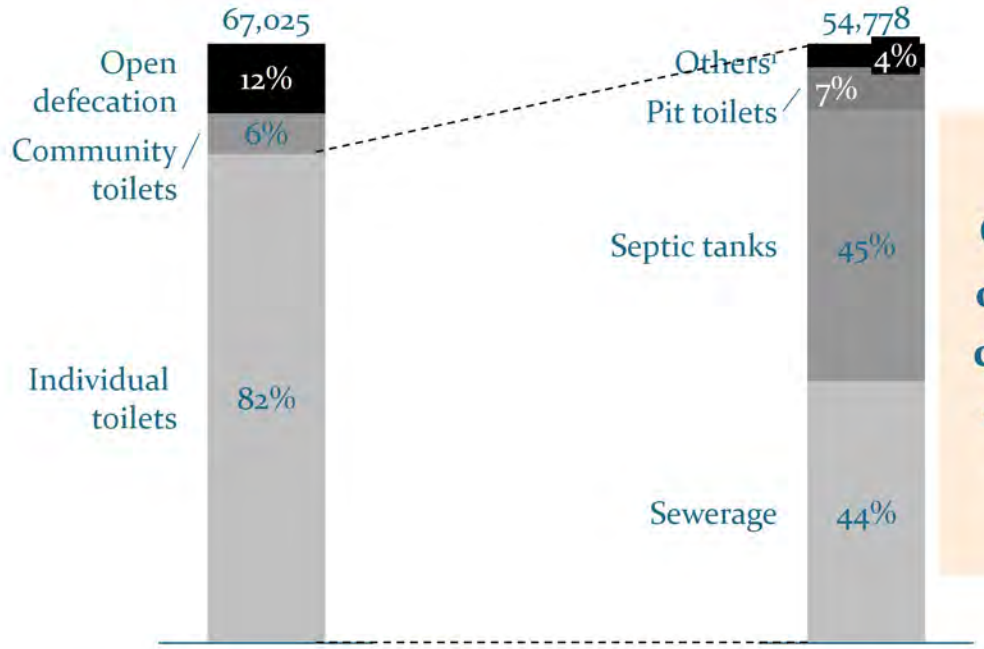
6% OF HHs DEPEND ON **PUBLIC TOILET**

12.6% OF HHs RESORT TO **OD**

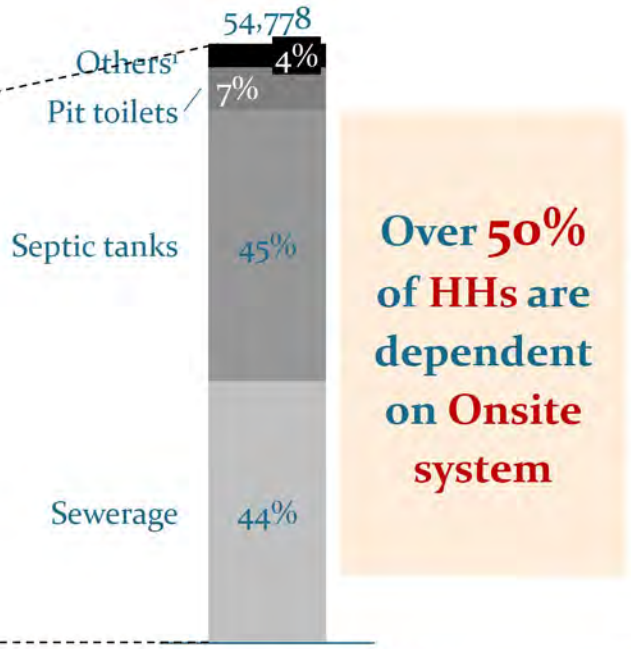
816 STPs IN **358** CITIES

Sanitation situation in INDIA . . .

Access | **Collection and Conveyance** | **Treatment**



Access to type of sanitation for HH in urban India
(in '000 HH)



Methods of disposal of waste by HH with personal toilets in urban India *(in '000 HH)*

Over 50% of HHs are dependent on Onsite system

Status of wastewater treatment in urban India[2] (MLD)

Only 30% of the WW is being treated

37 million people practice open defecation in urban India

28 million people with individual toilets use unsanitary methods of disposal of waste

43,117 MLD untreated wastewater is discharged in water bodies or on land

Note: (1) Others includes primitive methods of C&C such as pour flush toilets-other systems, night soil disposed intro open drain and latrines serviced by humans and animals, (2) "Inventorization of sewage treatment plants " report by Central Pollution Control Board of India (CPCB), 2015

Source: Based on Census of India 2011

Swachh Bharat Mission (SBM) - Urban

Mission Objectives

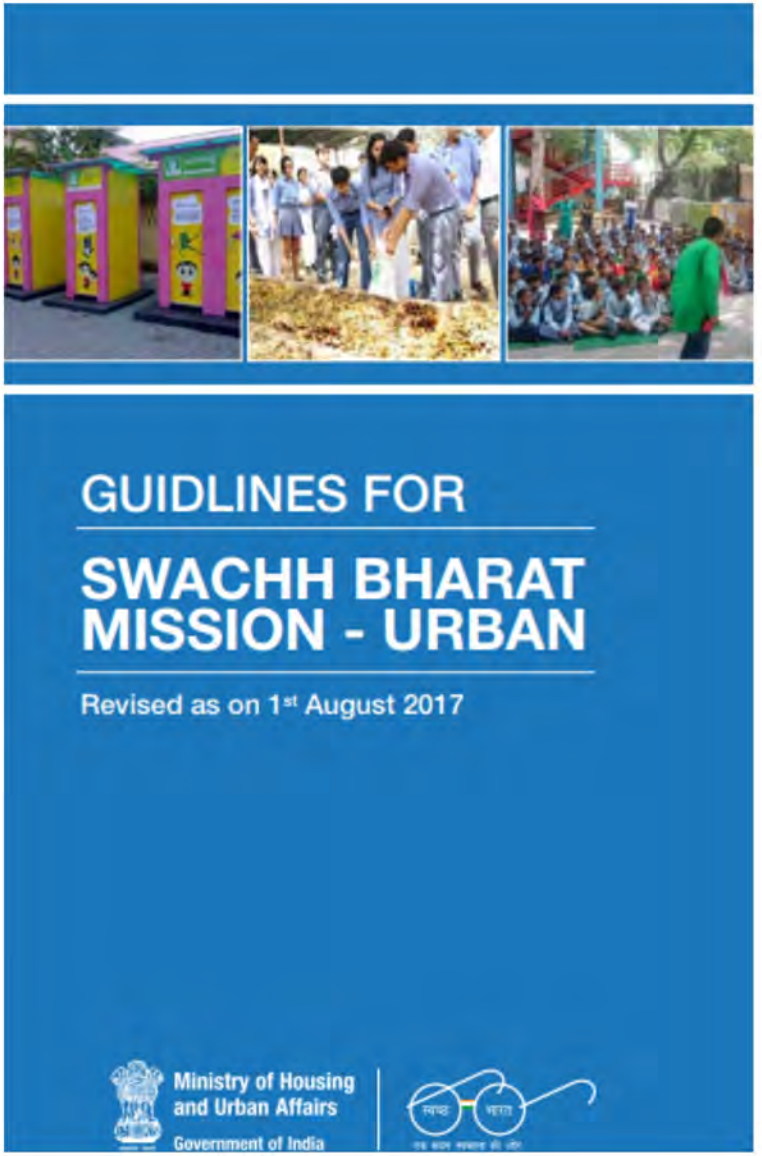
- Elimination of open defecation
- Eradication of Manual Scavenging

SBM (Urban) aims to ensure that

a. No households engage in the practice of open defecation:
b. No new insanitary toilets are constructed during the mission period, and
c. Pit latrines are converted to sanitary latrines.

Mission Components

- Household toilets, including conversion of insanitary latrines into pour-flush latrines
- Community toilets
- Public toilets and urinals



Source: http://www.swachhbharaturban.in:8080/sbm/content/writereaddata/SBM_Guideline.pdf

Swachh Bharat Mission (SBM) - Urban

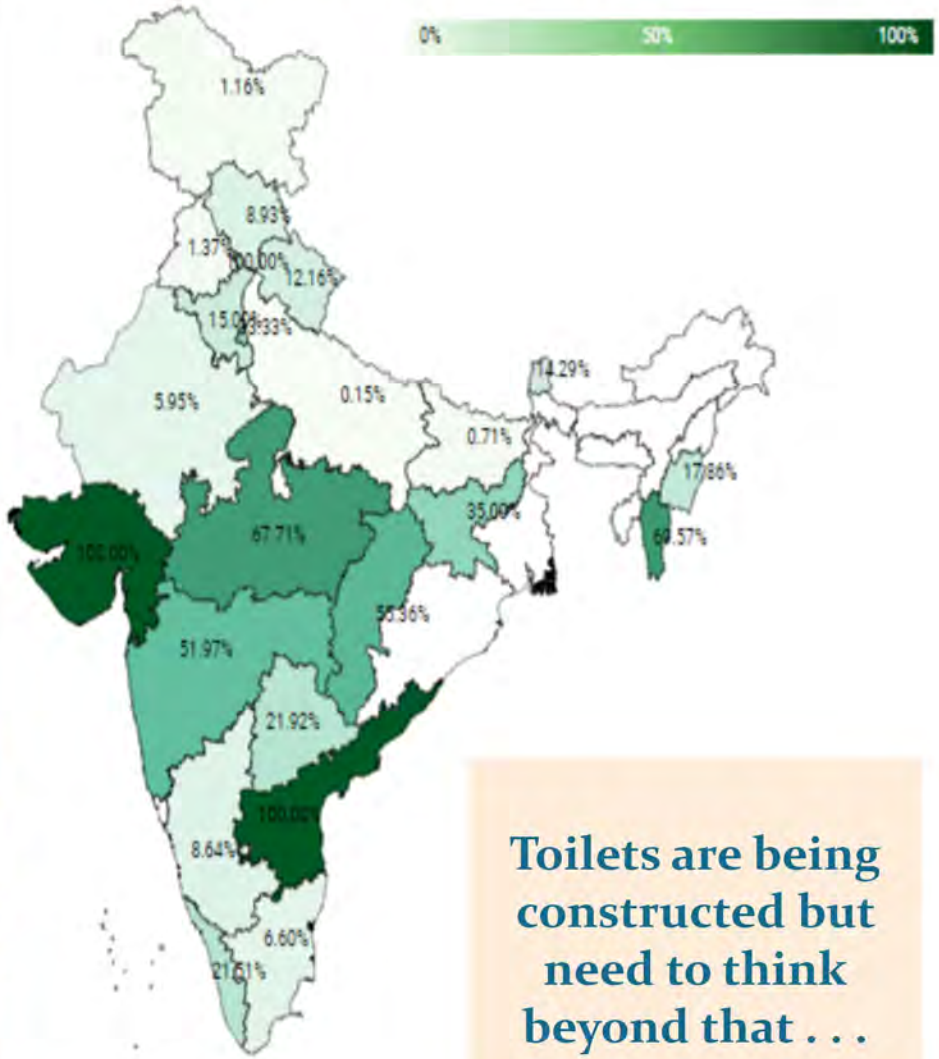
Physical Progress under SBM

33,76,793	1,28,946	1,012
Constructions Achieved	Constructions Achieved	No. of Cities
Individual Toilets	**Community & Public Toilets**	**Open Defecation free**
100% Door to Door Waste Collection	**Waste to Energy**	**Waste to Compost**
Wards Achieved	Current Production (Mega Watt)	Production for year 2016 (Metric Ton)
43,200	**88.4**	**1,64,891.6**

स्वच्छ भारत

एक कदम स्वच्छता की ओर

ODF Status of Urban India



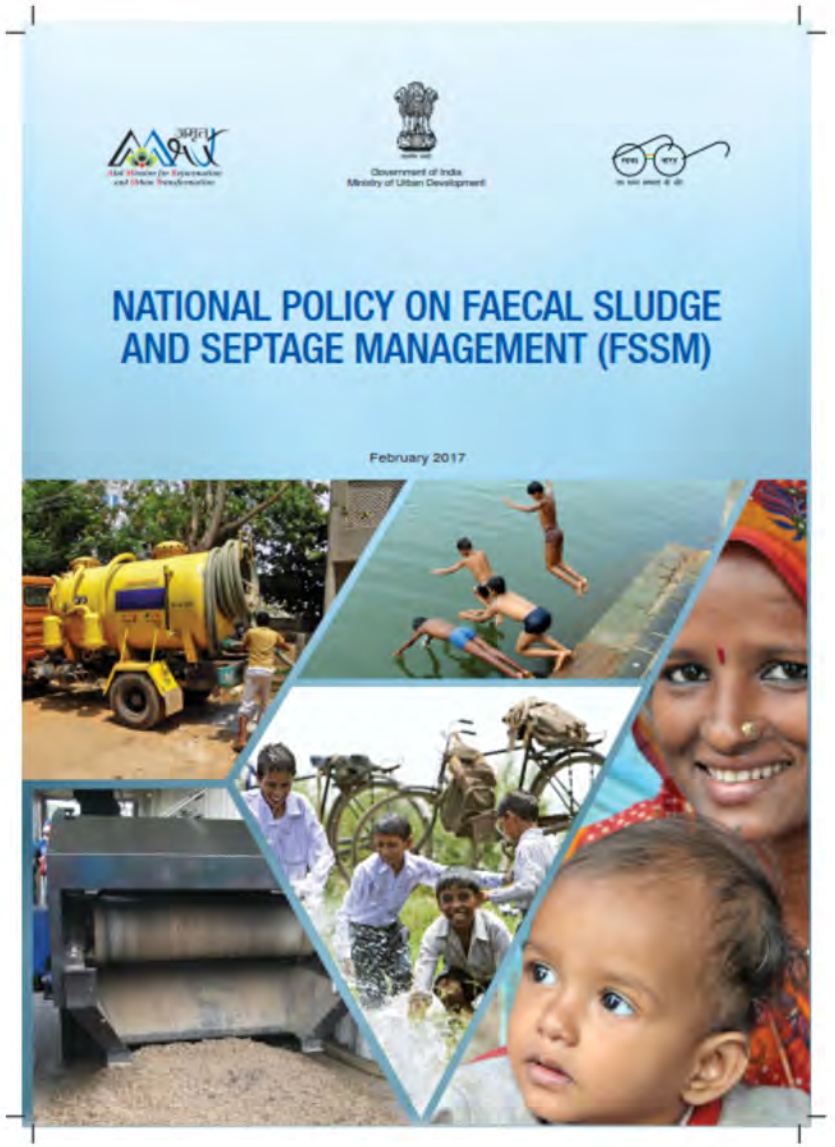
Toilets are being constructed but need to think beyond that . . .

Source: http://www.swachhbharaturban.in; Information retrieved as on 10.8.2017

What is Faecal Sludge . . .

"Faecal sludge is the solid or settled contents of pit latrines and septic tanks.

Faecal sludge (FS) comes from onsite sanitation system such as pit latrines, non-sewered public ablution blocks, septic tanks, aqua privies, and dry toilets."

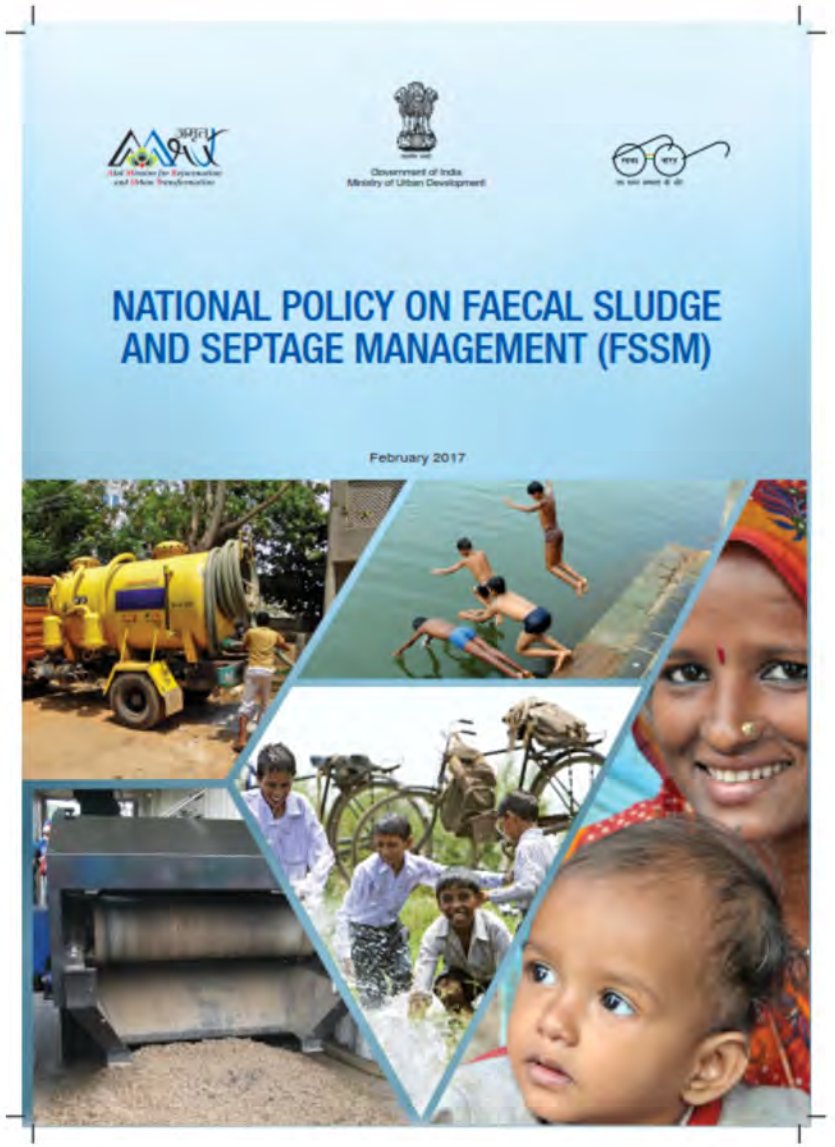


Source : http://amrut.gov.in/writereaddata/FSSM_Policy_Report_23Feb.pdf

What is Septage . . .

"It is the liquid and solid material that is pumped from a septic tank, cesspool, or such onsite treatment facility after it has accumulated over a period of time.

Septage is the combination of scum, sludge, and liquid that accumulates in septic tanks".



Source : http://amrut.gov.in/writereaddata/FSSM_Policy_Report_23Feb.pdf

1 truck of Faecal Sludge and Septage carelessly dumped = 5,000 people shitting in the open!

Source : Chary, Srinivas, (2017), "City Wide Approach to Sanitation : Operationalizing FSM Regulations A Case study of Warangal City" at Ujjain Workshop by Water Aid, ASCI *(mimeo)*

Onsite sanitation and FSSM – emerging questions

38% URBAN HHs TOILETS HAVE SEPTIC TANKS

Are septic tanks linked to soak pits

Are they built as per Codes / Specifications ?

How often are they cleaned ?

Where does the effluent flow ?

What happens to the SLUDGE?

Need for Faecal Sludge and Septage Management (FSSM)

- Facilities like **septic tanks**, dry latrines, community toilets, or other types **accumulate faecal sludge**

- **Septage needs to be removed periodically**. If this septage is **not properly managed**, **negative impacts** on the **urban environment** and on **public health** may result

- **Environmental pollution** is caused by **effluents of not regularly de-sludged septic tanks** or community toilets;

- **Improper handling of septage** regenerates the risks of faecal matter **re-entering the domestic environment**

Table 3: Pollutants in the effluent of on-site treatment Systems

Pollutant	Reason for concern
Total suspended solids	In surface waters, suspended solids can settle and form sludge deposits that smother benthic invertebrates, fish eggs and can contribute to benthic enrichment, toxicity and sediment oxygen demand. Colloidal solids can block sunlight, affect aquatic life and lower the ability of aquatic plants to increase the dissolved oxygen in the water.
Biodegradable organics (BOD)	Biological degradation of organics can deplete the dissolved oxygen in surface waters resulting in anoxic conditions, harmful to aquatic life.
Nitrogen	Nitrogen could lead to eutrophication and dissolved oxygen loss in surface waters. High levels of nitrate nitrogen in drinking water can cause methemoglobinemia in infants and pregnancy complications for women. Livestock can also suffer from drinking water high in nitrogen.
Phosphorus	Phosphorus would also lead to eutrophication and reduction of dissolved oxygen in surface waters.
Pathogens	Parasites, bacteria and viruses can cause communicable diseases through body contact, ingestion of contaminated water or shellfish. Transport distances of some pathogens (bacteria and viruses) can be quite significant.

Effluent and septage from septic tanks systems impacts ground and surface water resources

Source : Advisory note on septage management in urban India, MoUD January 2013

Emerging recognition of FSSM

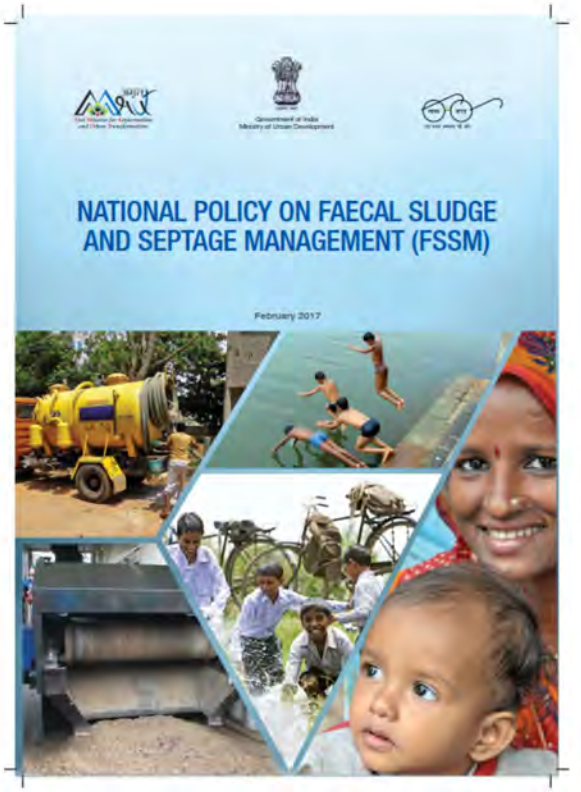
- **National Policy** on **FSSM** by MoHUA, GoI
- **National declaration** on **Septage Management** by MoHUA, GoI
- One of the major **thrust areas** of **AMRUT**
- **Primer** on **septage Management** and **Rapid Assessment tool** for estimating **budget requirements** for **FSSM**
- **Septage Management Advisory** of Government of India provides references to CPHEEO guidelines, BIS standards, and other resources for preparing SMP / FSSM plan.

Emphasis on FSSM in National Policy

The **key objective** of the urban FSSM Policy is to **set the context, priorities, and direction** for, and to **facilitate, nationwide implementation of FSSM services** in all ULBs such that **safe and sustainable sanitation** becomes a reality for all in each and every household, street, town and city

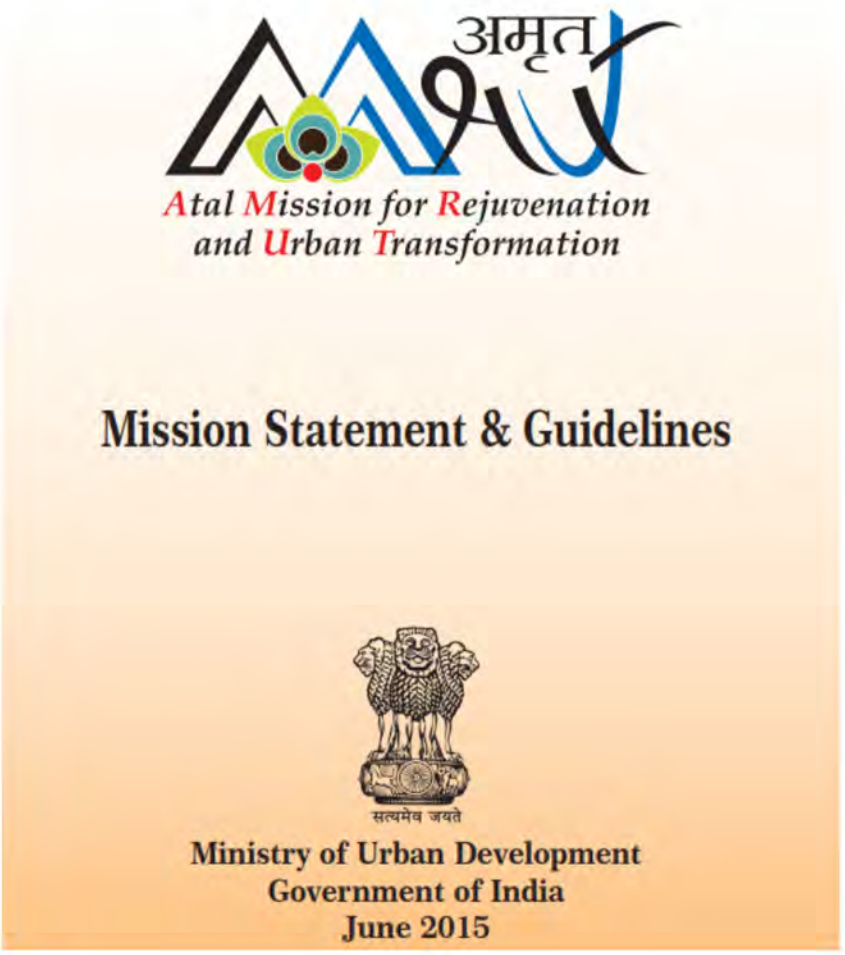
Key Milestones :

- **Leveraging FSSM to achieve 100% access to safe sanitation**
- **Achieving integrated citywide Sanitation: Mainstreaming Sanitation**
- **Sanitary and Safe disposal**
- **Awareness generation and behavior change**

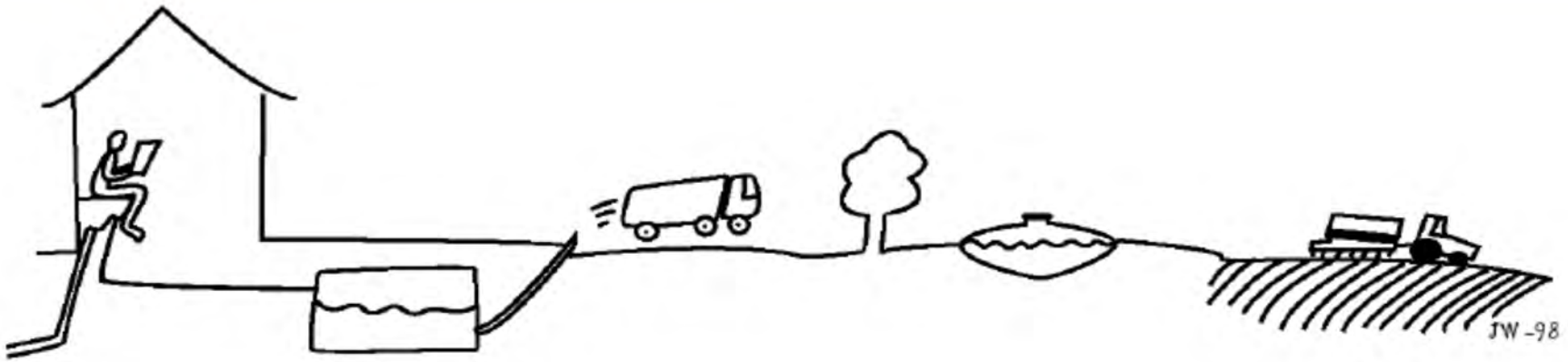


Emphasis on FSSM in AMRUT

- Service Delivery – Focus on infrastructure that leads to delivery of services to citizens.
- Incentives for achievement of Reforms – State to prepare FSSM policy
- Financial Allocation under AMRUT for FSSM related projects



Sanitation Service chain . . .



Access	Collection	Conveyance	Treatment	Reuse/Disposal
Describes **type of toilet facilities** the user accesses.	Describes **ways of collecting** and sometimes treating the **faecal waste** generated by the users.	Describes **transport of waste** from collection to the treatment / disposal site	Describes way in which waste is **treated**	Describes the way in which waste **reused / disposed off**

Type of Access . . .

Individual toilet

- Toilets used by households at their home

- On premise toilet

Community toilet

- Toilets used by residents / community that do not have toilet at their home

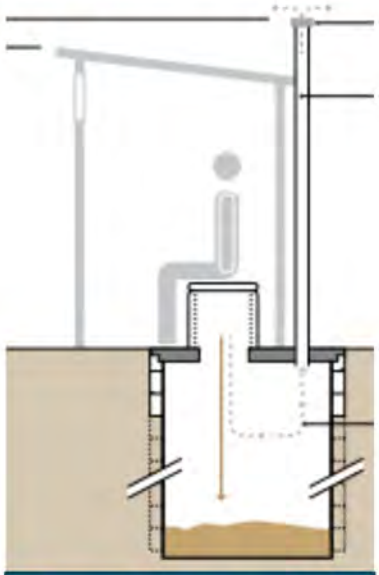
- Located near a community / slum area

Public toilet

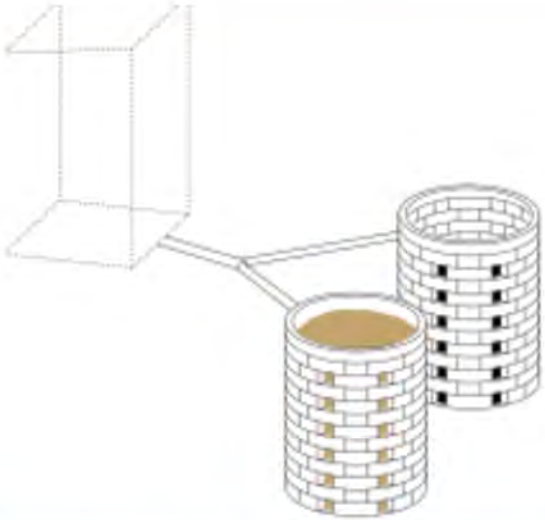
- Toilets used by floating population

- Located in market area, bus stop , commercial area

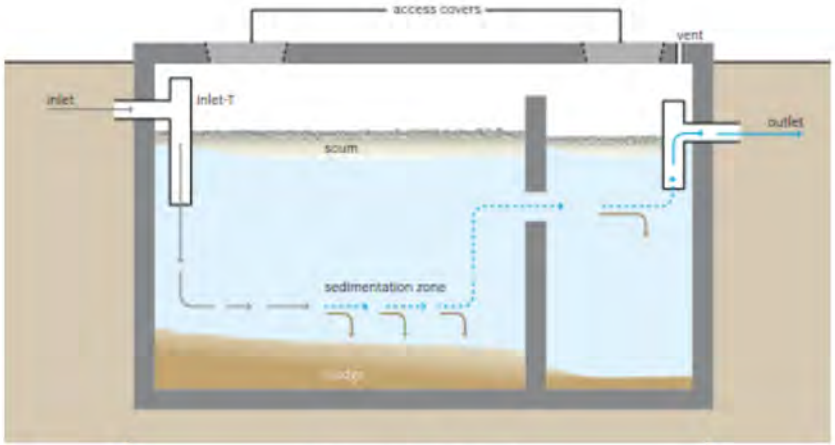
Type of Collection systems . . .



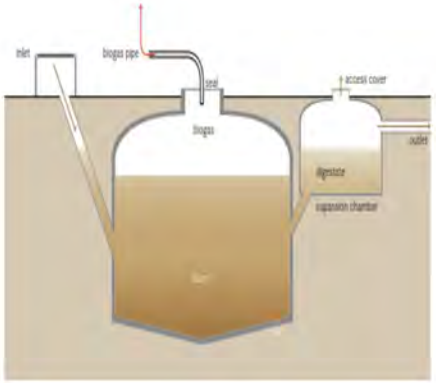
Single pit toilet



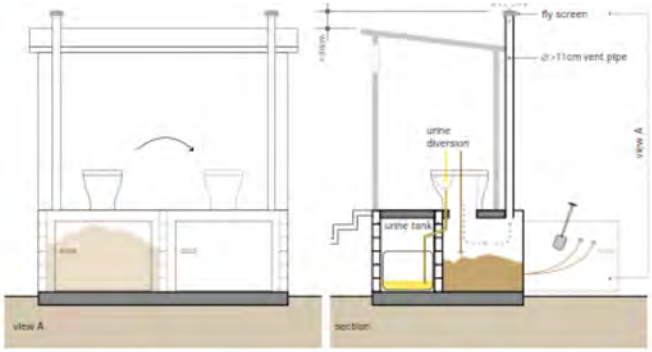
Twin pit toilet



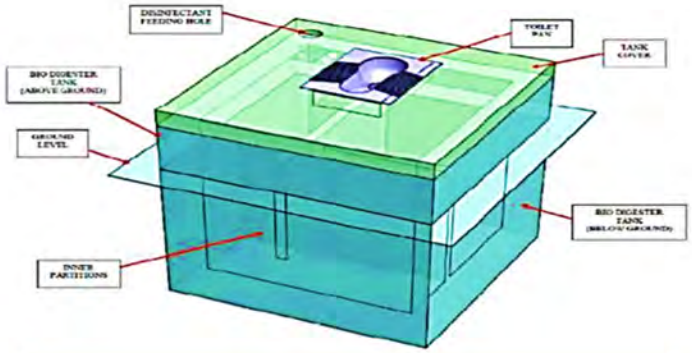
Septic tank



Biogas



Composting toilet



Bio-digestor

Type of Conveyance systems . . .

Conventional Vacuum Tanker

For septic tanks which have proper **access roads**, a **larger vehicle** maybe used

Mini-Vacuum Tanker (Vacutug)

For septic tanks located in **narrow lanes** or those that do not have proper access roads, **smaller vehicles** maybe used

Gulper

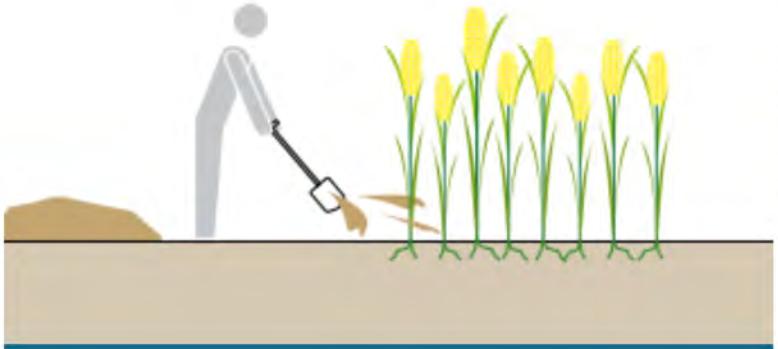
Smaller mechanized tricycle/ motorcycle mounted collection tanks of 20–40 litres capacity with gulper or smaller vacuum pumps at the primary level backed by a secondary transport system may work in the informal slum settlements.

Type of treatment systems . . .

Treating at an Existing Sewage Treatment plant

Treating at an Independent Faecal Sludge and Septage treatment plant (FSSTP)

Types of reuses / disposal systems. . .



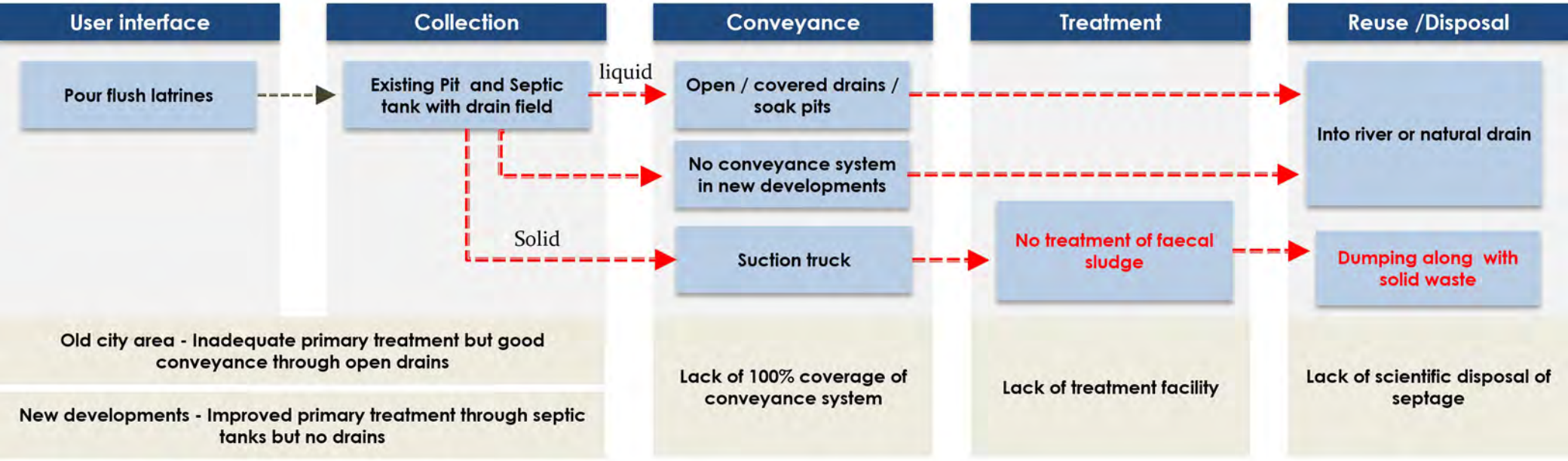
Soil Conditioning

Surface disposal

Biogas

Backfilling Material

Current situation of septage management in Small – Medium towns in India



Missing links in Sanitation value chain in a city

Discussion points . . .

- For your state how will assess sanitation situation ?
- What is the difference between faecal sludge and septage?
- Sanitation Service Chain for FSSM ?

References

- Central Pollution Control Board (CPCB), (2015), *"Inventorization Of Sewage Treatment Plants"*, Ministry of Environment and Forests, GoI Retrieved from http://nrcd.nic.in/writereaddata/FileUpload/NewItem_210_Inventorization_of_Sewage-Treatment_Plant.pdf
- Chary, S (2017). *"City Wide Approach to Sanitation : Operationalizing FSM Regulations A Case study of Warangal City"*. ASCI. Presented at consultation on Faecal sludge and septage management workshop, Ujjain.
- Ministry of Urban Development (MoUD), (2013), *"Advisory note on septage management in urban India"*. MoUD, GOI.
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- Ministry of Urban Development (MoUD), (2017), *"National Policy on Faecal Sludge and Septage Management (FSSM)"*. MoUD, GOI.
- *Swachh Bharat Urban*. (2017)."*Information on Swacchh Bharat status in India"*. Retrieved 10 August 2017, from http://www.swachhbharaturban.in

Session 2 : Challenges and Opportunities in FSSM

Objective of the session . . .

- Highlight current practices for each link of the sanitation service chain

- Highlight various challenges that are encountered for proper implementation of FSSM services.

Challenges in Access

Individual Toilet

- Space issues
- Affordability issues
- Inadequate water supply in selected regions
- Dilapidated/ Quality
- Insanitary toilet -Unsafe toilet

Community Toilet

- Poor condition
- Lack of O&M
- Water Supply and Electricity issue
- Limited time access
- Not adequate
- Require huge space at prime location
- Categorized as Unsafe toilet as per Joint Monitoring programme

Public Toilet

Challenges in collection system

Septic tanks are below the toilets and don't have access covers

Inaccessible septic tanks with sealed tops

Septic tanks located near drains and sealed from the top

Single pit toilets

Oversized septic tanks

Toilets directly connected to drains

Challenges in Conveyance system

Services mainly provided by city governments

Unsafe handling of septage

Informal Private sector

Emptying when the tank is full

- No monitoring mechanism for informal sector
- Cleaning cycle greater than 8-10 years against recommended cycle of 2-3 years
- Due to infrequent cleaning, septage begins to solidify in tanks and septic tank fills up, faecal matter along with effluents is released into the drains

Challenges in Disposal system

Disposal of septage at dump site

NO TREATMENT OF FAECAL SLUDGE & SEPTAGE

Disposal of septage in open land

Disposal of septage in water bodies

Source : Chary, Srinivas, (2017), "City Wide Approach to Sanitation : Operationalizing FSM Regulations A Case study of Warangal City" at Ujjain Workshop by Water Aid, ASCI *(mimeo)*

Standards for Disposal

Effluent discharged standards for Sewage Treatment Plant are mentioned below:

Sl. No.	Industry	Parameters	Standards for New STPs (Design after notification date)*
	Sewage Treatment Plant	pH	6.5-9.0
		BOD	10
		COD	50
		TSS	20
		NH_4-N	5
		N-total	10
		Fecal Coliform (MPN/100ml)	<100

Note:
(i) All values in mg/l except for pH and Coliform.
(ii) These standards will be applicable for discharge in water resources as well as for land disposal. The standards for Fecal Coliform may not be applied for use

Standards of disposal of septage

Source : Gazzate notification by MoEF, 24th November 2015
http://www.moef.gov.in/sites/default/files/Draft%20notification%20of%20Sewage%20Treatment%20plan.PDF

Actual quality of septage that is being disposed off

Sr.No.	Parameter	Faecal Sludge & septage
	Test results	
1	pH	7.6-9
2	BOD	6000 - 16500
3	COD	11408 - 27776
4	TSS	9000- 90000
5	Total Nitrogen (as N)	300-800
6	Faecal Coliforms (MPN/100ml)	>1600

Discussion
Challenges and Opportunities of FSSM

- **What are current practices and challenges from your state perspective?**
- **What are institutional and monitoring challenges in FSSM?**
- **Divergent Challenges faced by different stakeholders**
  - Households,
  - Private emptier,
  - City government
  - End Users
- **Links with SBM / AMRUT**

Session 3: Introduction to the FSSM process

The FSSM planning process . . .

"Main objective this session on Citywide FSSM process is to help users identify **key areas of assessment** while planning for **FSSM activities .**

This process can be facilitated by various tools that are available in the IFSM toolkit for assessment and planning purpose. This will help users make **informed discussion** with **stakeholders** and provide for **'evidence-based' decision making**"

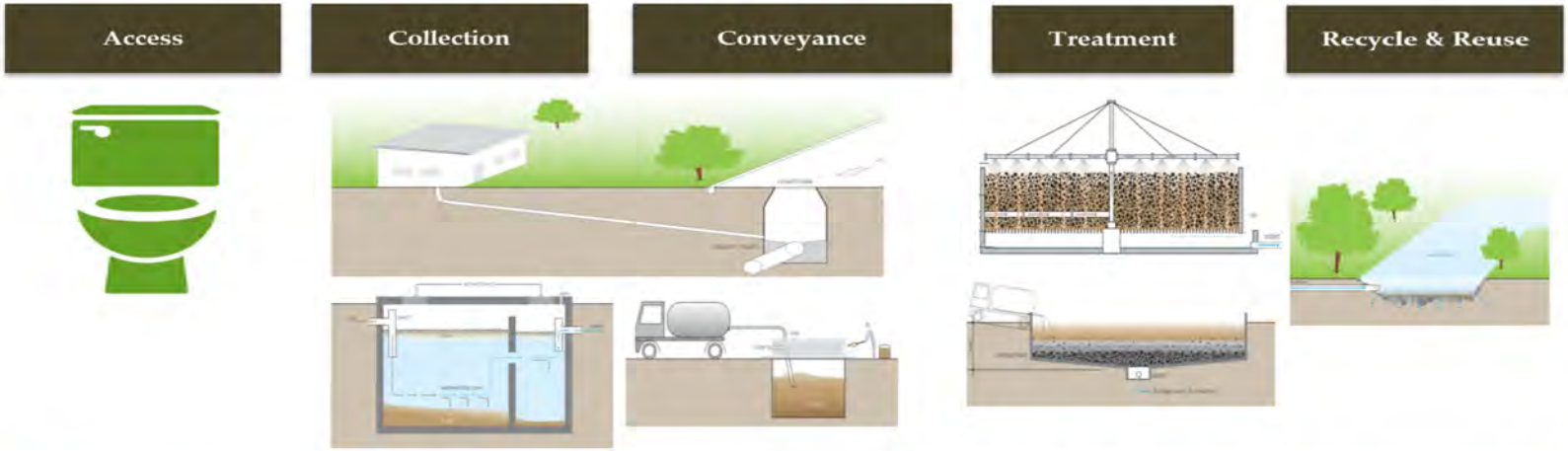
Five Stages of Assessment . . .

Stage 1 : Assessing Service Performance Across the Full Service Chain

Assessing service performance across the **service chain** through a city level assessment is the first step in planning process.

It is an important exercise, which provides an **initial sense** of the **state of FSM in the city**, help in understanding the context and **identifying gaps** in key services.

The **data collection** and **field assessments** in the city should start with a kick-off meeting with **key stakeholders**.



Stage 1: Assessment across sanitation Service Chain . . .

Access

Identify Dependence on Various Toilet Facilities

Capture details of community / public toilets

Spatial Variations

Collection

Assess details of Septic Tanks related to location, size, design and access

Dependency on On-Site Systems

Conveyance

Assess available infrastructure and process for septic tank emptying

Details related to type / size of Trucks

Coverage in different parts of city

Number of Septic tank emptied annually

Private sector availability

Treatment / Disposal / Reuse

Identify present location of septage disposal/treatment

Assess the capacity requirement / adequacy of a Septage Treatment Facility

Reuse of treated septage

Market and Demand for Reuse

Stage 1: Citywide Sanitation assessment through Indicators - SAN Benchmarks

Citywide Sanitation Indicators (Sewerage system + Onsite systems)	
1. Coverage of toilets	Percentage of properties with access to toilet facility in the city
2. Coverage of adequate sanitation system	Percentage of households with individual or group toilets connected with adequate sanitation systems (sewer network/ septic tank / double pit system) to total households in the city.
3. Collection efficiency of sanitation system	Weighted average of collection efficiency of each sanitation system, weighted by share of households dependent on each sanitation system.
4. Adequacy of treatment capacity of sanitation system	Weighted average of adequacy of treatment plant capacity available for each sanitation system, weighted by share of households dependent on each sanitation system.
5. Quality of treatment of sanitation system	Weighted average of quality of treatment of each sanitation system, weighted by share of households dependent on each sanitation system.
6. Extent of reuse and recycling in sanitation system	Weighted average of extent of reuse of treated wastewater and sludge after adequate treatment as a percentage of wastewater and sludge received at the treatment plant, weighted by share of household dependent on each sanitation system.

Stage 1: Tools for assessing service performance

TOOLS available for **ASSESSING** service **PERFORMANCE** across the service chain

Assessment areas		
Assessment through City level Performance Indicators	Assessment across each link in the service chain	Summary and vision

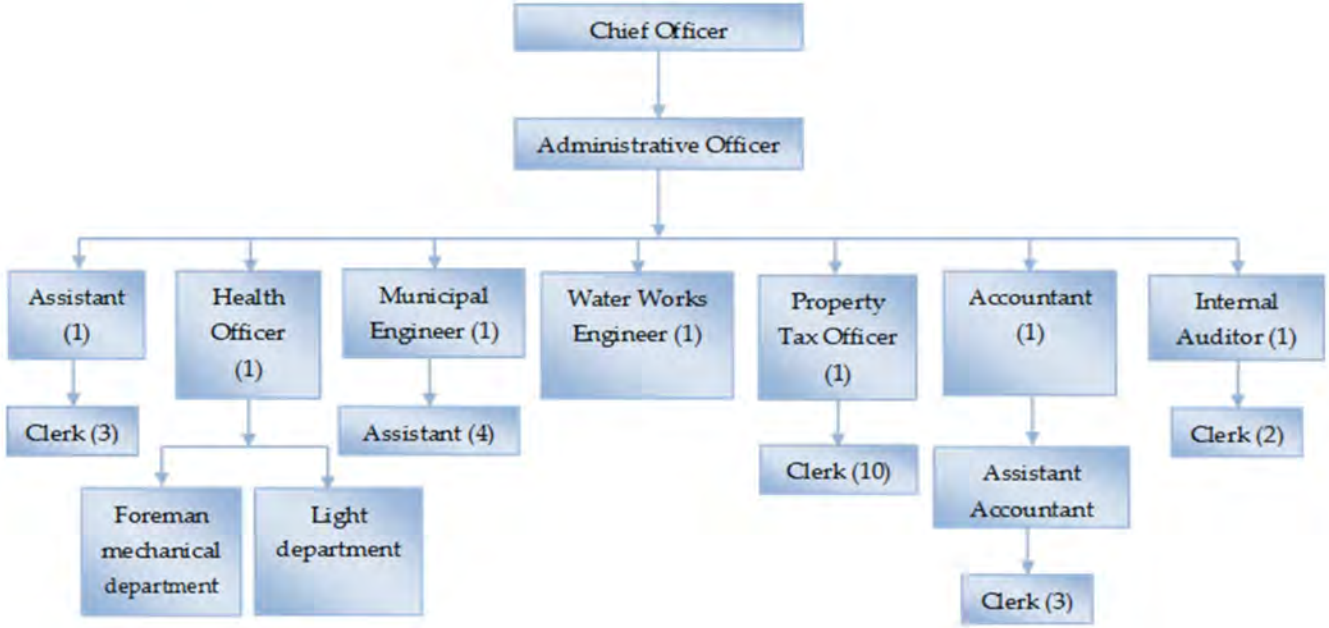
Assessment Tools	Download
1. SANIPLAN: Information collection and initial performance assessment	a. SaniPlan , SaniPlan-FSM b. Data for SaniPlan Input:List of sources
2. Physical and spatial analysis of city	a. Sample maps
3. Field assessment of toilets and onsite systems	a. SaniTab tool (Android installer .apk file/ sample questionnaire) b. Manual for Surveyors c. Template for survey of small contractors and masons d. Template for technical assessment of onsite systems
4. Field assessment of emptying services and treatment	a. Template: Onsite system emptying service b. Template: Wastewater quality assessment

Source : IFSM toolkit - http://ifsmtoolkit.pas.org.in/

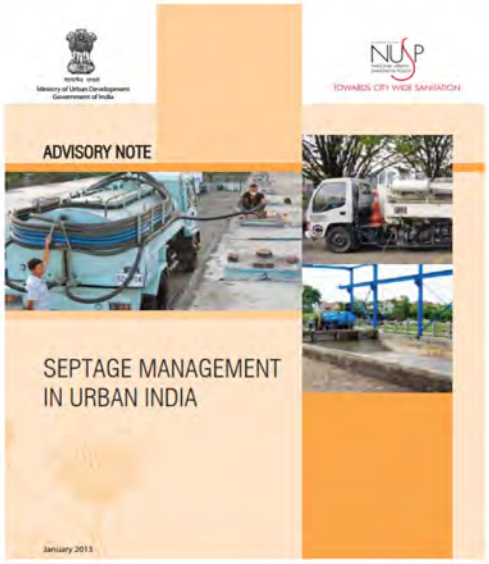
Stage 2: Assessment of enabling environment: Policy, Regulation and Institutions

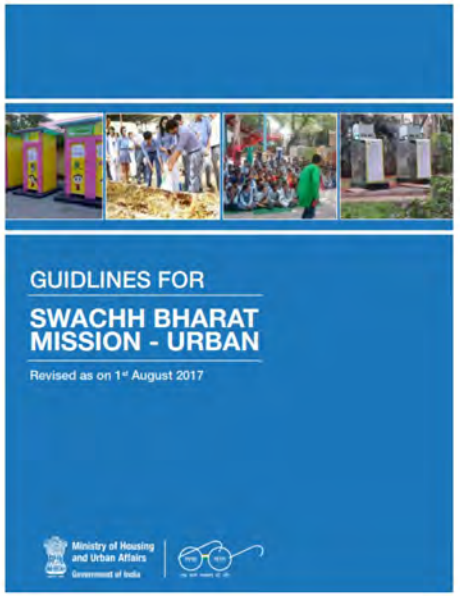
It is important to **understand** and **assess** the **prevailing enabling** and **regulatory environment** as well as **capacity** of local **stakeholders** to **manage** the citywide **FSM services**.

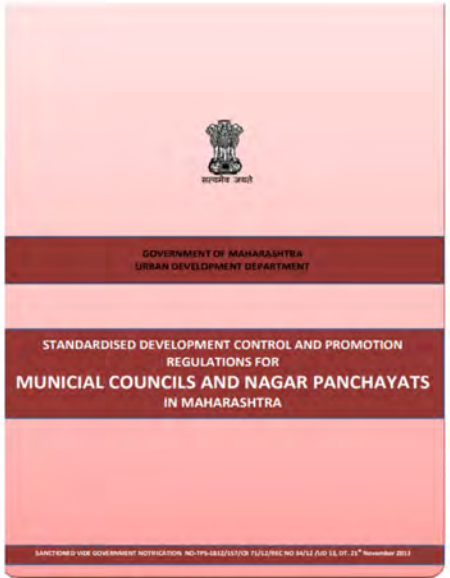
This can be **assessed** by a review of: a) **State/national policies** and guidelines on FSM, b) **Regulatory framework** for treatment, disposal, and reuse of faecal matter, and c) assessing **roles** and **responsibilities** of **local government** for FSM.

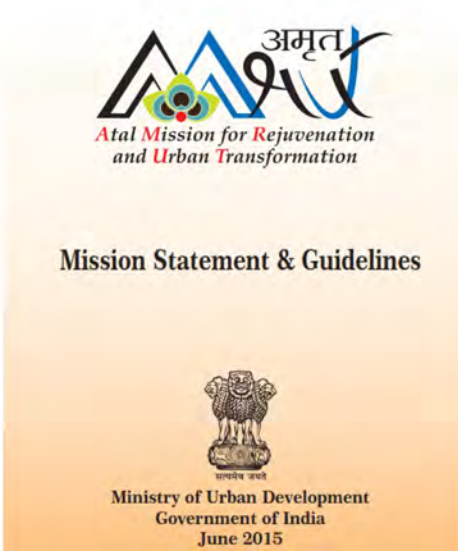


Stage 2: Review of state policies , acts & programmes that enable FSSM









Stage 2: Assessing local capacity for FSSM

- Understand the **governance** and **institutional mechanism** of the **local government** (or the agency responsible for FSSM), and review of city wide plans, if any; especially those **related to sanitation**

- **Assess** the **organizational structure** and **responsibilities** related to **septage management** in the agency

- **Review of outsourcing** contracts and its management

- **Capacity assessment** of local government and **gaps for FSSM** – e.g. developing contracts and monitoring mechanisms

Stage 2: Tools for policy and governance assessment

TOOLS available for ASSESSING policies, REGULATIONS and CAPACITY of Local government

Assessment areas		
National and state policy and guidelines	Regulatory regime for FSM and the institutional roles	Assessing local capacity for FSM

Assessment Tools	Download
5. Assessing policies and regulations affecting FSM at local levels	a. Sample policies and guidelines (NUSP , FSM guidelines GOI / GoM , GoTN , FSM in Urban Maharashtra , Other Sanitation Acts)
6. Assessing capacity at local level: local government and other stakeholders	a. Examples of Process mapping b. Examples of citizens charter c. Interview guide for local government to assess capacity for PSP

Source : IFSM toolkit - http://ifsmtoolkit.pas.org.in/

Stage 3 : Technology options for FSSM services

In designing a citywide IFSM service, it is important to **assess technology options** for each link in the **service chain**.

This ranges from **appropriate toilets** and **onsite systems** such as septic tanks to **conveyance** as well as **treatment** and reuse.

Toilets and its connectivity

Twin pit

Bio-digestor toilet

Emptying services

Conventional Vacuum Tanker

Mini-Vacuum Tanker (Vacutug)

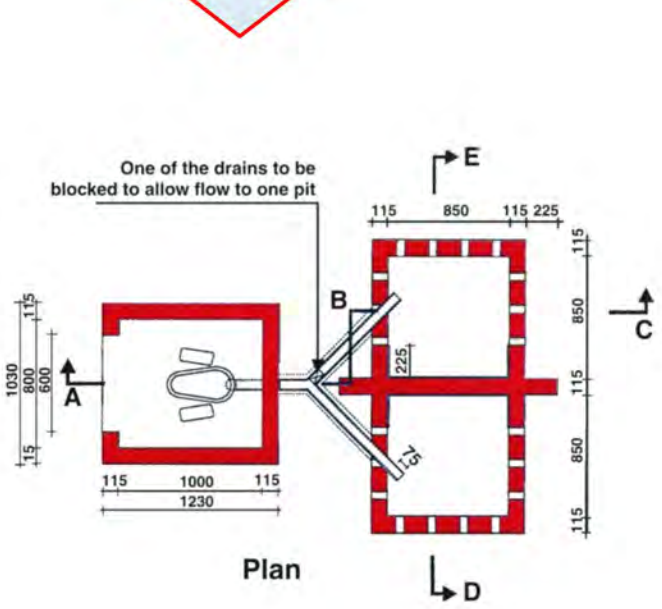
Treatment technologies

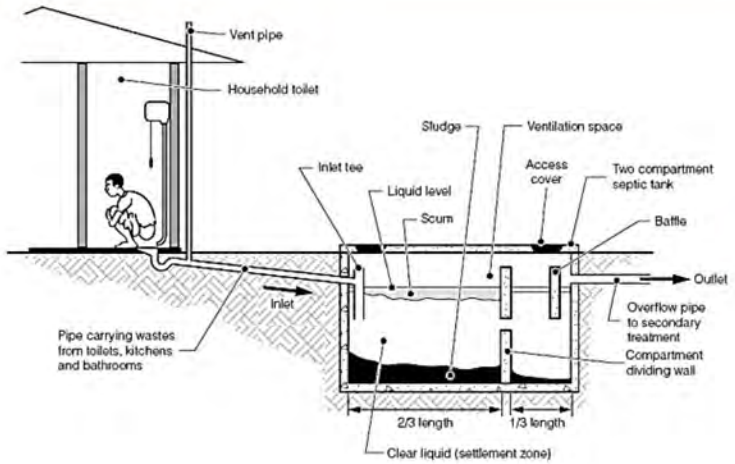
Sludge drying bed

Co-composting

Stage 3: Assessing options for toilets and septic tanks

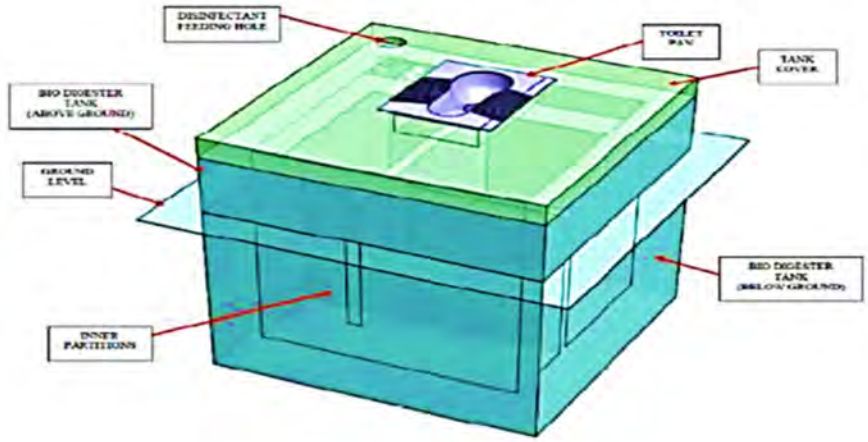
Twin pit toilets





2-3 Chambered septic tanks

Bio Digester toilets



Source : Guidelines for Swachh Bharat Mission – Urban (2017), Ministry of Housing and Urban Affairs (MoHUA), Government of India (GoI)

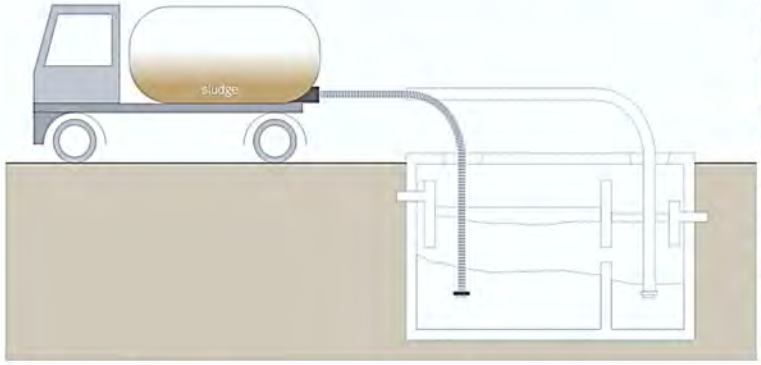
Stage 3: Assessing options for emptying services and conveyance

"When the pit is Full".

Often a tank is emptied when it is full. There is a tendency to use/build oversized septic tanks to avoid frequent emptying. It is important to assess how often a septic tank is emptied. Such information will need to be gathered through a household surveys.

Planning Decision

Demand desludging **V/S** **Scheduled desludging**



Sketch adopted from compendium of sanitation systems and technologies, Eawag

Example

In India: the Central Public Health Engineering and Environmental Organization (CPHEEO) suggests:

*"**Yearly desludging of septic tank is desirable**, but if it is not feasible or economical, then **septic tanks should be cleaned at least once in two - three years**, provided the tank is not overloaded due to use by more than the number of persons for which it is designed"*

Pg 9-22, CPHEEO Manual

Stage 3: Vehicular options for septage collection

Conventional Vacuum Tanker

For septic tanks which have proper access roads, a larger vehicle maybe used

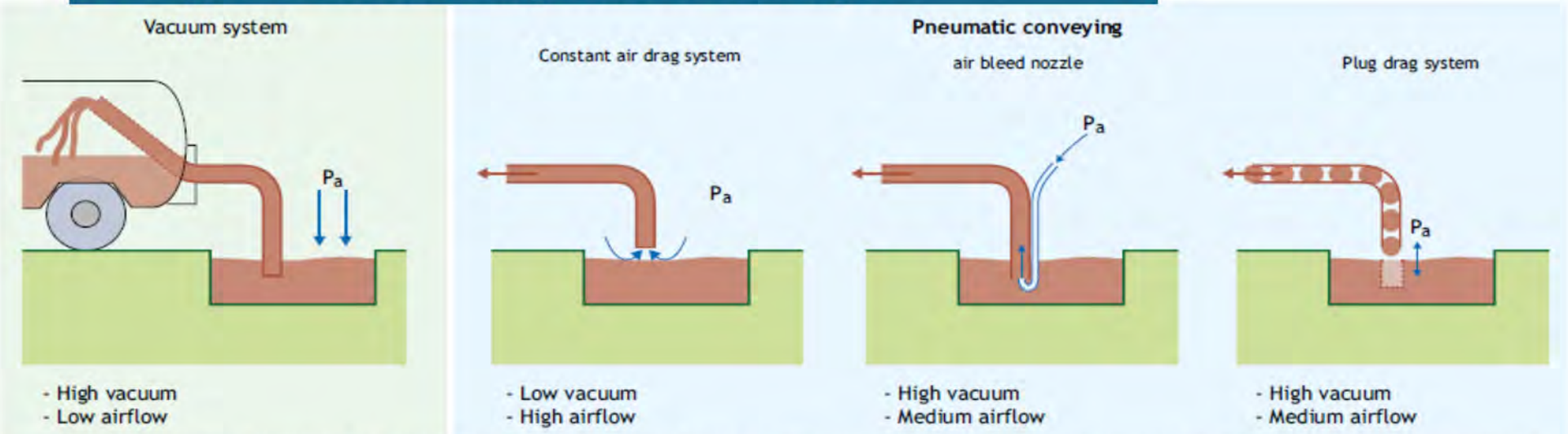
Mini-Vacuum Tanker (Vacutug)

For septic tanks located in narrow lanes or those that do not have proper access roads, smaller vehicles maybe used

Gulper

Smaller mechanized tricycle/ motorcycle mounted collection tanks of 20–40 litres

Four types of vacuum sludge removal techniques



Source: STRANDE, L. (Editor); RONTELTAP, M. (Editor); BRDJANOVIC, D. (Editor) (2014): Faecal Sludge Management. Systems Approach for Implementation and Operation. London: IWA Publishing. Pg-81

Stage 3: Assessing options for treatment and reuse of faecal sludge/septage

Treatment / Reuse / Disposal

- Treatment at **existing sewage treatment plants**
  - Septage addition at the **nearest sewer** manhole
  - Septage addition **at the STP**
  - Septage addition to **sludge digesters/sludge drying beds**
- Treatment at **independent septage treatment plants**
  - **Space is not a constraint** : Lime treatment, Sludge drying beds, Anaerobic baffled reactor, stabilization pond, Constructed wetland, co-composting with solid waste
  - **Space is a constraint** : Mechanical Dewatering system
- Properly **treated sludge** can generate energy and can be **reused** to reclaim parched land by application **as soil conditioner**, and/or as a **fertilizer**






Source : Advisory note on Septage management in Urban India (2013), MoUD, GoI

Stage 3: Tools for assessing technology options

TOOLS available for ASSESSING TECHNOLOGY options across service chain

Assessment areas		
Assessing technical options for toilets and septic tanks	Assessing options for emptying services and conveyance	Assessing options for treatment and reuse of fecal sludge/septage

Assessment Tools	Download
7. Assessing options for conveyance of septage services	a. Determining infrastructure required for septic tank emptying cycle b. Template for licensing of septage transporter c. Template manifest form for emptying
8. Assessing options for treatment and reuse of fecal sludge	a. Factors influencing selection of treatment facilities

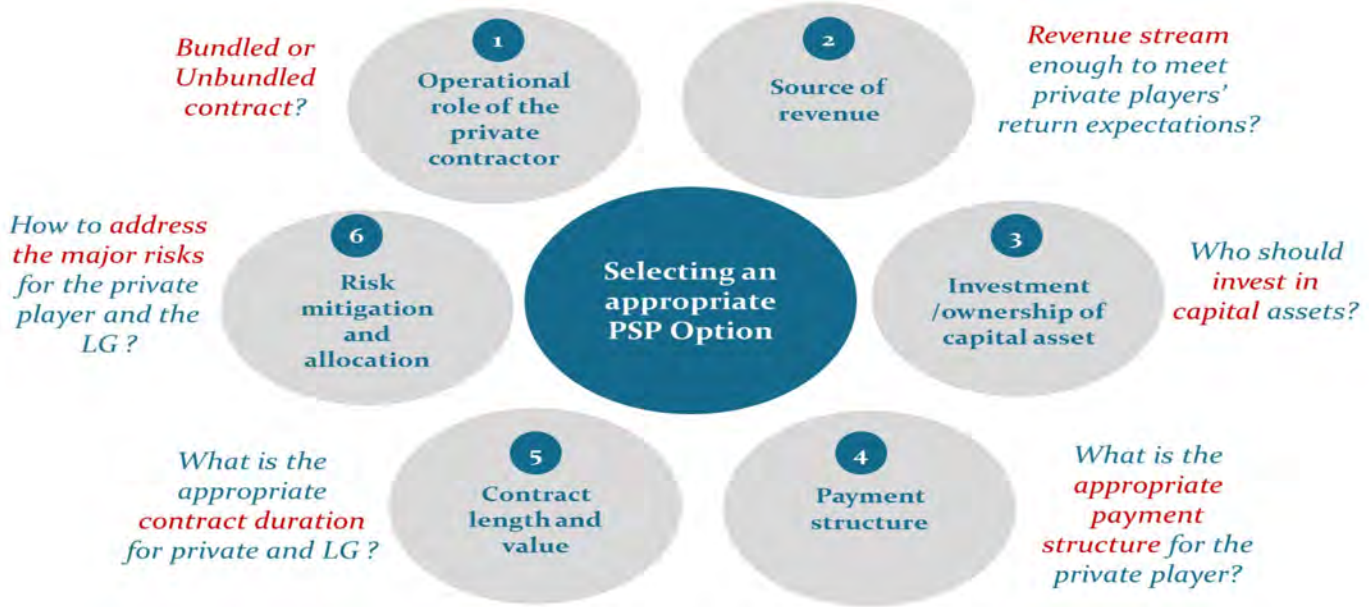
Source : IFSM toolkit - http://ifsmtoolkit.pas.org.in/

Stage 4 : Exploring Potential private sector role across the service chain

While the **city governments** generally **have** the **mandate** to **ensure service provision**, often there is an **active private sector** that provides FSM services in the city.

It is necessary to **assess** the **current role** of **private sector** providers as well as their **potential role** in a citywide service provision

The assessment will thus need to start with a quick **landscape analysis**, and can be followed by a **detailed assessment** after the FSM strategy is developed.



Stage 4: Tools for assessing potential of PSP

TOOLS available for ASSESSING potential for PRIVATE sector PARTICIPATION

Assessment areas		
Assessing local government capacity for PSP	Landscape study of private sector	Develop and review potential structure of PSP option

Assessment Tools	Download
9. Guide to a landscape study of private sector	a. Interview guide for Private sector players
10. Review of potential structure of PSP option	a. Interview guide for Local government about FSM-PSP structure and contracts b. Interview guide for Private sector about FSM-PSP structure contracts c. Model contract/bid documents (O&M / construction)

Source : IFSM toolkit - http://ifsmtoolkit.pas.org.in/

Stage 5 : Financial Assessment

To ensure financial **sustainability** of **FSSM services**, it is important to **assess capacity for financing** both capital and O&M expenditure over the plan period.

This can start with an **assessment** of **financial** requirements for both **capital** and **O&M expenditures**.

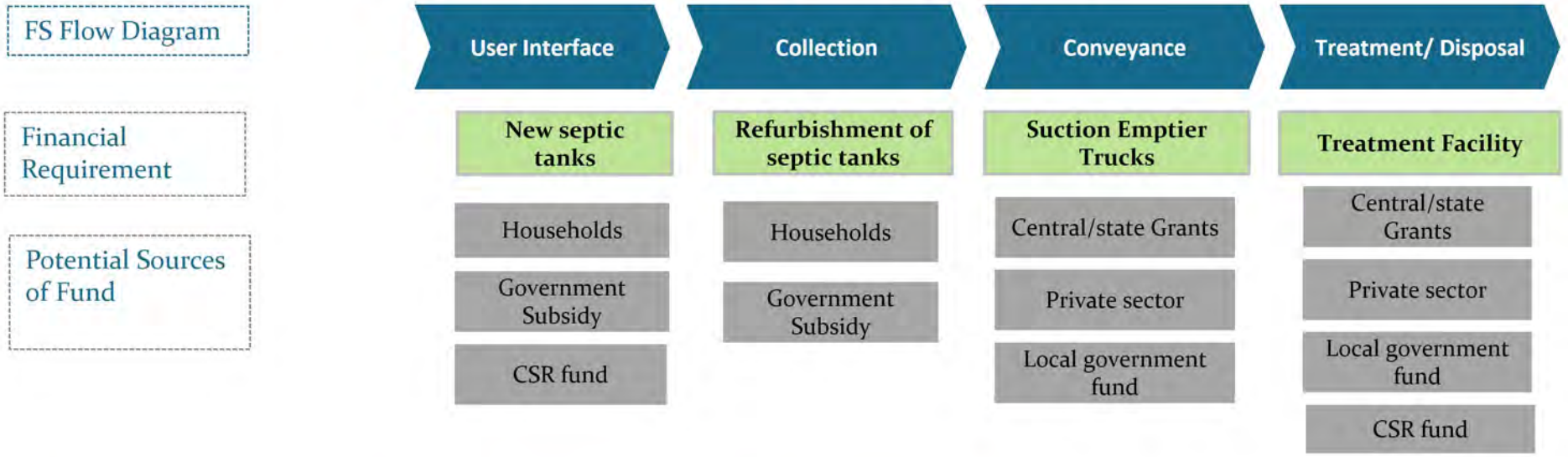
The assessment also **provides guidance** on **potential sources** of **finance** for meeting these expenditures including through external **grants**, **private sector investments**, user contributions, external **debt** or through local government internal resources.

Assessment of Financing requirement across FSSM service chain

FS Flow Diagram	User Interface	Collection	Conveyance	Treatment/ Disposal
Financial Requirement – Capex	New septic tanks	Refurbishment of septic tanks	New Suction Emptier Trucks	**Treatment Facility-** Land cost, construction cost
Financial Requirement – Opex			**Operation of Emptier trucks–** Fuel cost, salaries of truck driver, etc	**Operation of Treatment Facility-** staff salary, electricity bill, pumps replacement, etc

Stage 5: Potential sources of finance

A. Potential sources of finance for Capital Expenditure



B. Potential sources of finance for O&M Expenditure

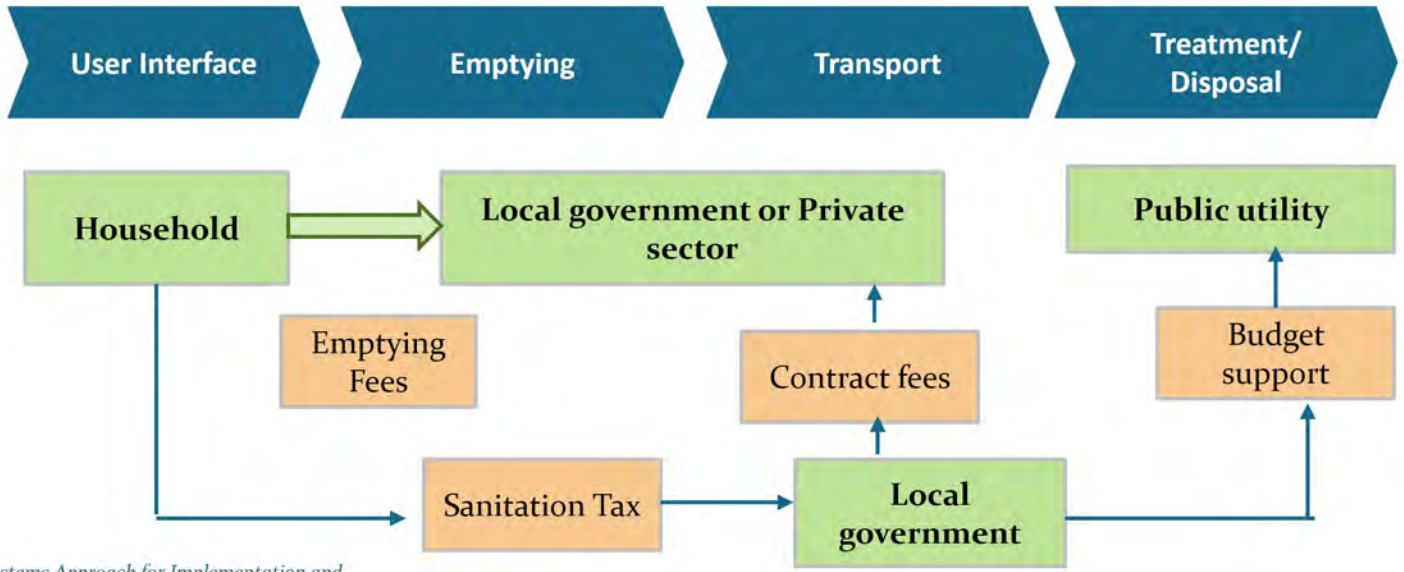
Stage 5: Review of required tariffs

- Local government become financially sustainable by leving taxes and/or user charges so as to recover O&M costs of recent urban development programmes.
- It is therefore imperative that any proposed investment plan includes ways to recover O&M costs.
- Besides meeting operating expenses, the ULB is required to keep sufficient surplus to meet repayment obligations in addition to its committed capital expenses.

Assessment of current tariffs levels across FSM service chain

FS Flow Diagram

Existing tariff flow



Source: Diagram adopted from Faecal Sludge Management: Systems Approach for Implementation and Operation, Linda Strande, Mariska Ronteltap, Damir Brdjanovic, IWA 2014

Stage 5: Tools for assessing Financing requirement & options

TOOLS available for

ASSESSING

FINANCE

Assessment areas		
Assessment of finance requirements and potential sources	Potential sources of finances for capital/ O&M expenditures	Review of required tariffs

Assessment Tools	Download
11. SANIPLAN: Financing plan and tariff review	a. SaniPlan , SaniPlan-FSM b. Financial planning using SaniPlan
12. Assessing willingness to pay and to charge	a. Questionnaire: Assessing willingness to pay b. Sample resolution by local government

Source : IFSM toolkit - http://ifsmtoolkit.pas.org.in/

Link to website - http://ifsmtoolkit.pas.org.in/

pas performance assessment system

Search this site

HOME

SaniPlan - IFSM
Tools for Citywide Assessment and Planning

Citywide Integrated Faecal Sludge Management (IFSM) planning involves assessment and planning across the full service chain. Citywide approach suggests universal coverage of services in all areas and for all properties in the city. It also involves a review of the full service chain – user interface, storage, conveyance, treatment and reuse. The focus here is on providing effective and sustainable sanitation services by the local government and other service providers.

Citywide IFSM planning is a consultative process and the tools for citywide assessment presented here help informed discussion among stakeholders and provide for 'evidence-based' decision making by city authorities. The process should start off with a kick-off meeting with key stakeholders. Consultations with key stakeholders should be planned during key stages in the planning process.

The IFSM planning process is facilitated by SANIPLAN, a decision support tool that has three main areas: a) assessment of service performance across the full service chain, b) designing an action plan to ensure service improvements across the chain, and c) developing a financing plan for both capital and O&M costs for the full plan period.

City-wide Assessment

Citywide assessment of FSM is the first key step for IFSM planning. The tools are organized around five key areas. Assessing the current situation of FSM in these five areas is important to develop a FSM plan that is technically appropriate and financially feasible at local level. Assessment in each area entails review of available information at city level, identifying information gaps, and conducting field studies where necessary.

IFSM Toolkit

Discussion points

- Key stages of assessment
- Use of tools from the toolkit

References

- Performance Assessment System Project, (2015)."*Assessment Tool for Citywide Integrated FSM Planning*",Mimeo, Retrieved 1 August 2016, from http://ifsmtoolkit.pas.org.in/

- Ministry of Urban Development (MoUD), (2013), "*Advisory note on septage management in urban India*". MoUD, GOI.

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- Strande, L., Ronteltap, M., & Brdjanovic, D. (2014), "*Faecal sludge management Systems: Approach for Implementation and Operation*", IWA Publishing, London.

- Tilley, E., Ulrich, L., Lüthi, C., Reymond, Ph., Schertenleib, R. and Zurbrügg, C., 2014. "*Compendium of Sanitation Systems and Technologies*", 2 Revised Edition, Swiss Federal Institute of Aquatic Science and Technology (Eawag), Switzerland.

Session 4: Assessing Service Performance across the service chain

Objective of the session

- Assessment is an important exercise that provides an **initial sense** of the **state of FSSM in the city**, help in understanding the context and in **identifying key stakeholders before developing proposals**.

- This session gives a brief overview on what and how **information needs to be collected** to assess **existing FSSM services** in your city.

- Understand how to identify issues and challenges in existing services.

- The session also provides guidance on **SaniTab tool**

Source : IFSM toolkit - http://ifsmtoolkit.pas.org.in/

Assessing Service Performance across the Service Chain

1. Assessment through Performance Indicators

2. Across each link in the Service Chain

3. Summary and Vision

Assessment through City-Level Performance Indicators

Collect and Assess Available Information

- Obtain background information about the city
- Identify available plan documents, any recent surveys done by the local government as well as by any research / academic institutions in the city.

Coverage of households with individual toilets in city / slums

Coverage of households with adequate sanitation system

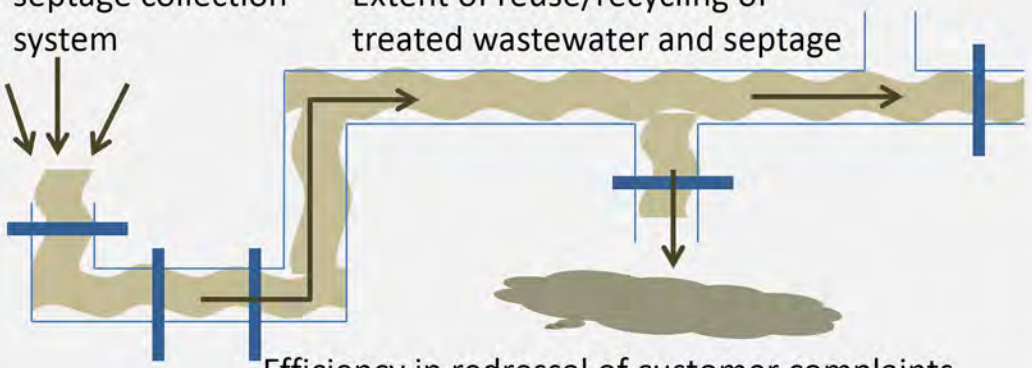
Adequacy of wastewater and septage treatment capacity

Quality of wastewater and septage treatment

MINISTRY OF URBAN DEVELOPMENT
GOVERNMENT OF INDIA

Efficiency of wastewater and septage collection system

Extent of reuse/recycling of treated wastewater and septage



Efficiency in redressal of customer complaints

Efficiency in collection of wastewater charges and taxes

Extent of cost recovery in wastewater services

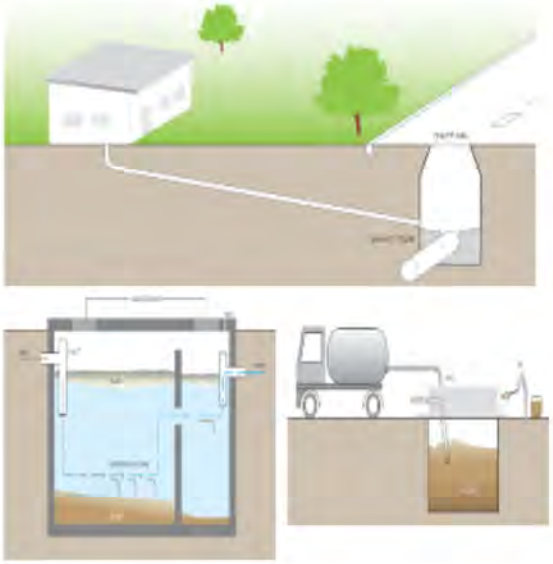
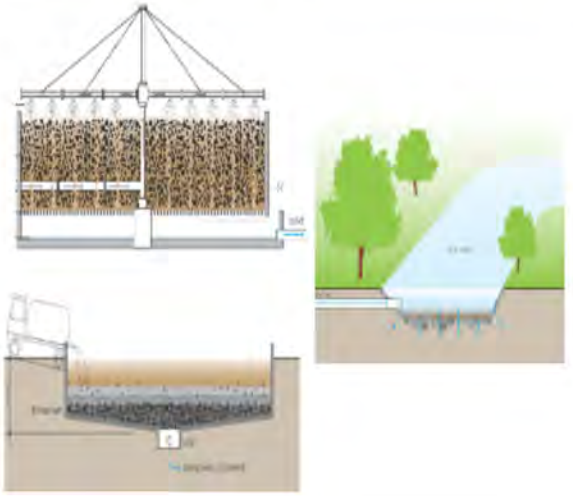
SanBenchmark *across the service chain*

SAN Benchmarks provides a framework for performance assessment of city wide sanitation by capturing onsite sanitation systems along with the conventional sewerage systems.

At the national level, SAN Benchmark has been adopted by the Government of India and is now a part of **"National Policy on Faecal Sludge and Septage Management"**.

Link to the policy:-
http://amrut.gov.in/writereaddata/FSSM_Policy_Report_23Feb.pdf

Link to SAN Benchmarks – Framework and Indicators on PAS Website:-
http://pas.org.in/Portal/document/UrbanSanitation/uploads/SAN%20Benchmarks%20Citywide%20assessment%20of%20sanitation%20service%20deliveryIncluding%20on-site%20sanitation.pdf

Access	Collection	Conveyance	Treatment	Recycle & Reuse
				
Coverage of toilets	Collection efficiency of sanitation system		Adequacy of treatment capacity of sanitation system	Extent of reuse and recycling in sanitation system
Coverage of adequate sanitation systems			Quality of treatment of sanitation system	

Assessing Service Performance across the Service Chain

1. Assessment through Performance Indicators

2. Across each link in the Service Chain

3. Summary and Vision

Assessment of Access . . .

Access: Describes the **type of toilet facilities** the user accesses.

Individual, Community or Shared

Open Defecation Spots

Non-Slum/Slum access to sanitation

Reasons for not owning an individual toilet -

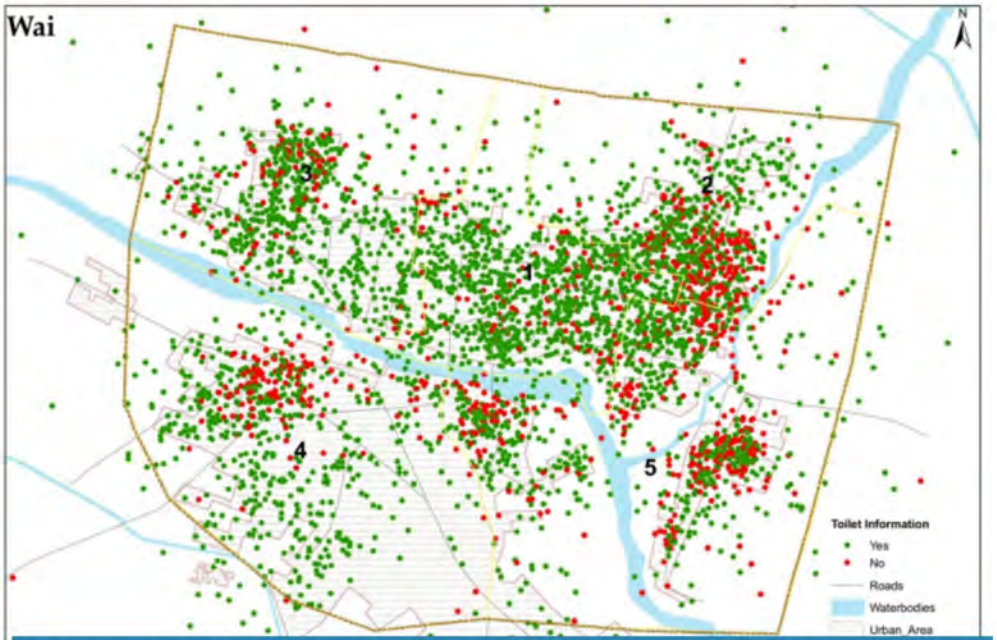
Lack of Space?
Lack of Finance?
Lack of Legal Clearances?

Details of Community/Public Toilets

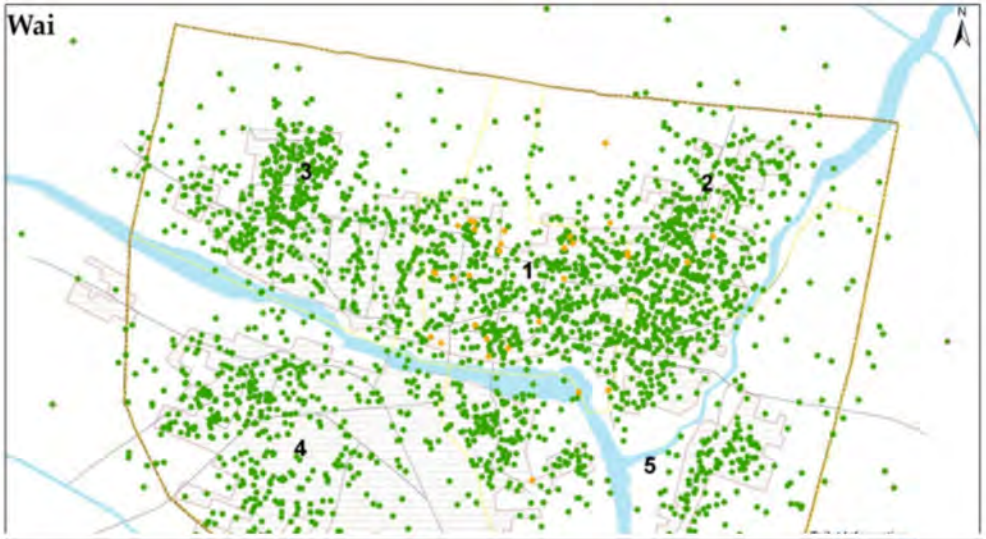
No. of toilet seats?
No. of users per seat?
Location in slum / non-slum areas?
O&M by Private or ULB?

Spatial Variations in access to Toilets

Spatial Assessment . . .

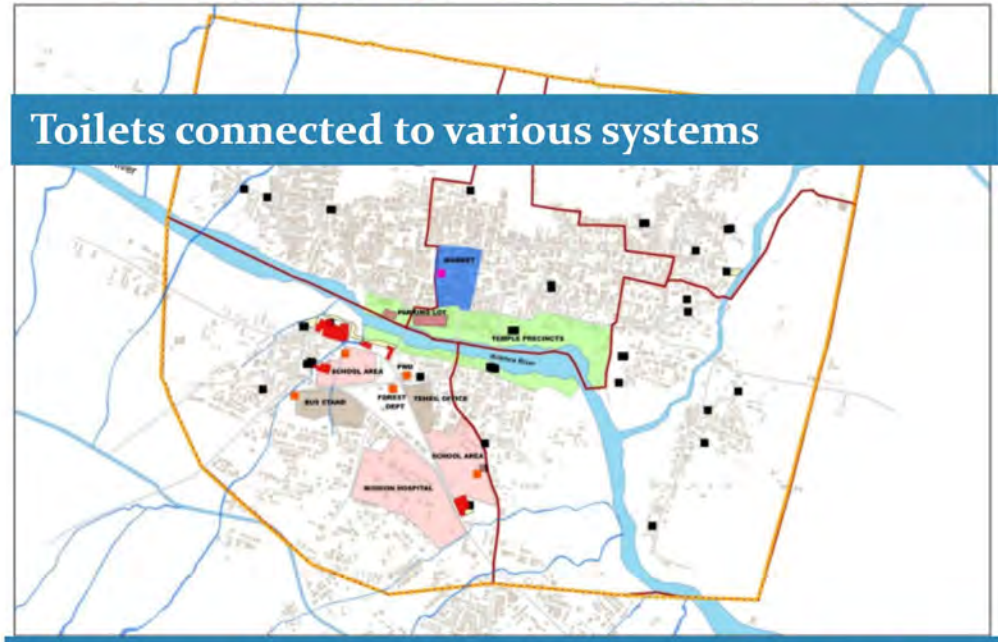


Household level access to toilet availability



Toilets connected to various systems

Spatial Assessment of Toilet Availability



Location of Community Toilets and OD spots

Tool – SaniTab for Household Level Sanitation Survey . .

SANITAB is an android-based tool for household / property level survey and creating database for Onsite Sanitation Systems.

Key Features:

- Citywide digital data collection tool
- Providing enabling environment for spatial analysis
- Quick and ease in survey, minimizing human error
- "Real time" monitoring of survey activity
- Survey at scale

Four Types of questionnaire available

Open Defecation Free	Integrated ODF-FSM	Faecal Sludge Management	Basic Information

- Toilet availability , OD and CT dependency
- Toilet connectivity
- Willingness to build own/shared toilets
- Financial capability
- Septic tank details
- Information about emptying and cleaning
- Number of septic tanks

SaniTab

Assessment captures the following aspects

- Toilet availability
- Disposal System Toilet is connected to
- Size and shape of septic tank, No. of chambers in septic tank, Accessibility of septic tanks
- Cleaning frequency of septic tanks, Problems encountered while cleaning and Reasons for emptying septic tanks

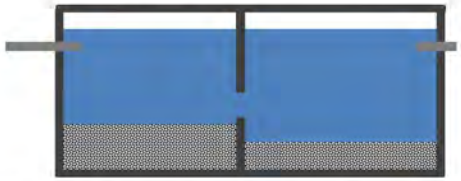
Link to Dashboard – http://smartmu.in/pas/app/

QR Code to Sanitab

- CEPT has developed a generic Mobile Application - **"SaniTab"**
- To create database for Onsite sanitation system
- SaniTab can be used by any ULBs

Assessment of Collection . . .

Collection: Describes the **ways of collecting** and sometimes treating the **faecal waste** generated by the users.



Location, Age, Size and Design

Dependency on Septic Tanks & pits

Cleaning Frequency

Design specifications

Septic Tanks located below the toilets are inaccessible.

Inaccessible septic tanks with sealed tops.

3 chambered septic tanks of sufficient size with access covers

Soil conditions, ground water table, flooding possibilities on the site

Distance from drinking water well

Is there a separate grey water system?
(In order to determine whether the inflow of on-site system is wastewater from toilet alone or both including kitchen & bath?)

Interview local contractors and masons to understand their level of knowledge and existing practices to assess the appropriateness of septic tank design.

TEMPLATES –

- **Survey of Small Contractors and Masons**
- **Technical Assessment of On-Site Systems**

Tool - Survey of small contractors and Masons

Survey of small contractors and masons is a tool to understand current construction practices of toilets and septic tank.

a Contractor Profile

✓Type of firms, size, scale and geography of operations, access to suppliers' credit
✓Broad assessment of their capacity,
✓Scale of work they can handle

b Awareness and Capacity

✓Knowledge and awareness about design norms, rules and regulations related to construction of toilets and septic tanks
✓How do they decide the size of toilet and septic tanks? Is there a standard size of toilet or Septic tank that they construct
✓Interest in training organized by ULB for standard toilet and septic tank design
✓How could the local contractors help in creating awareness generation of the toilet scheme

c Costs and Surveys of Toilets built

✓Their assessment of costs - For standard design of toilet and septic tanks as given in SBM, how the block cost would vary for different materials i.e Brickwork, R.C.C, sheet roof etc.
✓What are the constraints, if any?

Refer Part A, Chapter 9 on On-Site sanitation in CPHEEO Manual, 2013 for designing septic tanks.

Assessment of Conveyance . . .

Conveyance of septage: Describes **transport of waste** from collection to the treatment / disposal site

Assess Available Infrastructure

Capture details like - Number, type and size of septic tank emptier available

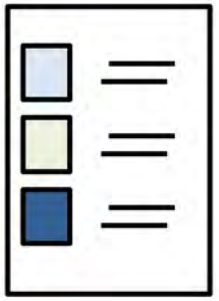
Extent of Service

How many septic tanks are emptied in a year?
How many emptying tractors are used?

Capacity of Private Companies

No. of septic tank emptiers
Cost per emptying visit
Registers maintained by them.

Coverage in different parts of the city



Monitoring and Complaint Redressal Systems

Cost per Emptying visit, Sanitation Tax

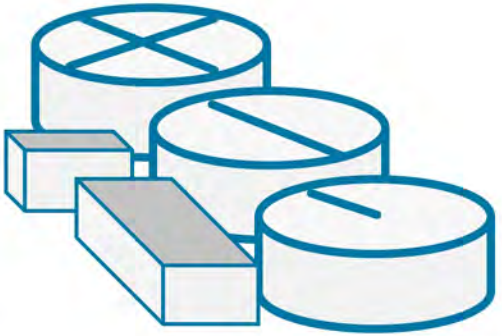
Assessment of treatment and disposal

The ULBs must not dispose septage collected from the Septic Tanks without any treatment. ULBs should first:-

- Identify present location where the septage is being treated / dumped.
- Assess the possibility of septage treatment at existing STP in the city or nearby city by checking the available capacity and treatment technology.
- Assess extent and nature of reuse of treated septage.

Assess the soil type and water table at the Dump Site

Landscape Study of surrounding areas of the dump site (for sale of treated septage)



Treatment at existing or nearby STP

Assessing Service Performance across the Service Chain

1. Assessment through Performance Indicators

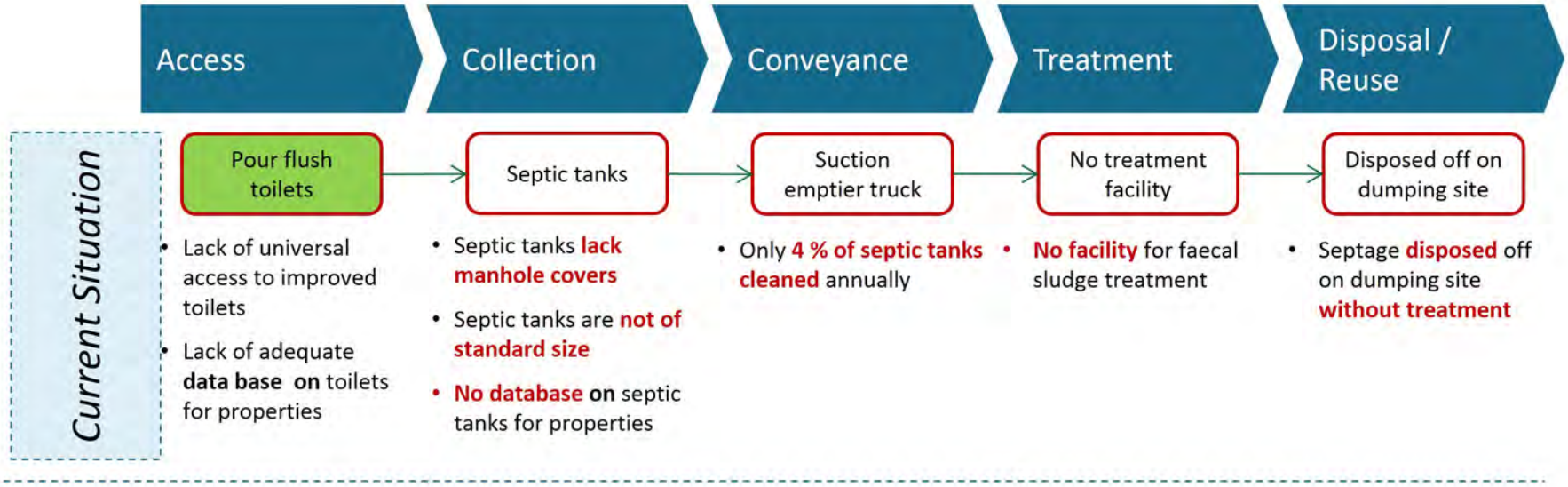
2. Across each link in the Service Chain

3. Summary and Vision

Summary: Identify Gaps across the Sanitation Value Chain

Summarize Gaps across Sanitation Value Chain

- Summarize service performance across the service chain
- Develop a vision of what the city needs to achieve across each link in the service chain
- Discuss the summary and vision at a multi-stakeholder meeting



Vision: Developing vision for end to end FSSM Plan

Vision for end to end FSSM Plan

- Summarize service performance across the service chain
- Develop a vision of what the city needs to achieve across each link in the service chain
- Discuss the summary and vision at a multi-stakeholder meeting

Vision

Pour flush toilets	Septic tanks	Suction emptier trucks	Treatment facility	Revenue from compost
• 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** • **Enforcing regulations and penalties for** periodicity of septic tank cleaning and safe handling of sludge • **Payment using local taxes** using escrow mechanisms	• **Installing treatment facility** for the treatment of septage	• **Safe dumping** of treated faecal matter and/or the **sale of septage** at a fixed rate to nearby farms or agro-businesses

Discussion points....

- In your view, which information is likely to be difficult to obtain in your state / city ?

- How and in what way can we involve different type of stakeholders in FSSM assessment?

References

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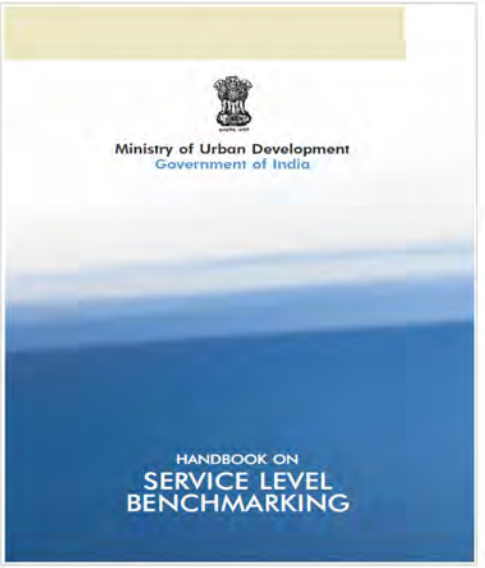
Session 5: Introduction to SanBenchmark & Online platform

Current monitoring framework for WSS (MOUD, GoI)

Service Level Benchmark framework: Basis to measure service delivery outcomes

- Performance monitoring through **Service Level Benchmarks (SLB)** under 13th and 14th Finance commission
- SLB under **SLIP for AMRUT**
- SLB put the focus on measurement of service delivery performance. Benchmarks published for each of the four sectors:
  - Water supply,
  - Waste water,
  - Solid Waste Management (SWM) and
  - Storm water
- This framework comprises of 28 SLB indicators



अमृत
Atal Mission for Rejuvenation and Urban Transformation

Are SLB indicators for Wastewater captures ground reality?

Water supply	
Coverage of water supply connections	100%
Per capita supply of water	135 lpcd
Extent of metering of water connections	100%
Extent of Non- Revenue Water (NRW)	20%
Continuity of water supply	24 hours
Quality of water supplied	100%
Efficiency in redressal of customer complains	80%
Cost recovery in water supply services	100%
Efficiency in collection of water supply related charges	90%

Solid Waste Management	
Household level coverage of solid waste management services	100%
Efficiency of collection of municipal solid waste	100%
Extent of segregation of municipal solid waste	100%
Extent of municipal solid waste recovered	80%
Extent of scientific disposal of municipal solid waste	100%
Efficiency in redressal of customer complains	80%
Extent of cost recovery in SWM services	100%
Efficiency in collection of SWM charges	90%

Wastewater	
Coverage of toilets	100%
Coverage of sewage network services	100%
Collection efficiency of the sewage network	100%
Adequacy of sewage treatment capacity	100%
Quality of sewage treatment	100%
Extent of reuse and recycling of sewage	20%
Efficiency in redressal of customer complains	80%
Extent of cost recovery in sewage management	100%
Efficiency in collection of sewage charges	90%

SLB indicators only captures performance of underground sewer network

Storm Water Drainage	
Coverage of storm water drainage network	100%
Incidence of water logging / flooding	0

Need for San Benchmark ?

Funding for FSM available under SBM, AMRUT and Smart city Programmes

स्वच्छ भारत
एक कदम स्वच्छता की ओर

अमृत
Atal Mission for Rejuvenation and Urban Transformation

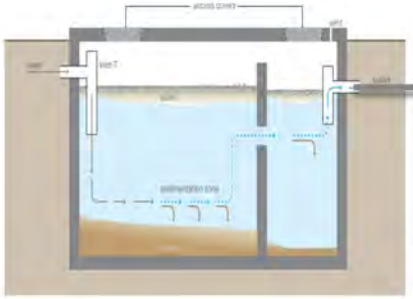
Smart City
MISSION TRANSFORM NATION

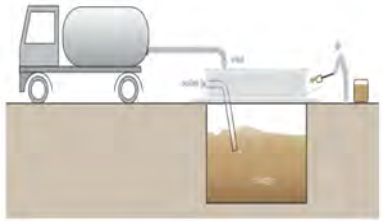
No Monitoring framework available for onsite sanitation system

Indicators for Onsite sanitation systems

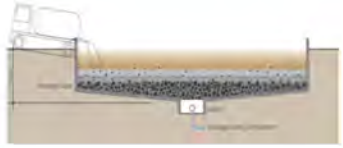
Onsite system – Septic tank with Settled Sewer/lined drain

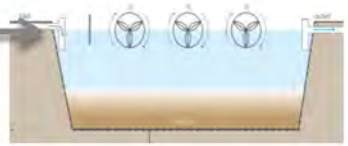
User interface	Collection	Conveyance	Treatment	Recycle & Reuse

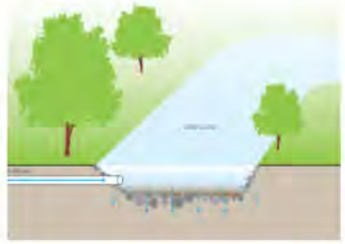




Settled sewers/drains





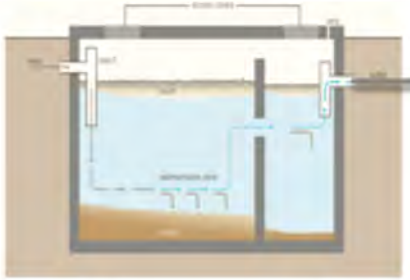


1. Coverage of toilets	2. Coverage of onsite sanitation system	3a. Collection efficiency of septage	4a. Adequacy of septage treatment plant	6a. Extent of reuse and recycling of treated Septage
			4b. Adequacy of effluent and grey water treatment plant	
		3b. Collection efficiency of effluents from septic tank and grey water	5a. Quality of septage treatment plant	6b. Extent of reuse and recycling of treated effluent and grey water
			5b. Quality of effluent and grey water treatment plant	

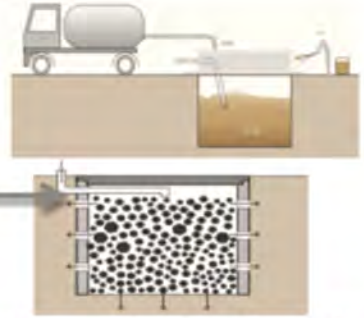
Indicators for Onsite sanitation systems

Onsite system – Septic tank with Soak pit

Toilets



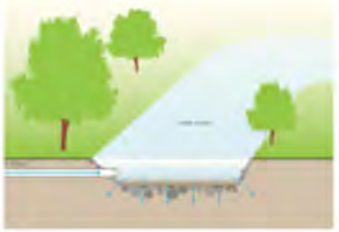
Toilets connected to septic tank



Septage collection through septic tank emptying service

Effluents from septic tank and grey water are collected and treated in soak pit

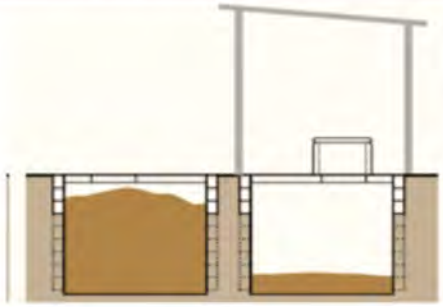
Treatment of septage



Reuse and recycling of treated septage

Onsite system –Double Pit toilet

Toilets



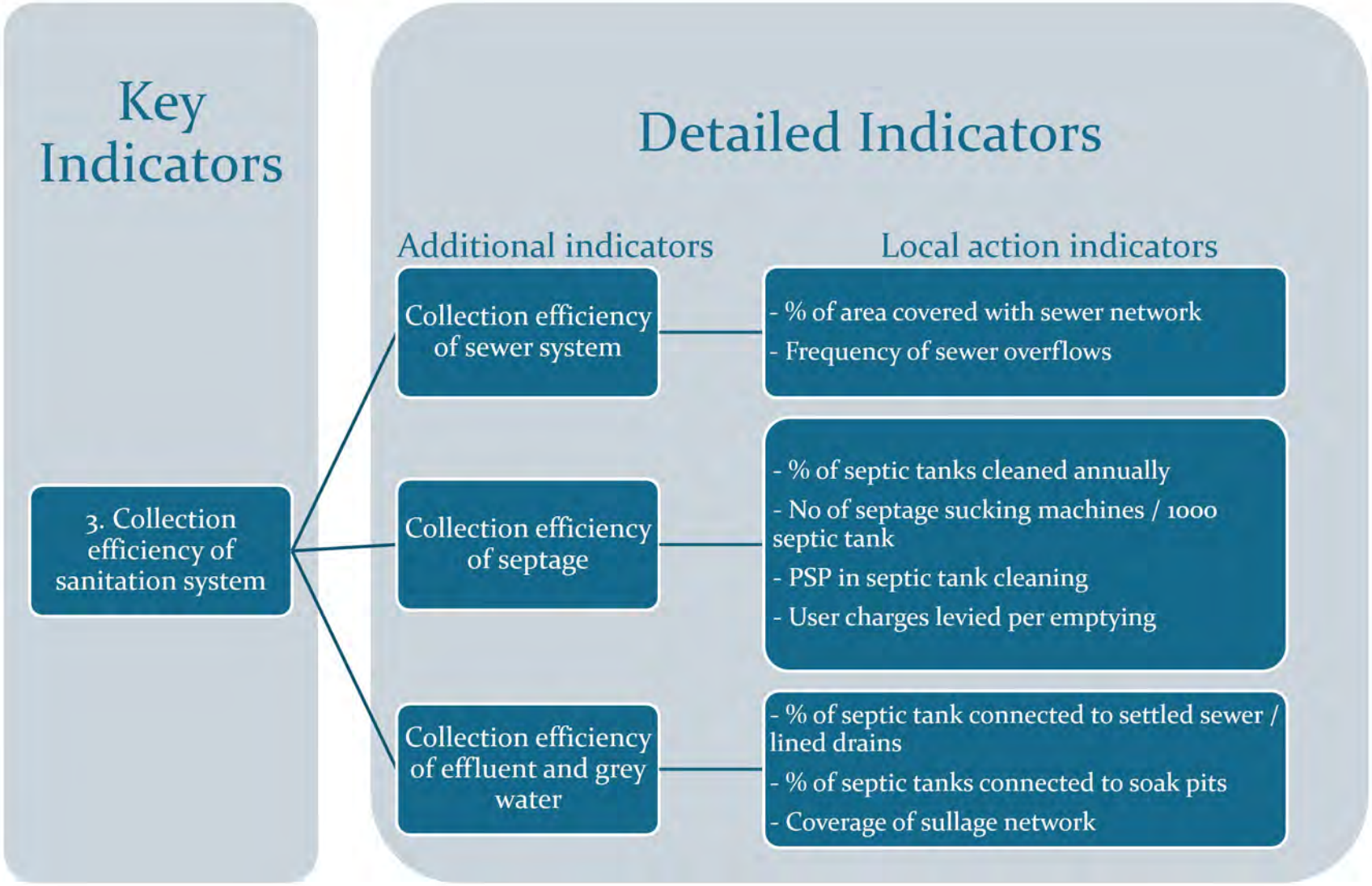
Toilet connected to double pit

Reuse as manure in Agriculture

SAN Benchmarks: *Citywide assessment of sanitation service delivery Including on-site sanitation*

Revised Sanitation Indicators (Sewerage system + Onsite systems)	
1. Coverage of toilets	Percentage of properties with access to toilet facility in the city
2. Coverage of adequate sanitation system	Percentage of households with individual toilets connected with adequate sanitation systems (sewer network/ septic tank / double pit system) to total households in the city.
3. Collection efficiency of sanitation system	Weighted average of collection efficiency of each sanitation system, weighted by share of households dependent on each sanitation system.
4. Adequacy of treatment capacity of Sanitation System	Weighted average of adequacy of treatment plant capacity available for each sanitation system, weighted by share of households dependent on each sanitation system.
5. Quality of treatment of sanitation system	Weighted average of quality of treatment of each sanitation system, weighted by share of households dependent on each sanitation system.
6. Extent of reuse and recycling in sanitation system	Weighted average of extent of reuse of treated wastewater and sludge after adequate treatment as a percentage of wastewater and sludge received at the treatment plant, weighted by share of household dependent on each sanitation system.

SAN Benchmarks: *Citywide assessment of sanitation service delivery Including on-site sanitation*



SAN Benchmarks: *Citywide assessment of sanitation service delivery*

Including on-site sanitation

Key Indicators

Capture	Collection	Conveyance	Treatment	Recycle and Reuse
1. Coverage of toilets	2. Coverage of each sanitation system	3. Weighted average of collection efficiency of each sanitation system	4. Weighted average of adequacy of each sanitation system 5. Weighted average of quality of treatment of each sanitation system	6. Weighted average of extent of reuse and recycling of each sanitation system

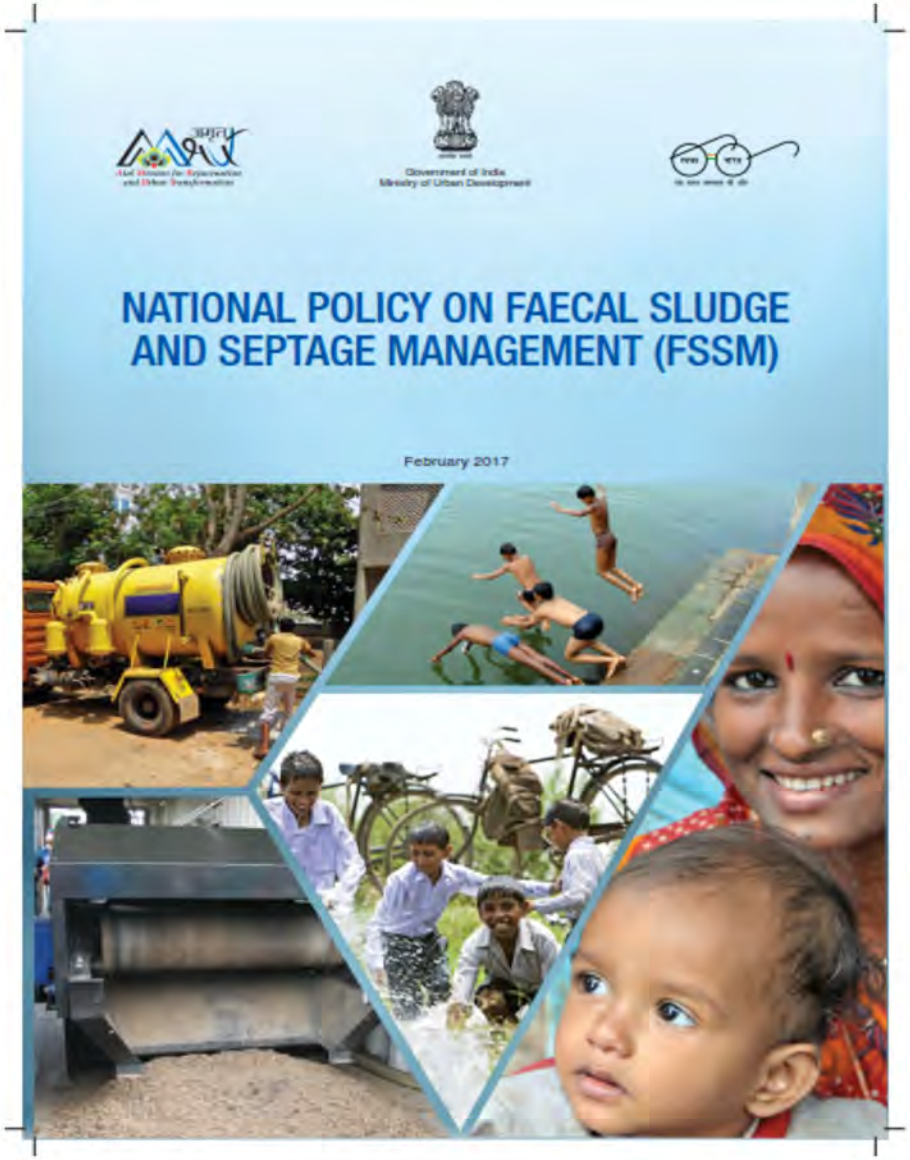
Detailed Indicators

- Coverage of households with own toilets (%)
- Percentage of functional community toilet seats (%)
- Percentage of households connected to septic tank (%)
- Percentage of households connected to septic tank as per design standards (%)
- Percentage of households connected to twin pit system (%)
- Percentage of households connected to sewer network (%)
- Percentage of illegal sewer network connections (%)
- Percentage of identified illegal sewer network connections that are regularized (%)
- Percentage of area covered with sewer network (%)
- Collection efficiency of septage (%)
- % of septic tanks cleaned annually
- Number of septage sucking machines/1000 septic tanks (Ratio)
- PSP in septic tank cleaning services (Y/ N)
- User charges levied per emptying
- Percentage of septic tanks connected to settled sewer / drains for effluent disposal
- Percentage of septic tanks connected to soak pit for effluent disposal (%)
- Collection efficiency of effluent (from septic tank) and grey water (%)
- Coverage of sullage network (open + covered) (%)
- Collection efficiency of sewer network (%)
- Frequency of sewer overflows (number)
- Adequacy of septage treatment facility (%)
- Adequacy of effluent (from septic tank and grey water) treatment capacity (%)
- PSP in O & M operations for treatment plant (Y/N)
- Quality of septage treatment (%)
- Quality of effluent (from septic tank) treatment (%)
- Adequacy of sewage treatment facility (underground sewerage system) (%)
- Quality of treated sewage disposed (BOD & COD) (%)
- Extent of reuse and recycling of treated septage received at treatment plant (%)
- Extent of reuse and recycling of treated effluent (from septic tank and grey water) (%)
- Extent of reuse and recycling of treated sewage (%)

Onsite indicators

Indicator definition , formula and rationale have been developed...

SAN Benchmarks – Monitoring and Evaluation framework



- National policy on faecal sludge and septage management (FSSM) has adopted SAN Benchmarks for monitoring performance of citywide sanitation

- As per FSSM, State Government will be responsible for Monitoring and Evaluation of its Cities' performance, and hence needs to devise data collection and reporting systems using indicator framework developed for Sanitation Benchmark.

- ULBs in turn need to develop database, registry of certified on-site sanitation system, robust reporting format to track compliance of households (establishments, etc.) with outcomes and process standards.

Source: National policy on faecal sludge and septage management, page no 26

PAS

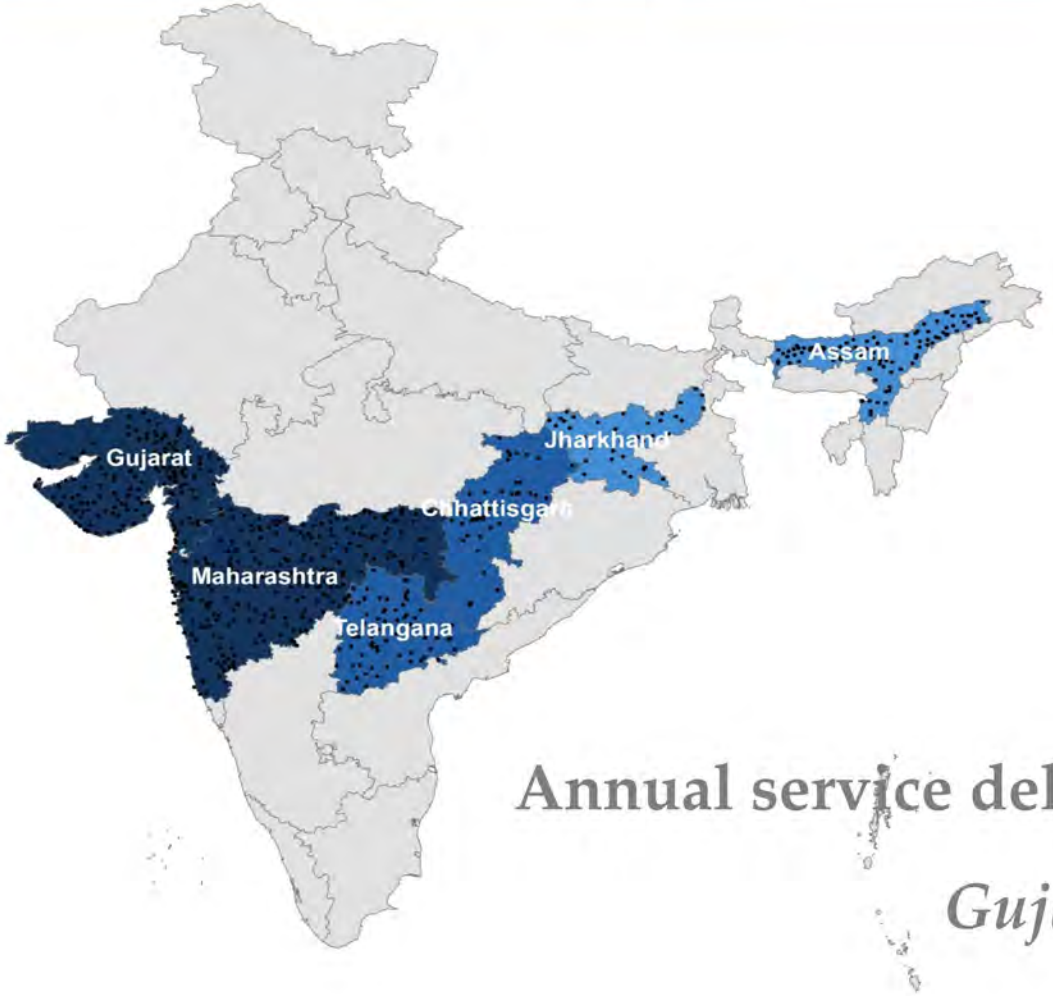
Performance Assessment System

www.pas.org.in

Water Supply Services

Wastewater Management

Solid waste Management



Started with
2 states, 416 Cities
68 Million population

Now **6 states**,
more than **900 cities**
96.5 Million population

Annual service delivery profile for **400+** cities in *Gujarat and Maharashtra* for **8** years

Online Performance Assessment System

- Performance measurement framework (PMF) has been developed for state-wide implementation of the benchmarking of water and sanitation with a focus on a 'real' developing country context.

- It is align with the Government of India's initiative Service Level Benchmarks (SLB).

- In addition to SLB indicators, it also includes aspect of **equity and SAN-Benchmarks** to capture the ground realities in Indian cities.

- Online tool is also used by cities of Chhattisgarh, Assam, Jharkhand and Telangana for publication of service level benchmarks.

PAS Project – www.pas.org.in

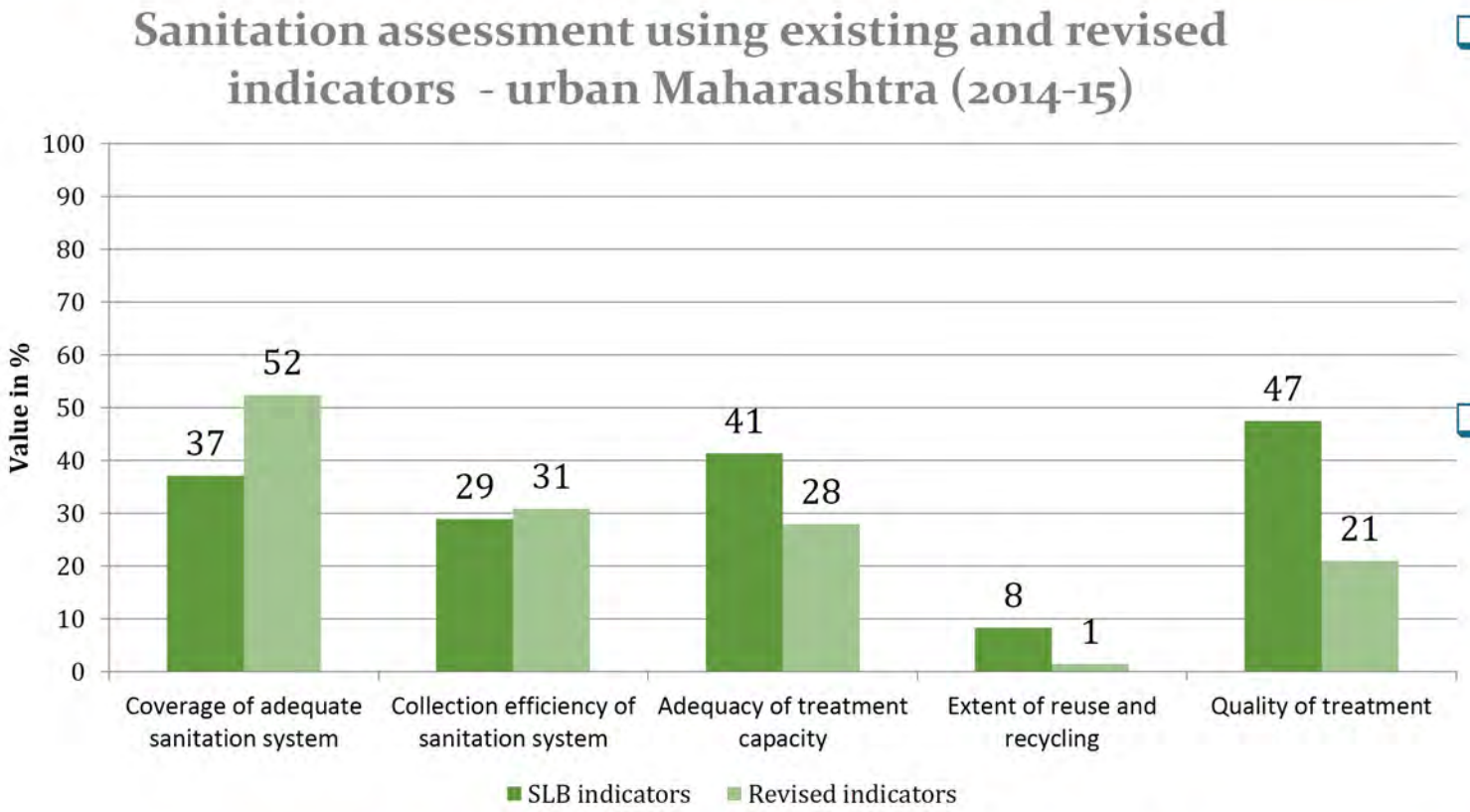
SLB Framework has been implemented by **PAS Project, CEPT University**

and is being used since **last 8 years**, for:

- 13th FC
- 14th FC
- SBM
- AMRUT
- Smart city mission

Handholding support to State for training and data entry

SAN Benchmarks: *State Level Sanitation Assessment*

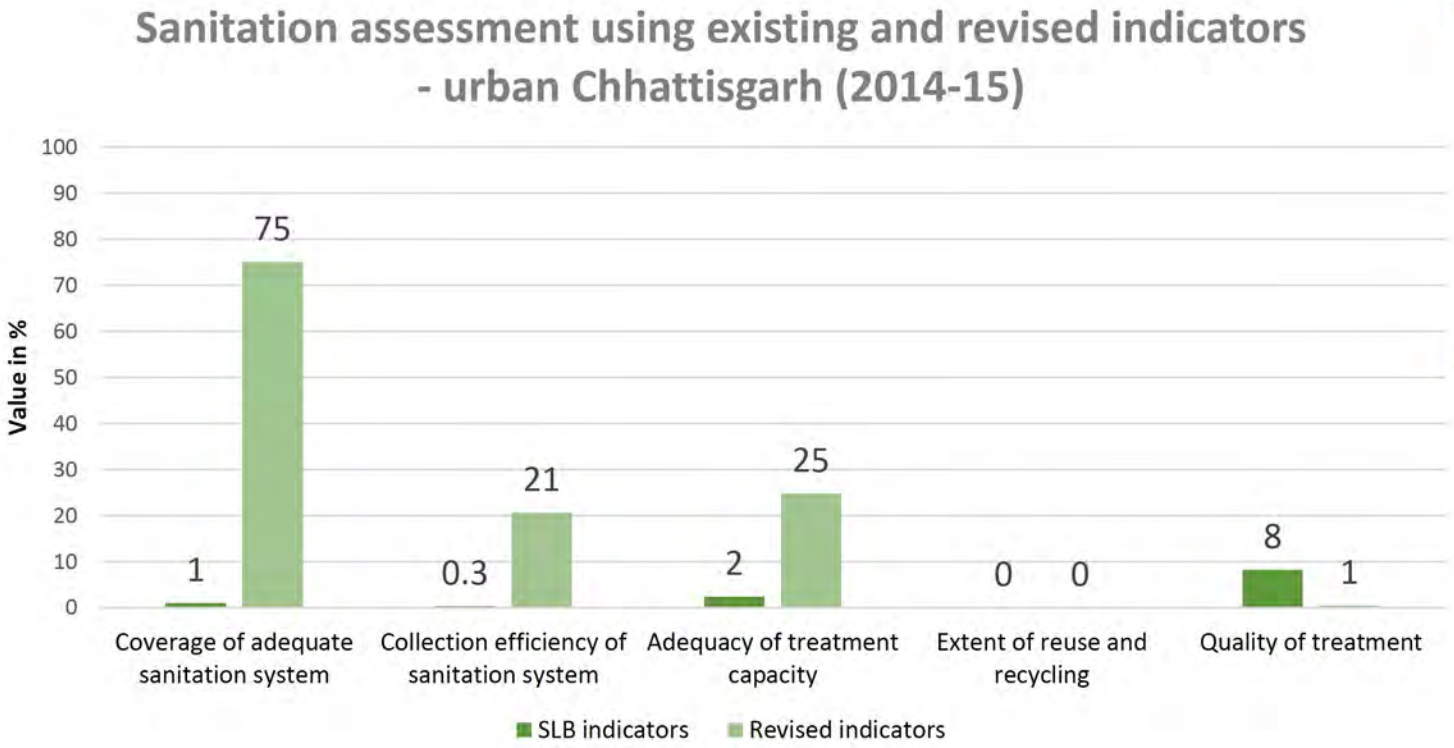


- Maharashtra has 259 urban local bodies (ULBs) of various sizes ranging from 3000 to 3.5 million population *(excluding greater Mumbai)*
- Only 34 ULBs has partial underground sewer network and 22 ULBs has sewerage treatment plant

- Revised indicators show **better performance for coverage of adequate sanitation system** and **collection efficiency**.
- Adequacy decreases as **only a few cities treat septage and grey water**
- None of the city reuses treated septage

Note: State level values are calculated using weighted average, above chart excludes Greater Mumbai, Akola, Aurangabad and Mirabhayantar ULBs values.

SAN Benchmarks: *State Level Sanitation Assessment*



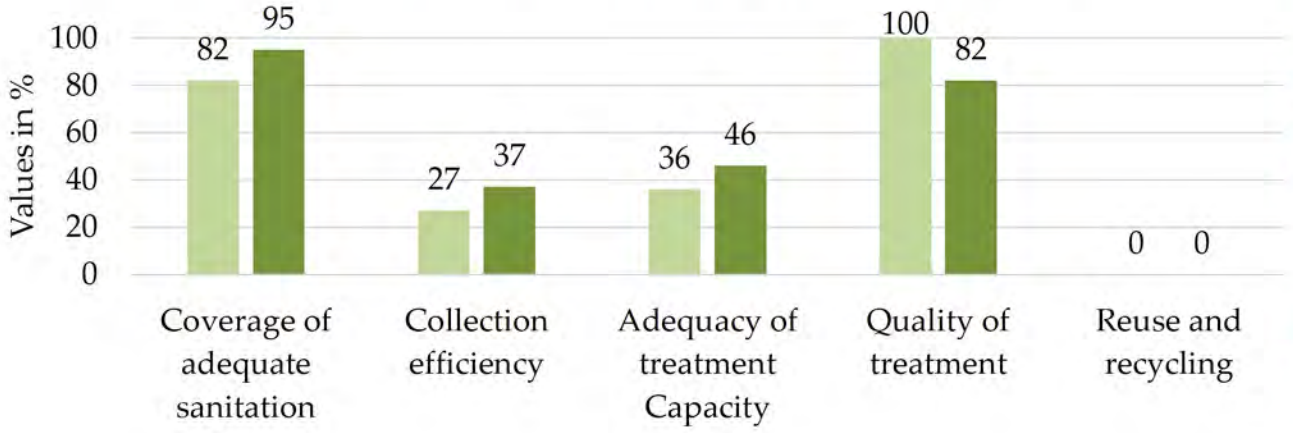
- Chhattisgarh has 43 urban local bodies (ULBs) of various sizes ranging from 11,000 to 1.2 million population
- Only 2 ULBs has partial underground sewer network and only 1 ULBs *(Bilaspur)* has sewerage treatment plant

- Revised indicators show **better performance for coverage of adequate sanitation system** and **collection efficiency**.
- Adequacy increases because it captures treatment of **grey water through septic tank connected to soak pit**
- None of the city treat septage

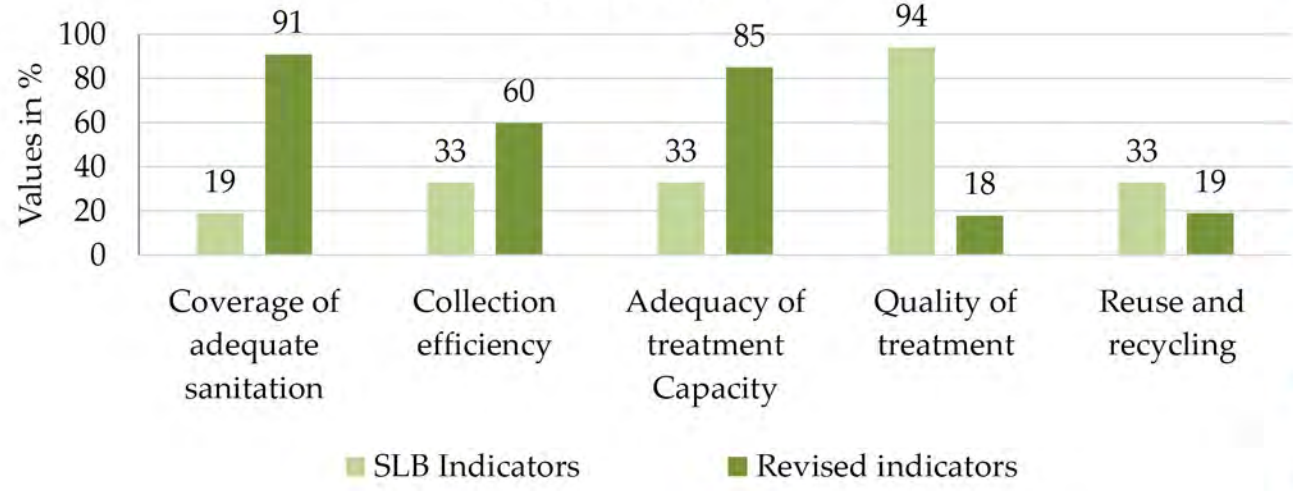
Note: State level values are calculated using weighted average

SAN Benchmarks: *City Level Sanitation Assessment*

Sanitation assessment using SLB and proposed sanitation indicators framework (mixed sanitation system - Nagpur)



Kalyan Dombivli



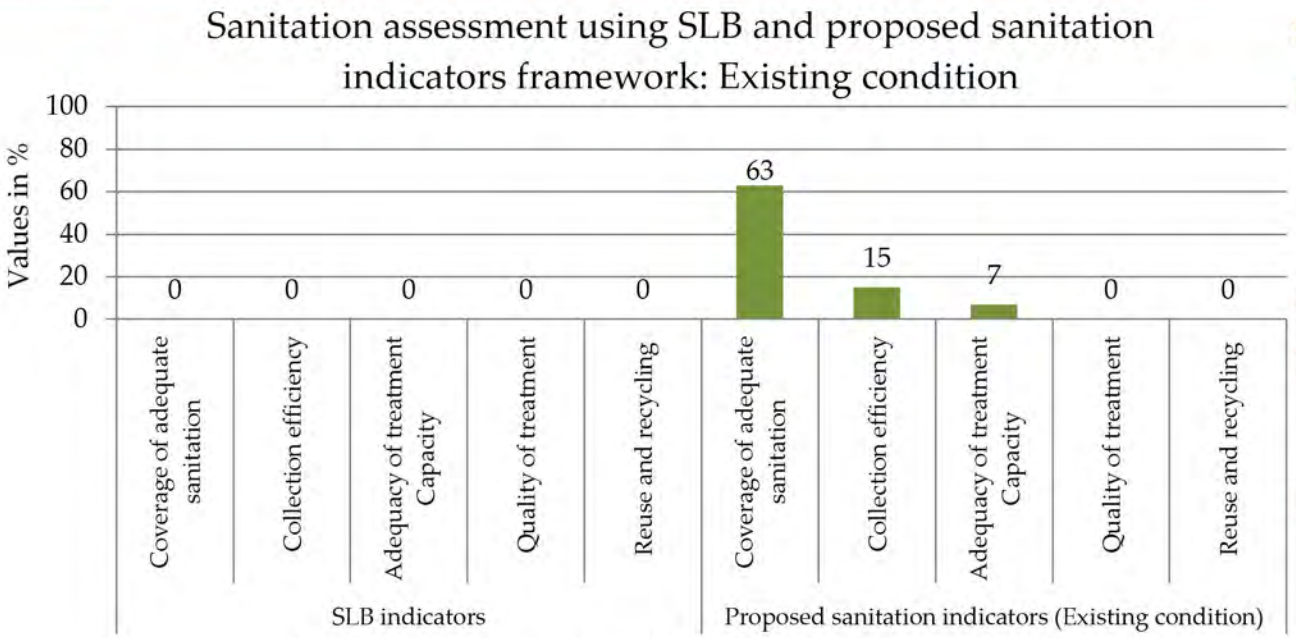
Nagpur :

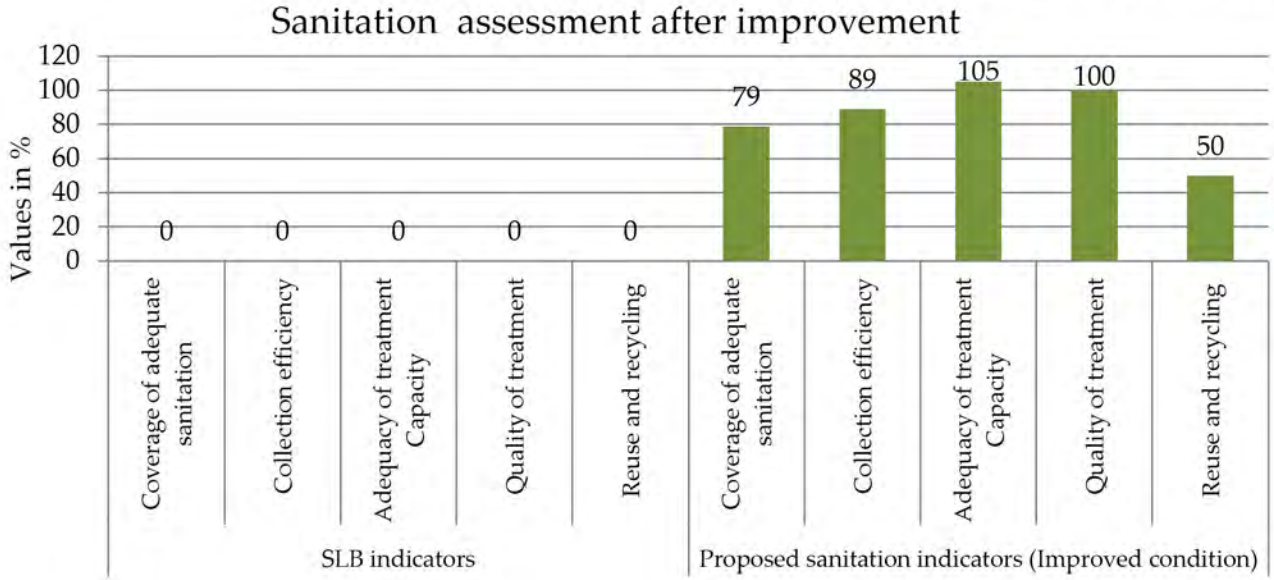
- 82% of properties are connected to sewer network. 13% have septic tanks with soak pits.
- WW generated: 276 MLD
- STP capacity: 100 MLD
- 12% of septic tanks are cleaned annually and treated in existing STP
- Quality tests are not carried out for sludge treatment

Kalyan Dombivli:

- 19% of properties are connected to sewer network. 78% have septic tanks with soak pits.
- WW generated: 370 MLD
- STP capacity: 123 MLD
- 8% of septic tanks are cleaned annually and treated in existing STP
- Quality tests are not carried out for sludge treatment
- 30 MLD treated sewage is reused

SAN Benchmarks: *City Level Sanitation Assessment*





Sinnar :

- 49% of households are connected to septic tanks with lined drains and 14% connected to septic tank with soak pit
- WW generated: 5 MLD
- 6% of septic tanks are cleaned annually and discharged on land without treatment
- **SLB indicators show zero value for all indicators**. Proposed sanitation indicators show performance of coverage, collection efficiency and adequacy of treatment (effluent treatment through soak pits).
- **Implementation of faecal sludge management plan is not reflected in old SLB indicators**. Whereas proposed sanitation indicators framework shows improvements in sanitation service

Session 6: Planning and Technology selection for FSSM

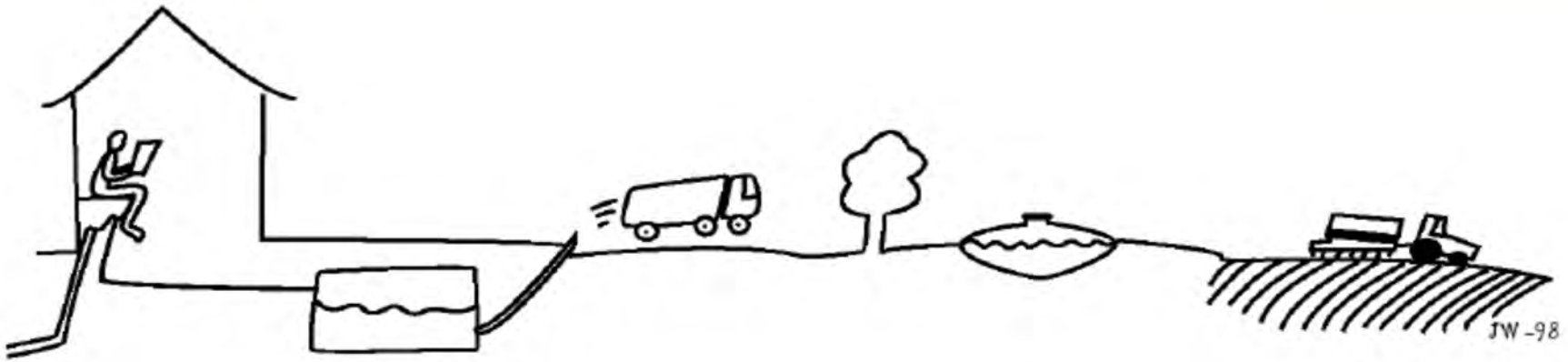
Objective of the Session

- In designing a citywide IFSM service, it is important to **plan** and **assess technology options** for each link in the **service chain**. This ranges from **appropriate toilets** and **onsite systems** such as septic tanks to **conveyance** as well as **treatment** and reuse.

- The session will give brief overview on how to plan FSSM services in a city.

- The session will also provide guidance on various parameters that need to be considered to select **appropriate technology** based on local conditions.

FSSM Planning objectives . . .



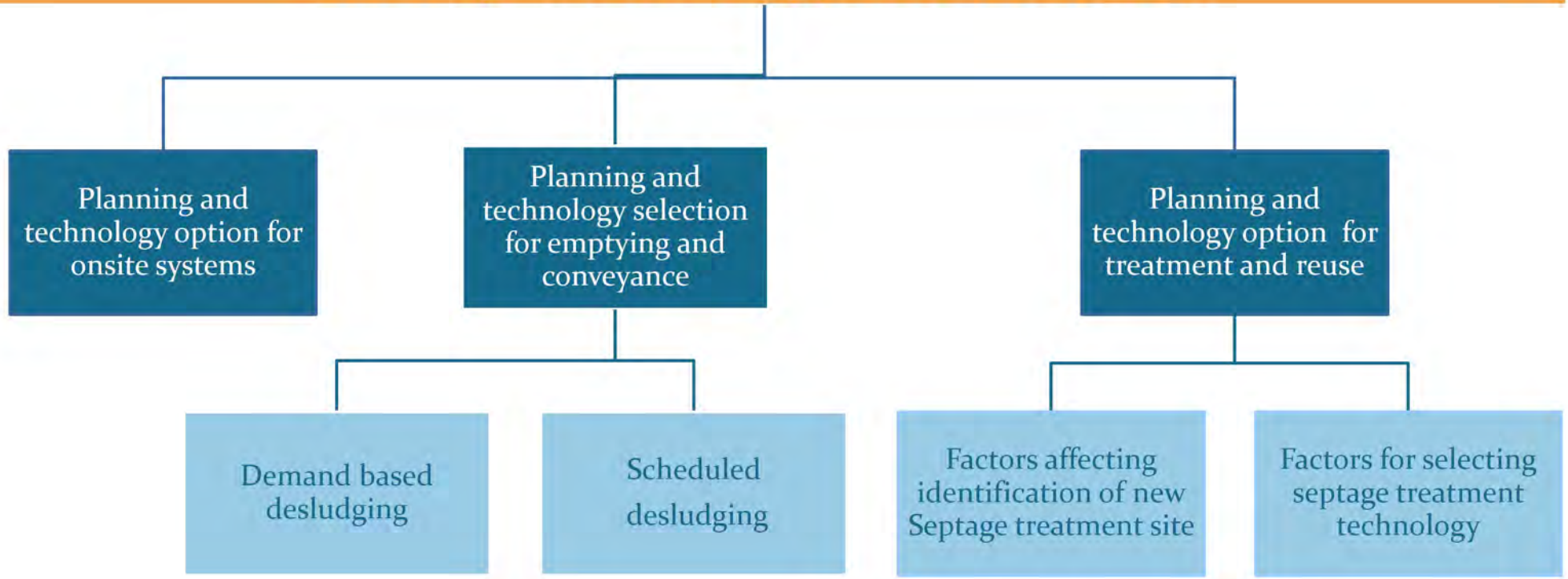
Access → Collection → Conveyance → Treatment → Reuse/Disposal

- Convert insanitary toilet systems (eg: single pit) to sanitary toilets
- Refurbish existing septic tank to avoid leakage
- New systems as per standard design

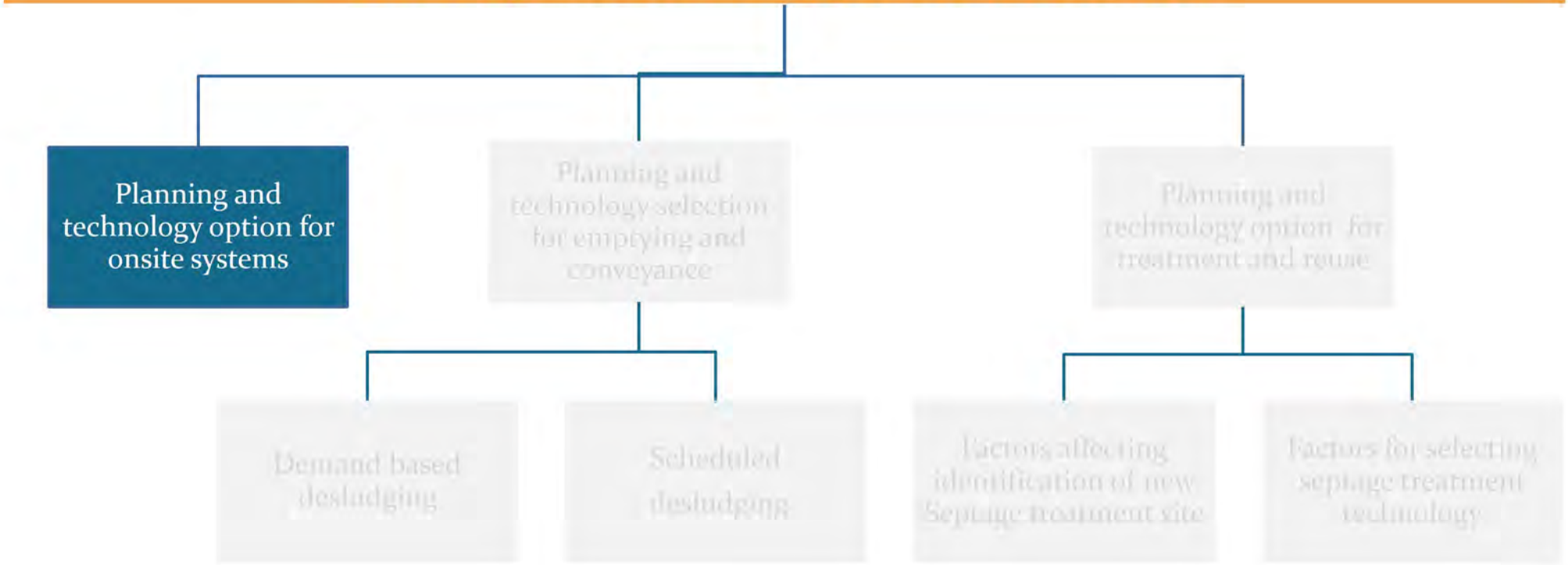
- Safe emptying and transport of Faecal sludge to avoid environmental and health hazard

- Proper treatment and reuse of faecal sludge and septage

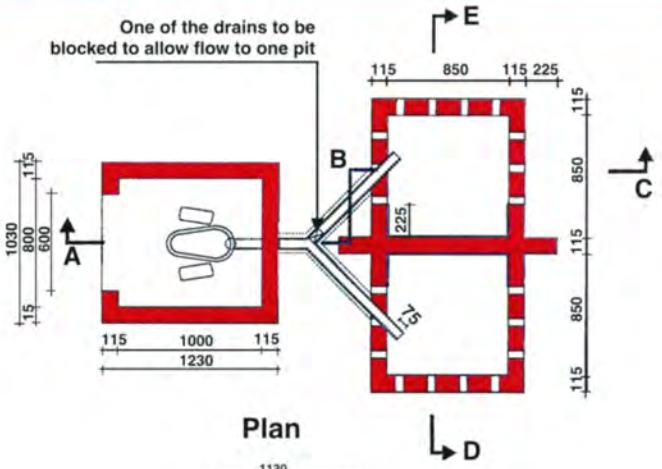
Planning and Technology selection for FSSM

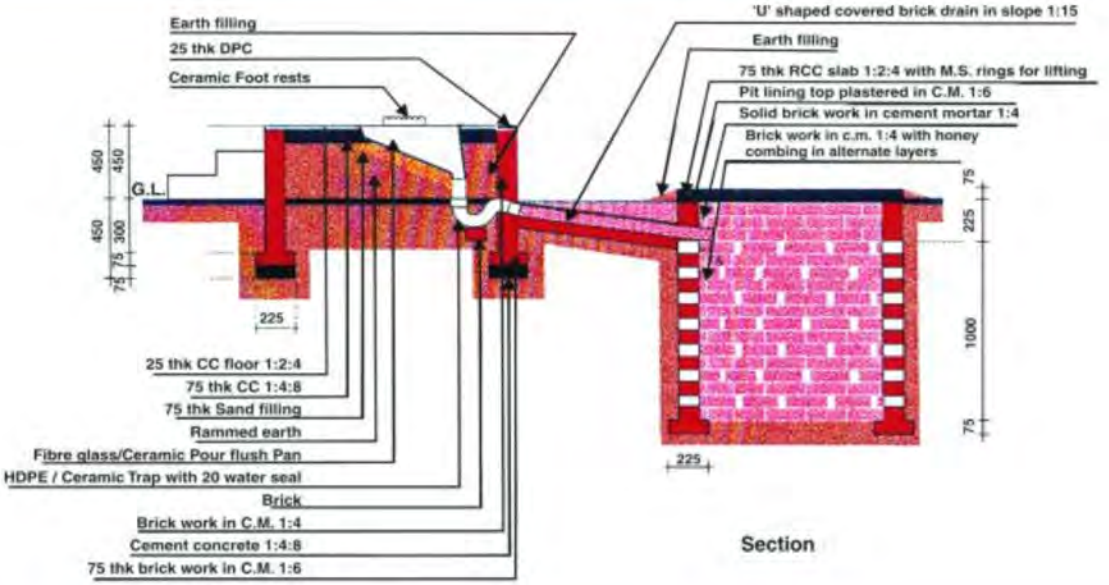


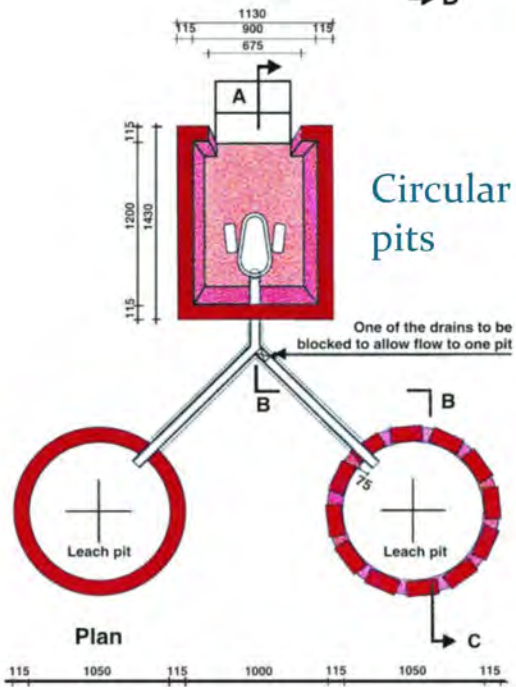
Planning and Technology selection for FSSM



Technology option for onsite systems (1/3)





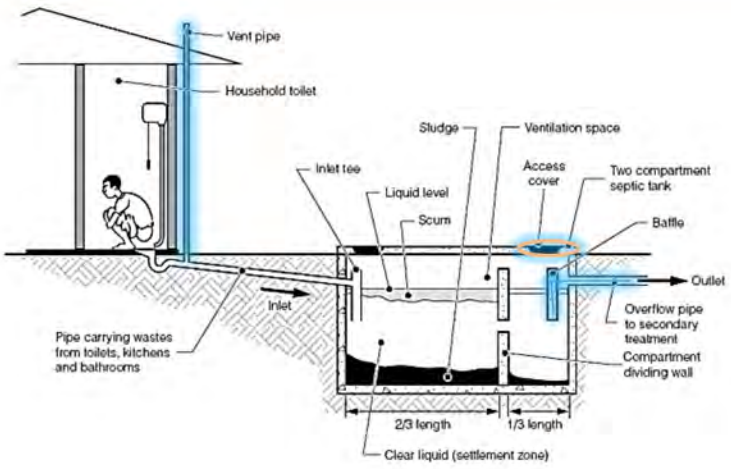


Applicability:	water use 25-50 lpcd
Soil characteristic:	Highly permeable soil
O&M Requirement:	1. Desludging, once pit is full 2. The undigested and unstabilized sludge must be treated and disposed of safely.
Limitation and risk:	1. Manual desludging of excreta and its indiscriminate disposal 2. Not Applicable if the bottom of the pit is < 2 m. above the groundwater table 3. Problems arise when water use increases 4. Not designed to cater for sullage water
Linked technologies:	Pit emptying and faecal sludge treatment

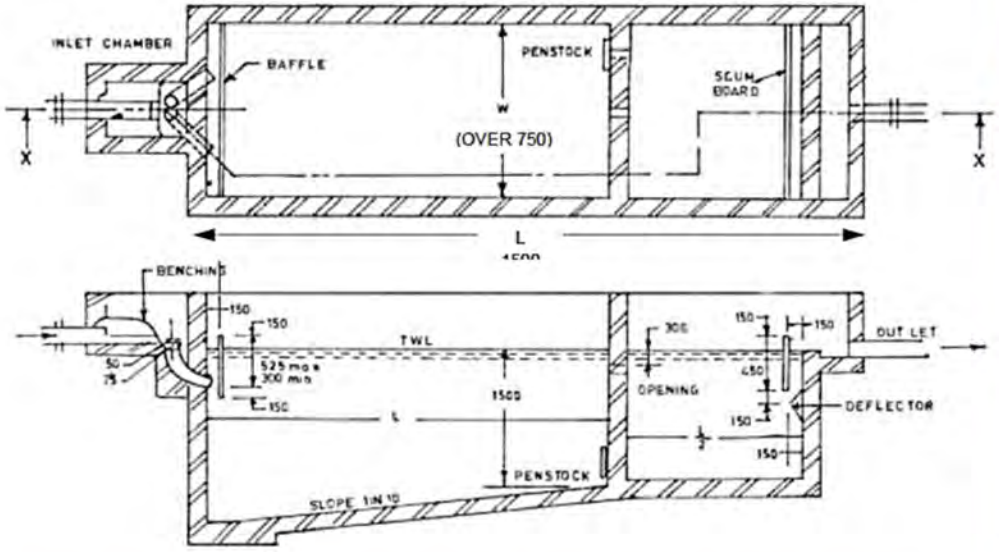
Source : Guidelines for Swachh Bharat Mission – Urban (2017), Ministry of Housing and Urban Affairs (MoHUA), Government of India (GoI)

TWIN PITS TOILETS

Technology option for onsite systems (2/3)

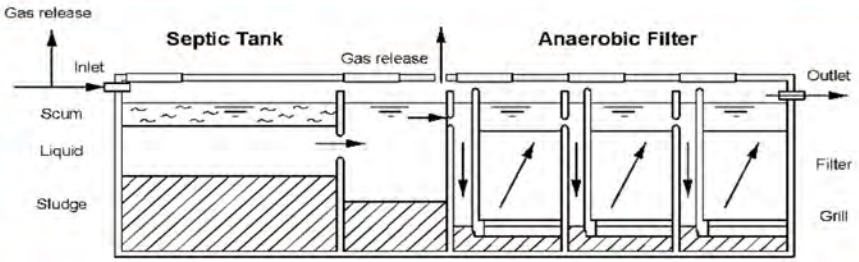


(Dimensions in mm)



Source: Manual on Sewerage and Sewage Treatment Systems, CPHEEO, 2013, Part A: Engineering: http://cpheeo.nic.in/WriteReadData/Cpheeo_Sewarage_Latest/PartA-HighResolution/Chapter%209.pdf

Toilet with Improved Septic tanks



Applicability:

1. Where there is no sewerage network.
2. Appropriate in peri-urban settlements as they do not require any centralized infrastructure.

Soil characteristic:

1. Must be suitable for infiltration of effluent
2. Micro wetland can help through increased evapo-transpiration losses and moisture uptake

O&M Requirement:

Septage must be removed and transported off-site for treatment prior to disposal.

Limitation and risk:

1. High cost and space requirements for the soak away or drain field
2. Common practice is to discharge effluent directly into an open drain as leaching system is often not constructed
3. Retention time is insufficient if Septic tank receives too much wastewater
4. Commonly the householder bypasses the soak away and connects the overflow directly to a surface water drain
5. Performance monitoring of septic tanks is rarely undertaken
6. Regulation to control private desludging operators is problematic

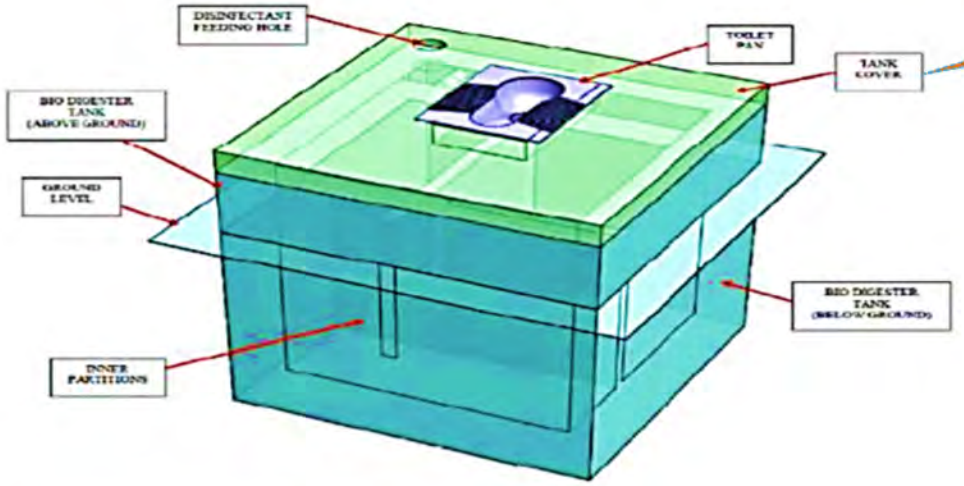
Linked technologies:

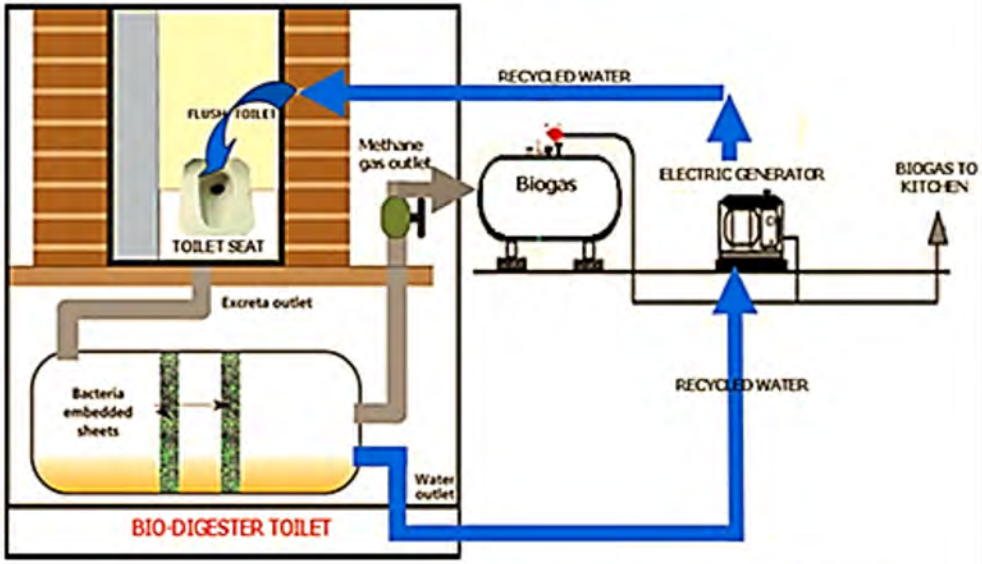
Periodic emptying

TOILET WITH SEPTIC TANKS

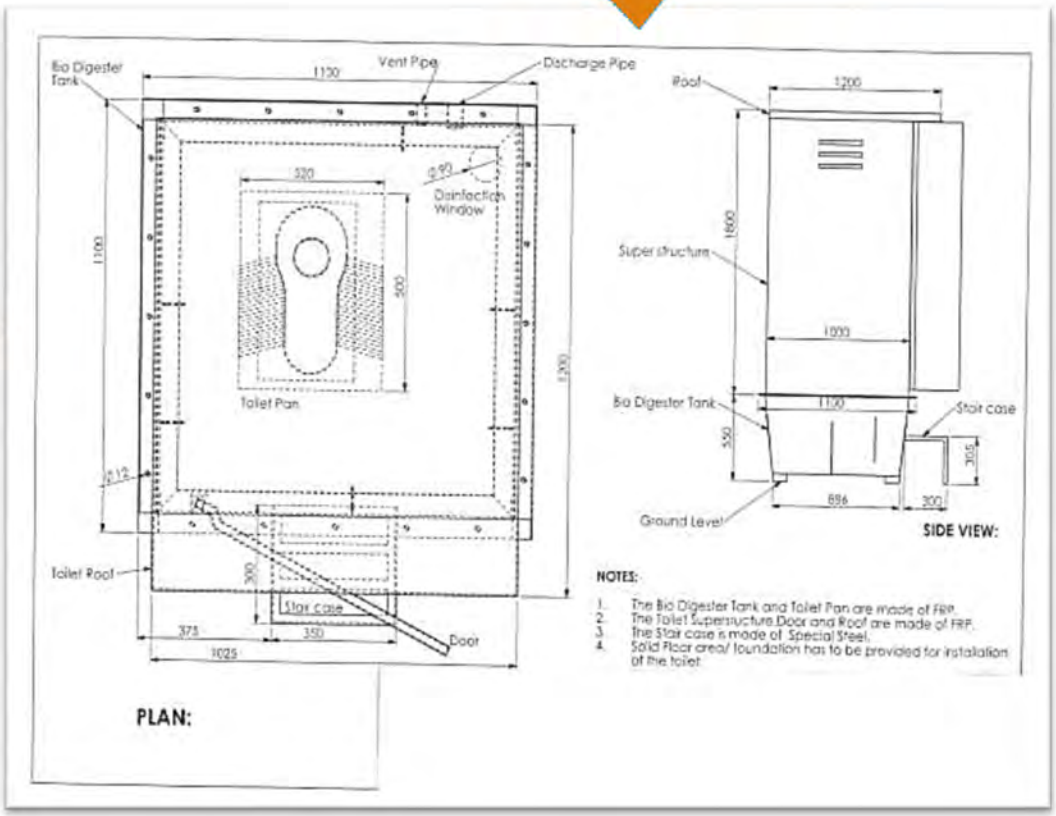
Technology option for onsite systems (3/3)

Bio-Digester toilets



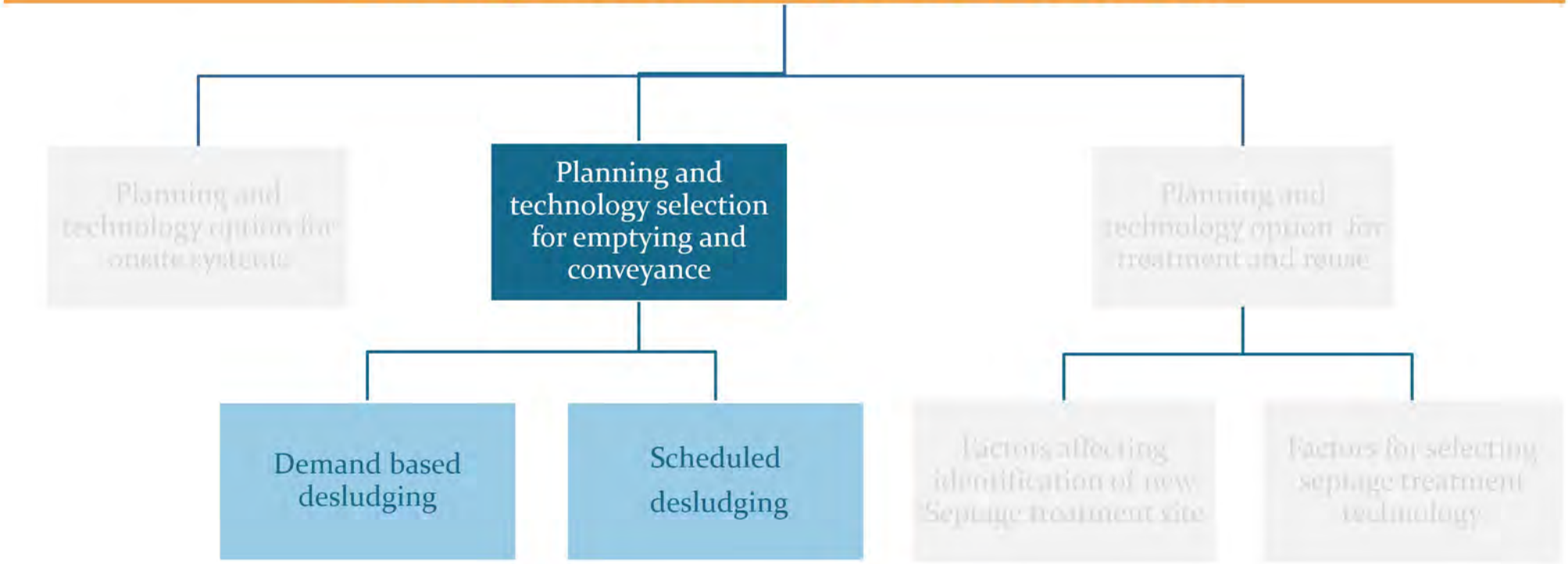


Bio-toilet



Source : Guidelines for Swachh Bharat Mission – Urban (2017), Ministry of Housing and Urban Affairs (MoHUA), Government of India (GoI)

Planning and Technology selection for FSSM



Existing types of emptying & conveyance systems. . .

Services mainly provided by city governments

Unsafe handling of septage

Informal Private sector

Emptying when the tank is full

- No monitoring mechanism for informal sector
- Cleaning cycle greater than 8-10 years against recommended cycle of 2-3 years by GoI advisory on Septage Management
- Due to infrequent cleaning, septage begins to solidify in tanks and septic tank fills up, faecal matter along with effluents is released into the drains

Manual Scavenging Act

Prohibition of Employment as Manual Scavengers and their Rehabilitation Act, 2013

Came into force on Dec 6, 2013

"Prohibition of Insanitary Latrines and Employment and Engagement for cleaning of Sewers or Septic Tanks as Manual Scavenger

Prohibition of Activity

Local authorities to survey **Insanitary latrines and provide Sanitary community latrines.**

Survey of manual scavengers in urban areas by Municipalities.

Duty of local authorities and other agencies to use modern **mechanical technology for cleaning of sewers and onsite systems,** etc.

Rehabilitation

Rehabilitation of persons identified as Manual Scavengers by a Municipality. Housing and Financial Assistance to be given.

Technology options for emptying and conveyance

Conventional Vacuum Tanker	Mini-Vacuum Tanker (Vacutug)	Gulper
For septic tanks which have proper **access roads**, a **larger vehicle** maybe used	For septic tanks located in **narrow lanes** or those that do not have proper access roads, **smaller vehicles** maybe used	**Smaller mechanized tricycle/ motorcycle mounted collection** tanks of 20–40 litres capacity with gulper or smaller vacuum pumps at the primary level backed by a secondary transport system may work in the informal slum settlements.

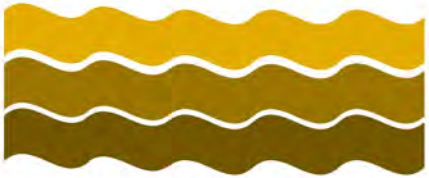
Parameters for assessing conveyance options

i. Distance of treatment site

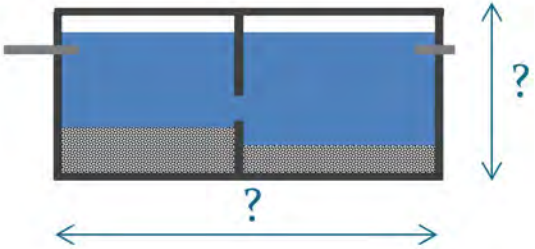
ii. Road Width

iii Access to site

iv. Characteristics of septage



v. Size of septic tanks/pits



vi. Traffic congestion

vii Fuel requirement and its implication in opex

viii Financial budget of emptying services

Parameters for assessing conveyance options

Parameters	Mini Vacuum Truck (Vacutug)	Conventional Vacuum truck	Gulper
Distance of treatment plant from emptying point	Small-Haul distance	Long-Haul distance	No means of disposing the sludge off site
Road width	To be used where road widths are narrower	To be used where road widths are broader	Can be used in narrower road widths
Access to site	**To be used where site access is difficult for large vehicles**	**To be used where site access is easy for large vehicles**	**Can access most locations**
Type of onsite sanitation system (septic tanks/ pits) and characteristics of septage	Difficulty emptying high viscosity sludge	Can handle high viscosity sludge	Hand pumps can be used for liquid and, to a certain degree, viscous sludge
Size of septic tanks/pits	**Applicable for Smaller volume (500-2000 litres)**	**Applicable for Larger size (3000-5000 litres)**	**Cannot empty entire pit (if pit is deep); Slow emptying times**
Traffic congestion	To be used in areas with high traffic congestion	Difficulty in moving in areas with high traffic congestion	Not affected by traffic congestion
Fuel requirement and its implication in opex	**Requires less fuel; low opex**	**Requires more fuel ; high opex**	**No fuel requirement; very low Opex**
Financial budget of emptying services	Not financially viable for long-haul transport	Proves to be financially viable for long-haul transport	Not financially viable for large septic tanks/pit size and for long-haul transport

Occupational Safety

- Municipalities should provide workers with safety gear.
- Each worker should be made aware of the risks of the work through trainings.
- Workers should be held liable for not using available protective gear.

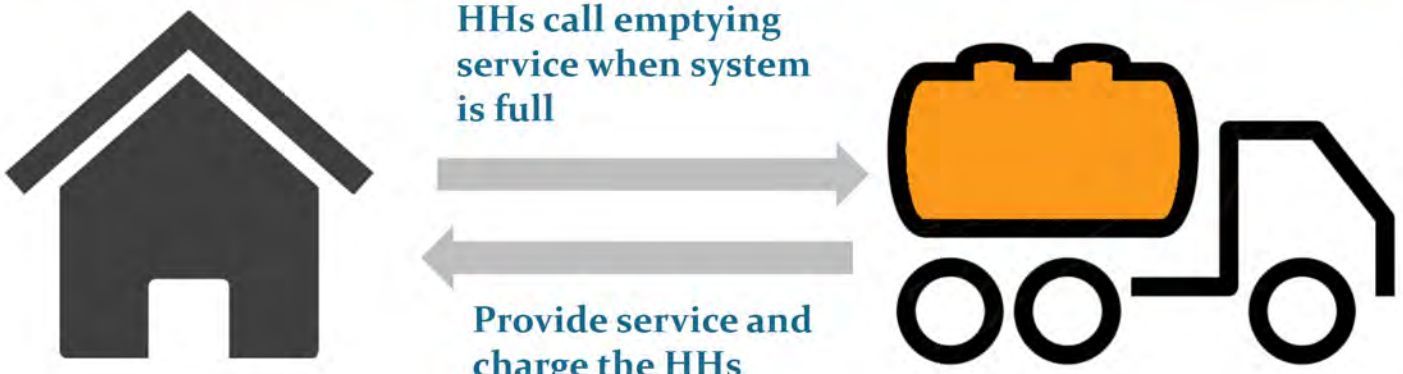
Safety Gears

Use of safety gears by a sanitation worker

Demand v/s Scheduled Emptying

On-Demand Basis	Scheduled Practice
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.	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
The ULBs operates the trucks (either owned or borrowed) when the demand arises.	Each town will require an additional **number of trucks to meet service standards** (which can be **operated by a private player**)
Households generally pay a certain amount once in >8-10 years to get tanks cleaned during the time of overflow.	**Local taxes levied** by the ULB will be used to **recover** the **operating expenses** for regular cleaning.

Demand Based emptying services



If non-regulated,

- No regular cleaning
- Overflowing system pose environmental and health risk
- Private emptier may charge higher
- No safety precautions
- No monitoring of septage disposal

Plan for Regulated Demand based emptying services

- Awareness and regulations to HHs for regular desludging
- Empanelment and training of desludging operators
- Monitoring of emptying services through GPS enabled trucks
- Mandatory safety measures during desludging
- Regulations for emptying charge/tax system

Dakar Model

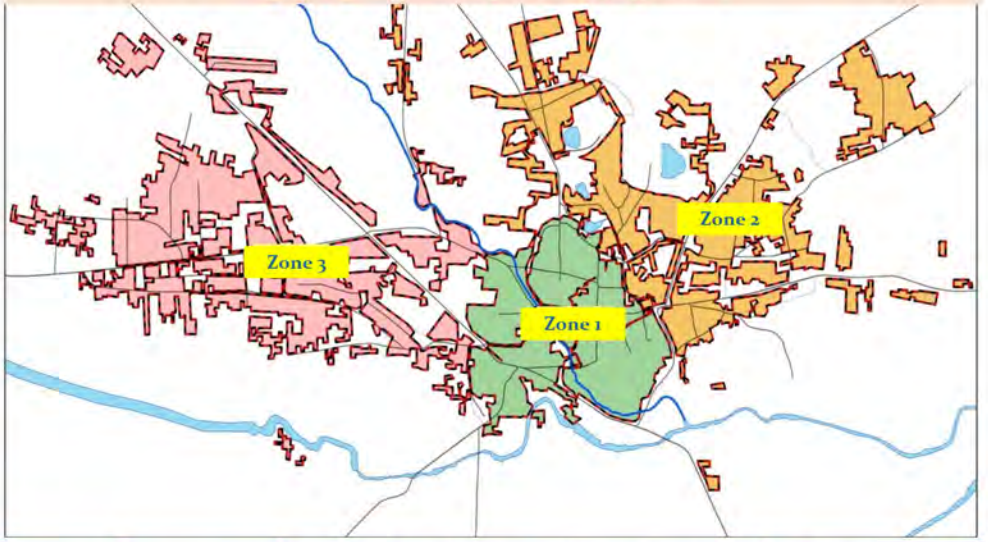
Schedule of emptying services

Septic tank cleaning cycle of 3 years

- To maintain a cycle of 3 years, roughly **2800 septic tanks** need to be **cleaned annually**
- **Each vehicle** needs to make **4 to 5 trips daily**
- Roughly **300 Working Days are required**
- To clean 2800 septic tanks, **2-3 nos of suction emptier trucks** of **5000 capacity** would be **required**

2-3 nos of trucks of 5000 litre capacity are required for cleaning HHs and non-residential septic tanks

Divide the city into zones and prepare a yearly plan



Year	Zones	No. of septic tanks to be cleaned annually (no)	No. of Days required
Year 1	Zone 1	1889	201
	Zone 2	947	101
	Total	2836	302
Year 2	Zone 2	1262	135
	Zone 3	1582	169
	Total	2844	303
Year 3	Zone 3	2762	294
	Total	2762	294

Regulating emptying services . . .

Licensing of septage transporters

Emptying services by ULB or by **private agencies**: management contracts. In case of private sector contract, **ULBs should certify** and **license private septage transporters** to **de-sludge** and **transport waste** to the designated **treatment facility.**

Septage Transporter Permit for _____ Municipality

In accordance with all the terms and conditions of the current _____ Municipality's Rates, Rules and Regulations, the special permit conditions accompanying this permit, and all applicable rules, laws or regulations of Government of Maharashtra, permission is hereby granted to:

NAME OF PERMITTEE: _____

ADDRESS: _____

For the disposal of septage from domestic septic tank or commercial holding tank at the_____ treatment facility.

This Permit is based on information provided in the Septage Transporter Permit application which constitutes the Septage Management Hauled Permit.

This Permit is effective for the period set forth below, may be suspended or revoked for Permit Condition Non Compliance and is not transferable. The original permit shall be kept on file in the Permittee's office. A copy of this Permit shall be carried in every registered vehicle used by the permittee.

EFFECTIVE DATE:

EXPIRATION DATE:

____ CHECK IF RENEWED PERMIT

Permit is liable to be cancelled in case of violations of any Acts, Rules and Regulations relating to the operation of Septage System or in cases of safety protocols not being adhered to or in case of non-permitted disposals.

Sample licensing format

Source: Operative guidelines for septage management for urban and rural local bodies in Tamil Nadu.(2014)

Template Manifest form for emptying

Manifest forms are an integral part of a comprehensive septage management program. This completed document or documents with signatures of the household/property, suction truck operator and treatment plant operator should be submitted to the local government for their records. These records can be linked to the payment of the emptier operator in such a way that the emptier operator is only paid if there are signatures of all the stakeholders

Collection and transport records form / manifest forms[1]

Sample Form to be filled by Operator / Transporter of Septage

i. Identification of Waste:

a) Volume _____
b) b) Type: ____ Septic Tank ____ Others
c) c) Source: ____ Residential ____ Commercial ____Restaurant ____ Portable Toilet ____Others

ii. Details of Waste Generator

a) Name:
b) Phone Number:
c) Address:
d) Pin:
e) Any kind of deficiencies, missing pipes or fittings, improper manholes or access covers, any other cracks or damage observed: _____

The undersigned being duly authorized does hereby certify to the accuracy of the source and type of wastewater collected and transported.

Date: _____ Signature: _____

iii. Details of Transporter / Operator

a) Company Name:
b) Permit:
c) Vehicle License:
d) Pump out date:

The above described wastewater was picked up and hauled by me to the disposal facility name below and was discharged. I certify that the foregoing is true and correct:

e) Signature of authorized agent and title: _____

iv. Acceptance by _____Municipality's authorized STP

The above transporter delivered the described wastewater to this disposal facility and it was accepted.

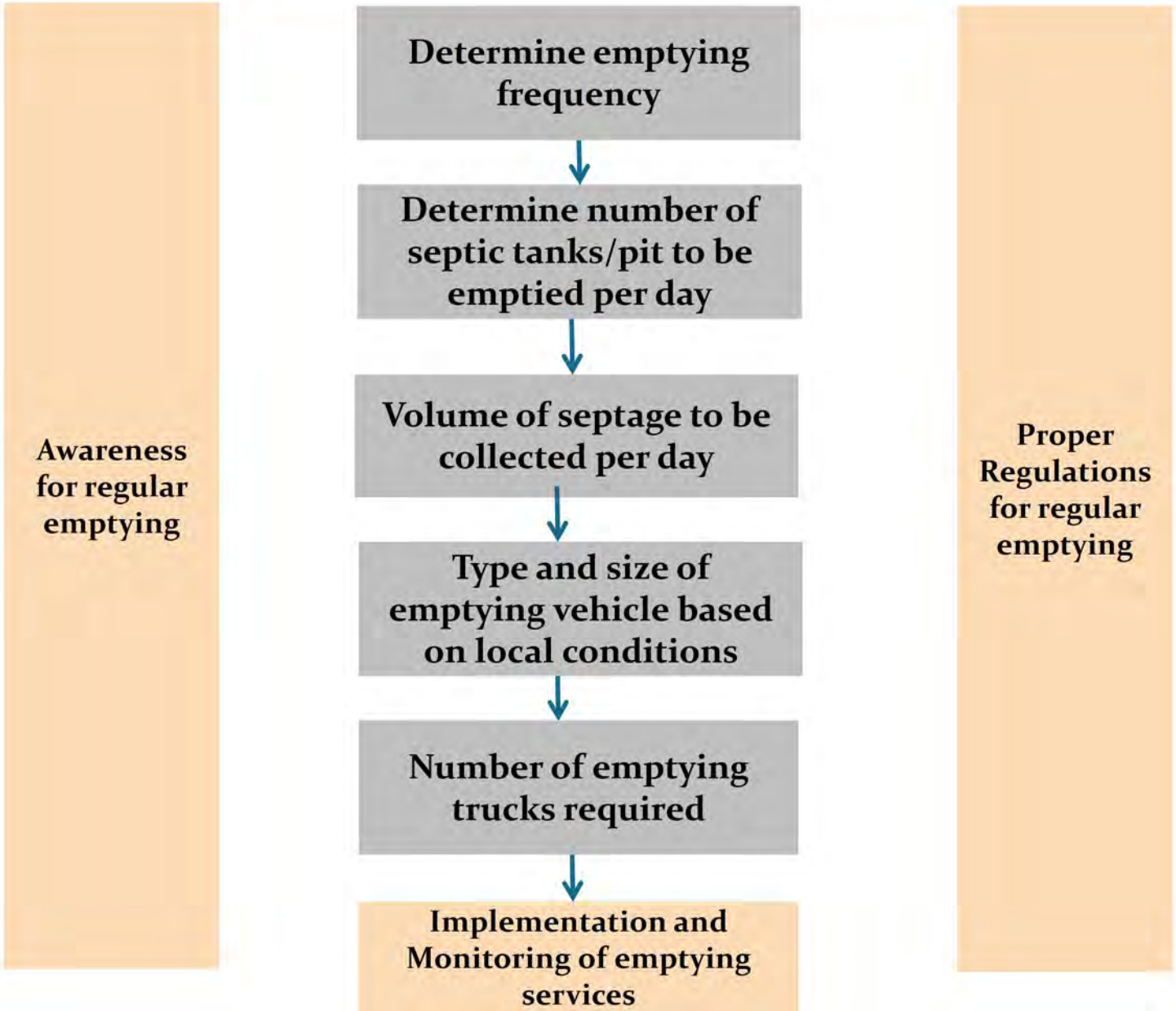
Disposal date: _____ Amount Collected from Transporter (if any):_____

Signature of authorized signatory and title: _____

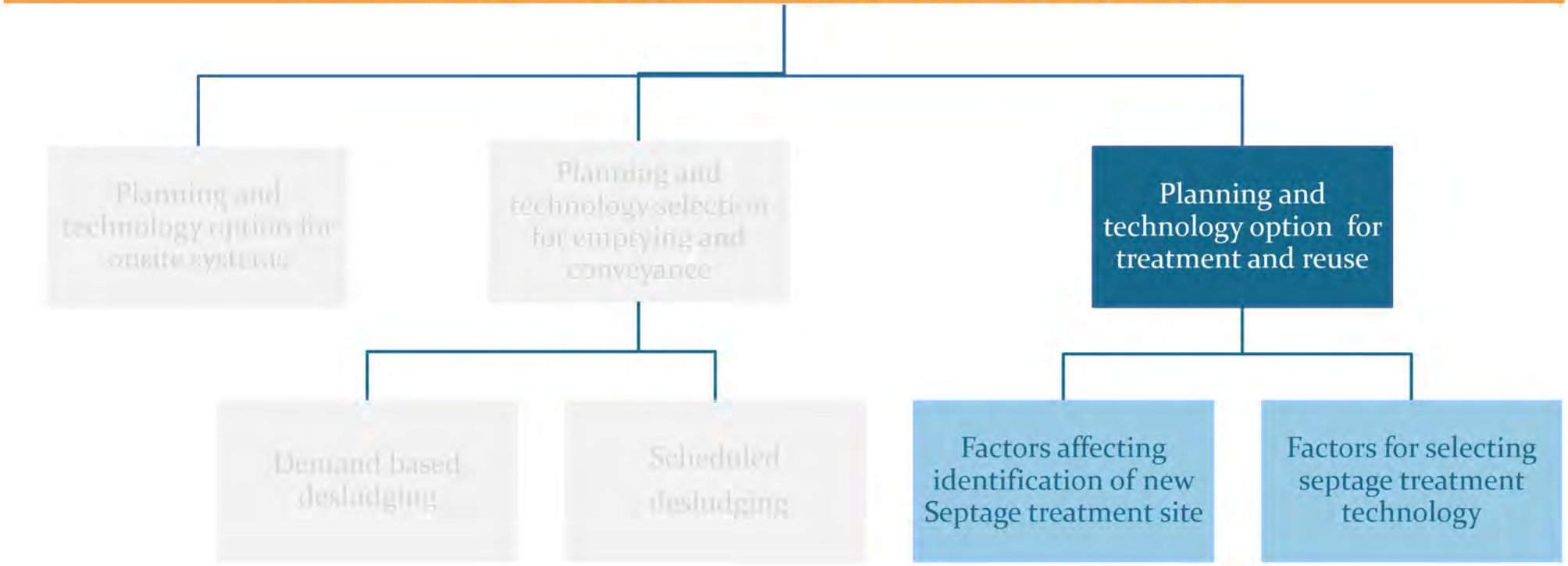
NOTE: SUBJECT TO THE TERMS AND CONDITIONS OF _____ MUNICIPALITY.

[1] Adapted from operative guidelines for septage management for urban and rural local bodies in Tamil Nadu.(2014)

Design Emptying and transport plan



Planning and Technology selection for FSSM



Septage quality results of cities. . .

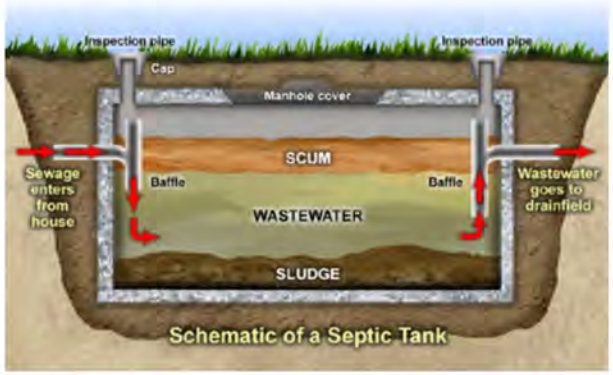
Sr.No.	Parameter	Unit	Wai		Sinnar	
			Household septage	Community - Public toilet septage	Household septage	Community - Public toilet septage
			Result	Result	Result	Result
Test results						
2	BOD5 at 20°c	mg/l	6000 - 16500	228 - 5400	336 - 39000	346 - 2533
3	COD	mg/L	11408 - 27776	395.2 - 9523	1000 - 88000	920 - 7200
4	Total Solids by volume	%	0.992 - 8.07	0.071 - 1.36	0.42 - 7.74	0.43 - 1.06
5	Total Nitrogen (as N) , by volume	%	0.044 - 0.0719	0.016-0.067	0.02 - 0.16	0.06 - 0.11
6	Phosphorus (as P), by volume	%	0.004 - 0.009	0.001 - 0.007	0.0002	0.0002
7	Pottasium (as K) by volume	%	0.004 - 0.014	0.005 - 0.015	0.006 - 0.027	0.017 - 0.029
8	Gross Calorific Value, on dry basis	cal/g	4148	*	3226 - 4817	1281 - 2732
9	Faecal Coliforms	/100ml	>1600	>1600	22 - 920	32 - 170

Note : * - Not analyzed due to insufficient quantity of sample

- **BOD and Total Solids are affected by emptying frequency**
  - ❑ **The more frequently the septic tank is emptied : Less is the BOD and Total solids and vice a versa**
- **The emptying frequency is also dependent on type of housing .**
  - ❑ **Flats are emptied more frequently as compared to bunglows / row houses**

Septage Quality differs City to City . . .

Septage Quantity calculation. .



Volume of Septic tank

- Requires detailed survey of each property (residential, community, commercial, institutional)
- Total volume of all types of collection system

Per capita generation Standard

- Based on Std norm of 230 litres/capita/year (GOI septage guidelines)
- Septage quantity (litres/year)= population*230

Identify new Septage treatment site . . .

i. Distance of treatment site

- Long distance: costly
- A site that is too far away implies fewer trips per day, less revenue and more fuel costs to private operators.

ii. Land availability

- Government land availability
- ULB should also explore the possibility of developing septage treatment facility at solid waste dumping or treatment site.

iii. Reliability of electricity

- If treatment technology has mechanical operated parts.

iv. Neighborhood

- A treatment site may generate nuisance, especially bad odors.
- It should be located at an appropriate distance from the residential areas.

v. Geological Parameters

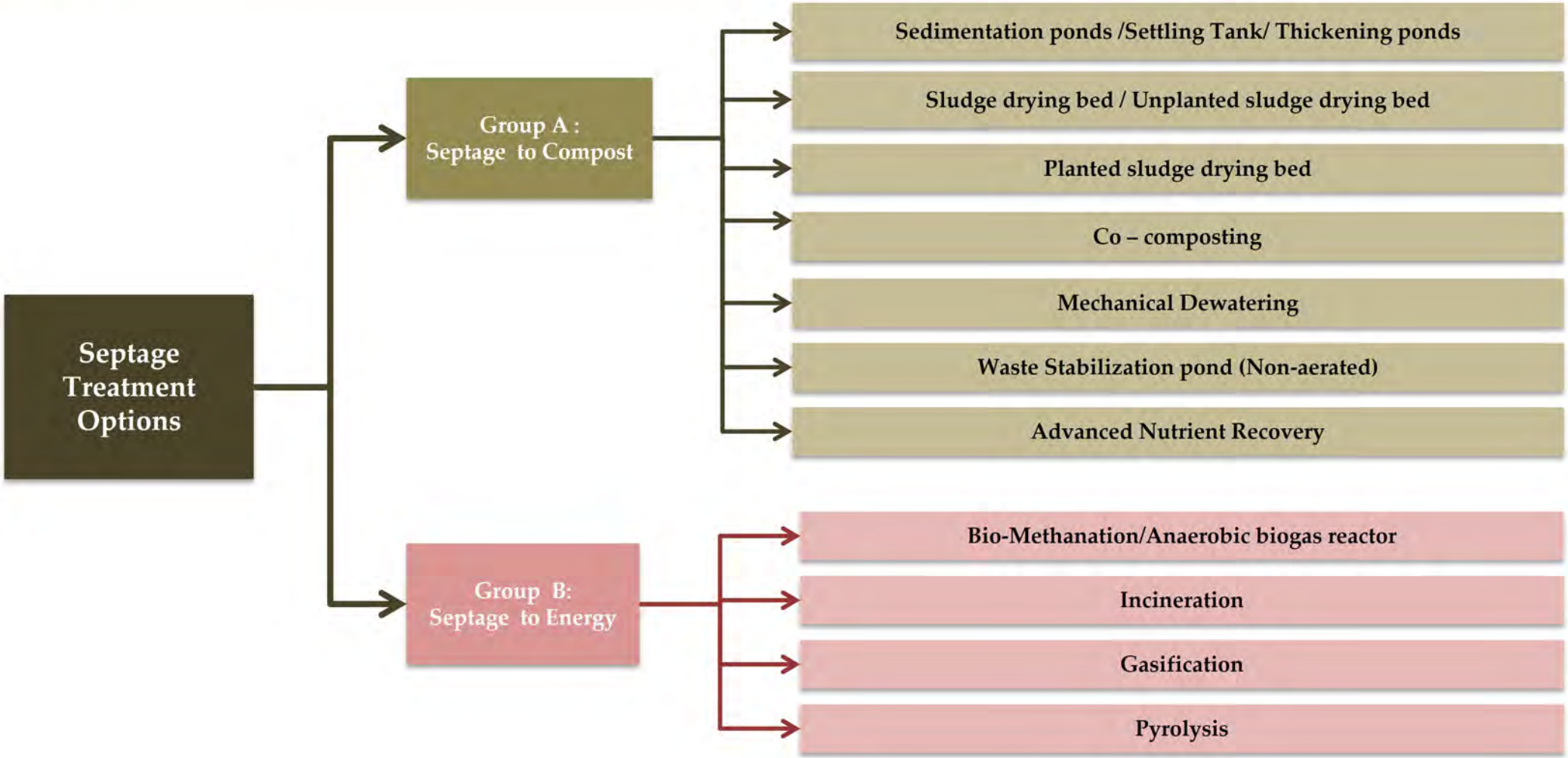
- Groundwater table
- Type of soil
- Prone to flooding

Source: Faecal Sludge Management: Systems Approach for Implementation and Operation, Linda Strande, Mariska Ronteltap, Damir Brdjanovic, IWA 2014

Identify and compare treatment Technology based on following factors...

- **Technical performance of treatment option:**
  - Technology providing required quality output,
  - Popularity in local context, advantages and disadvantages,
  - requirement of pre-treatment or post treatment,
  - level of difficulty in handling or discharging endproduct generated, etc.
- **Site condition:** Permeability, groundwater table, soil type etc
- **Capital and operating cost**
- **Simplicity in Construction & Operation**
- **Level of mechanization** required for its operation
- Efficiency of **energy recovery**

Various Septage treatment options are available. . .

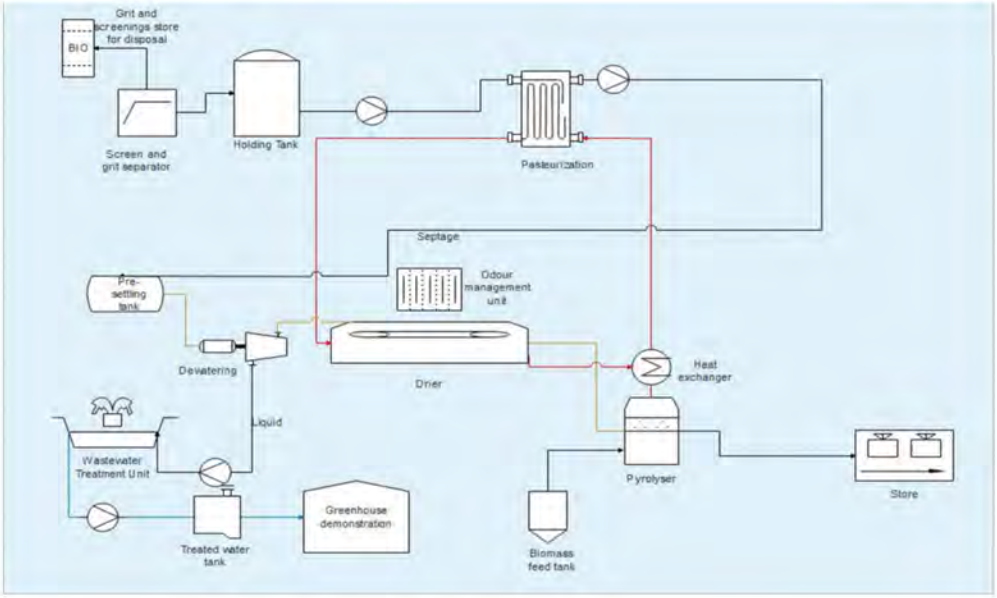


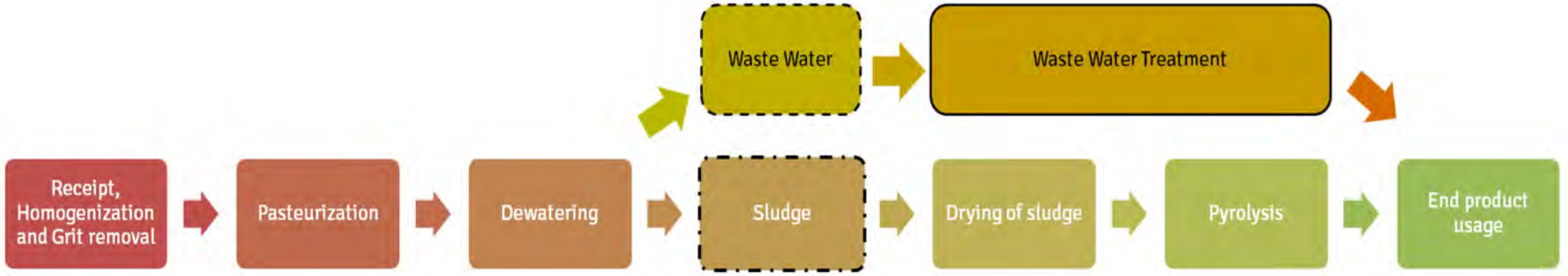
Based on literature reviews and international case studies . . .

Case studies showing combination of these technologies . . .

Proposed Wai FSTP

Population	**~40,000**
Plant capacity	**70 m3/day**
Area	**1000 Sqmt**
Commission year	**Under construction**
Operated by	**Private sector**

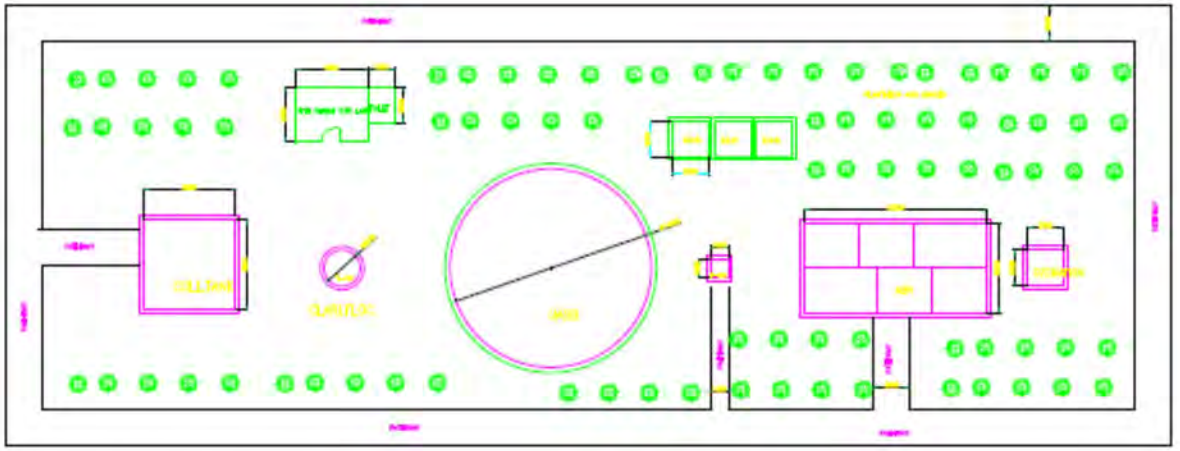


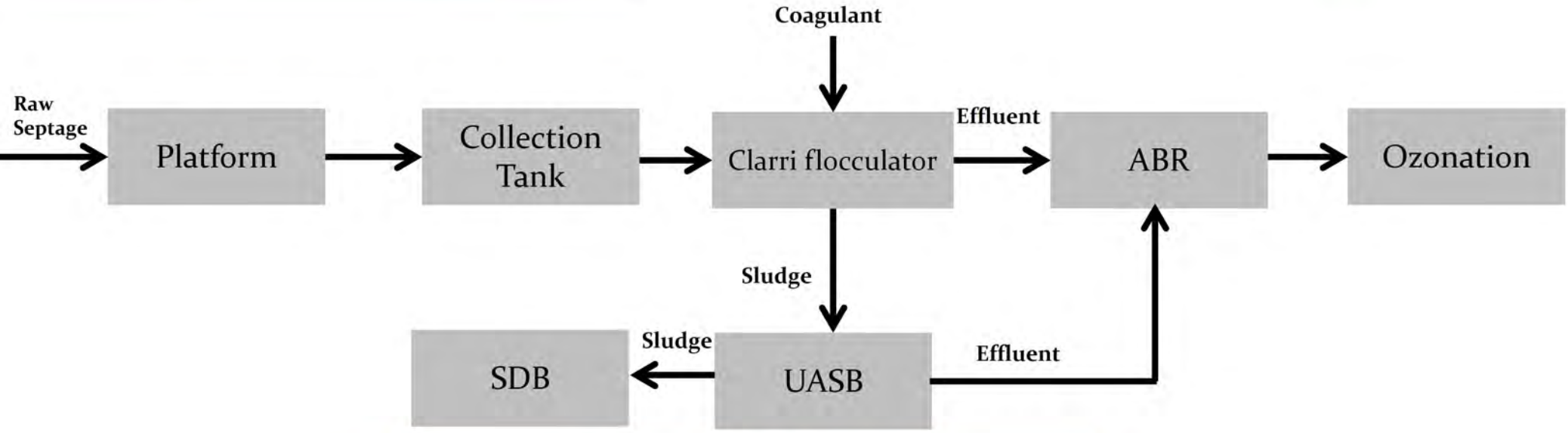


Process flow diagram

Proposed Sinnar FSTP

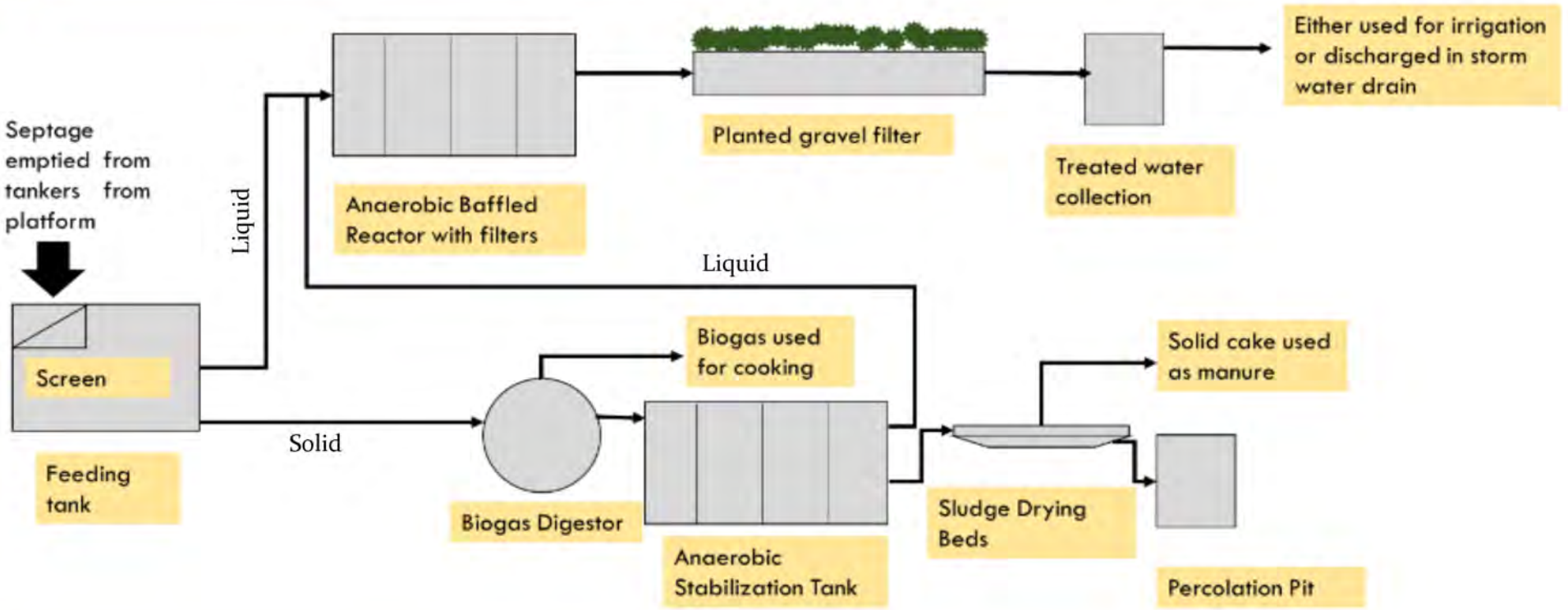
Population	~75,000
Plant capacity	70 m3/day
Area	650 Sq mt
Commission year	Under Construction
Operated by	Private sector





Process flow diagram

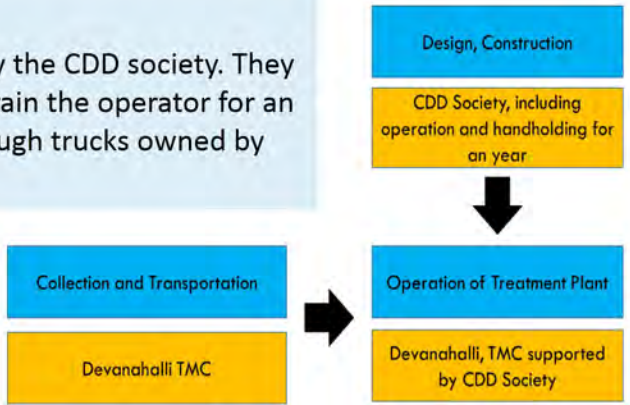
Devanahalli, Karnataka



Population	**28,051**
Plant capacity	**6 m3/day**
Area	**625 Sq mt**
Construction cost	**70 lakhs**
O&M cost	**3-4 lakhs/ annum**
Commission year	**Nov 2015**
Operated by	**Private sector**

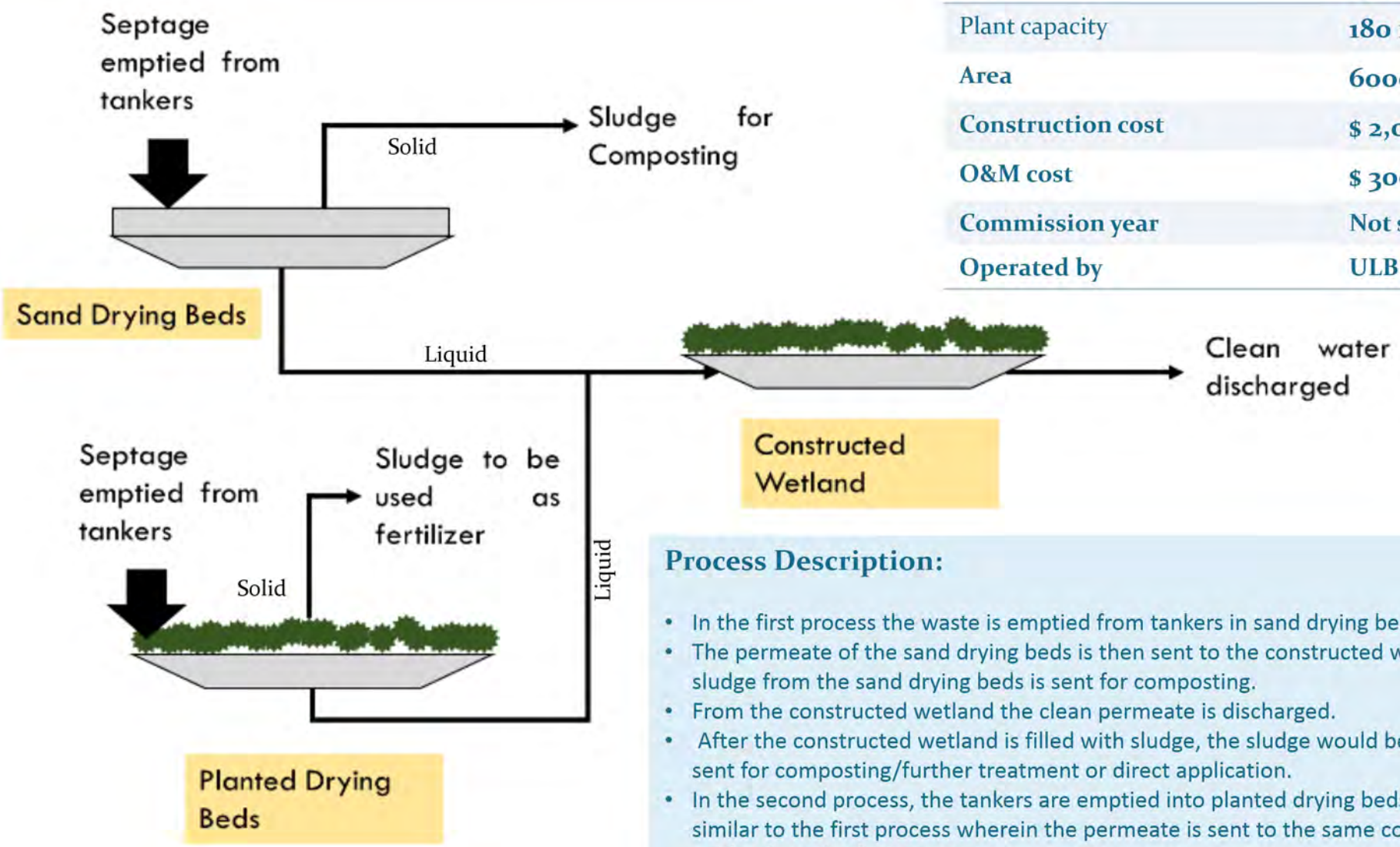
Stakeholder and Responsibilities

At present the FSTP is being maintained by the CDD society. They have a contract to design, construct and train the operator for an year. The faecal sludge is transported through trucks owned by the TMC Devanahalli.



Khulna, Bangladesh

Population	15 lakhs
Plant capacity	180 m3/day
Area	6000 Sq mt
Construction cost	$ 2,00,000
O&M cost	$ 3000/ annum
Commission year	Not started
Operated by	ULB

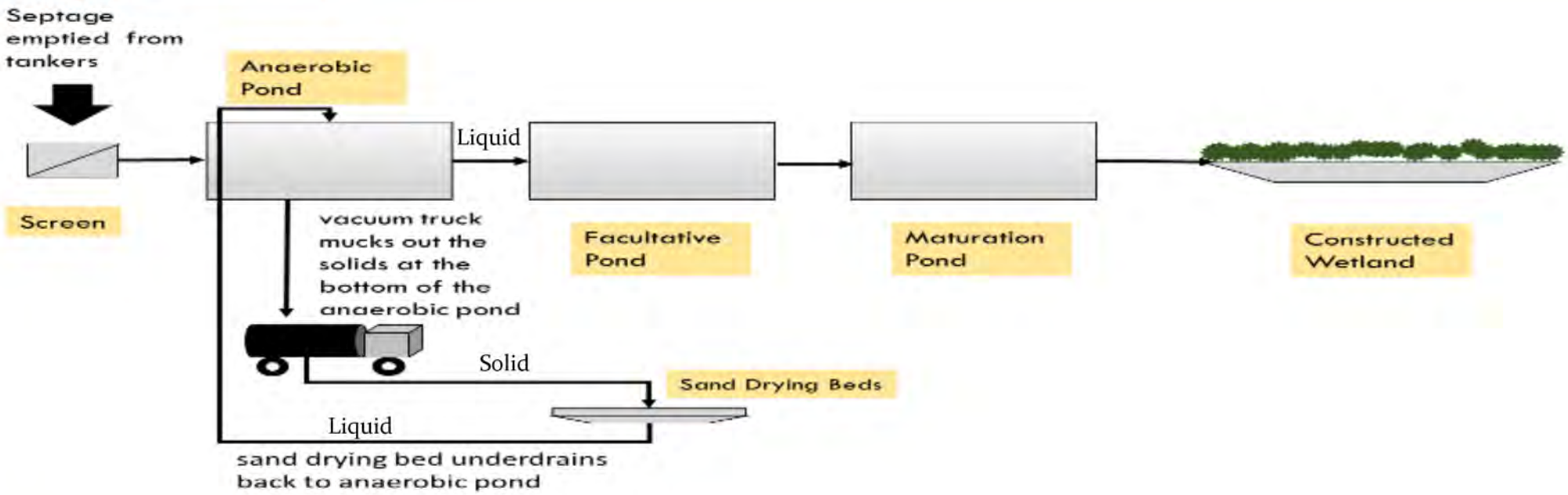


Process Description:

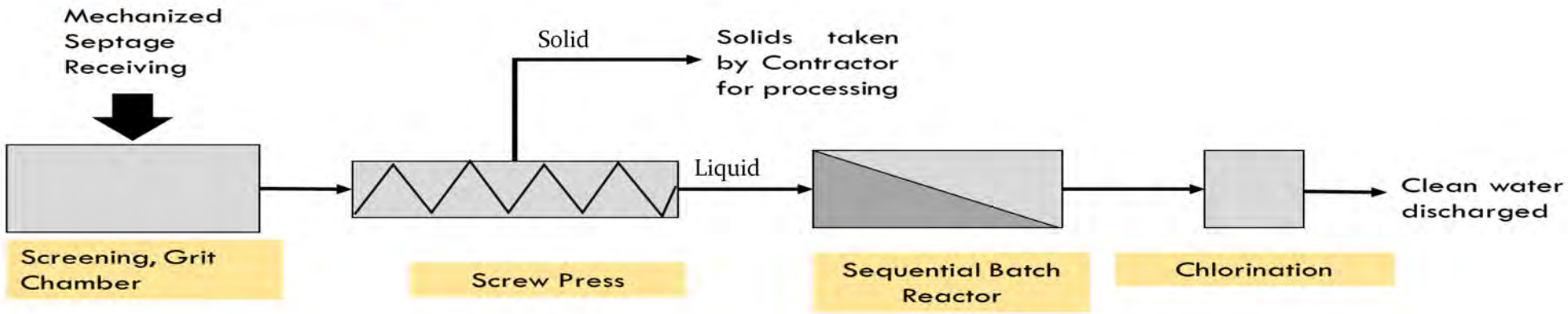
- In the first process the waste is emptied from tankers in sand drying beds.
- The permeate of the sand drying beds is then sent to the constructed wetland. The sludge from the sand drying beds is sent for composting.
- From the constructed wetland the clean permeate is discharged.
- After the constructed wetland is filled with sludge, the sludge would be removed and sent for composting/further treatment or direct application.
- In the second process, the tankers are emptied into planted drying beds. The process is similar to the first process wherein the permeate is sent to the same constructed wetlands as the first process.
- The sludge from the planted drying beds here is used directly as fertilizer.

Other septage treatment plants . . . (2/2)

Dumaguete, Philippines
80 m3/day



Bay Laguna, Philippines
100 m3/day



Quality Standards for Reuse of treated Septage . . .

- ***Dewatered septage/sludge use as a fertilizer in agriculture , should satisfy criteria of Class A Bio-solids of US EPA :***
  - Faecal coliform density < 1000 MPN/g total dry solids
  - Salmonella sp. Density < 3MPN/4g total dry solids
  - Helminth egg concentration < 1/g total dry solids (WHO, 2006)
  - E – Coli of 1000/g total solids (WHO, 2006)

- ***As per MSW Rules, 2000 compost quality should not exceed the prescribed limit as below:***

Parameter	Concentration not to exceed (mg/kg dry basis, except for pH and carbon to nitrogen ratio)
Arsenic	10
Cadmium	5
Chromium	50
Copper	300
Lead	100
Mercury	0.15
Nickel	50
Zinc	1000
C/N ratio	20 – 40
pH	5.5 – 8.5

Properly **treated sludge** can be **reused to reclaim parched land** by application as soil conditioner, and/or as a fertilizer.

Deteriorated land areas, which cannot support the plant vegetation due to lack of nutrients, soil organic matter, low pH and low water holding capacity, can be **reclaimed and improved by the application of treated septage**

Source : Advisory note on Septage management in Urban India, MoUD Jan 2013

Discussion points....

- Idea of Scheduled v/s demand based emptying ? Which is feasible in your state / city context
- Is Co-treatment of sludge/septage in STP an option in your state/ city ?
- Is there a market for treated sludge in your state / city

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Group Exercise

Prepare FSSM plan for a city

Participants will plan for infrastructure that is required for implementing a FSSM plan for a city.

FSSM PLAN		
Sr.No	**Description**	**No.**
	Input details	
A	Population	65251
B	Total households (HHs)	13112
C	HHs having toilets with septic tanks	9901
D	No. of community/ public toilets having septic tanks	21
E	Average volume of household and community toilet septic tanks (cum)	5
F	Septic tank cleaning cycle for HHs (Years)	3
G	Septic tank cleaning cycle for CT/PT (Days)	7
H	No. of working days in an year	300
I	No. of trips possible per emptying vehicle per day (trip/day/vehicle)	4

Key Outputs . . .

- **Number of tanks to be emptied daily = _____ daily**
  - HHs toilets connected to septic tank / cleaning cycle for HHs = _____ annually
    - HHs toilets to be cleaned daily = annual cleaning / number of working days = _____ daily
  - CTs connected to septic tank / cleaning cycle for CTs = _____ daily

- **Number of trucks required = _____ nos**
  - Number of tanks to be emptied daily / Number of trips per day = _____ nos

- **Volume of septage to be treated = _____ cum/day**
  - Average volume of HHs and CTs septic tanks x Number trips per day = ___ cum/day

Session 7: Financing FSSM

Objective of the Session

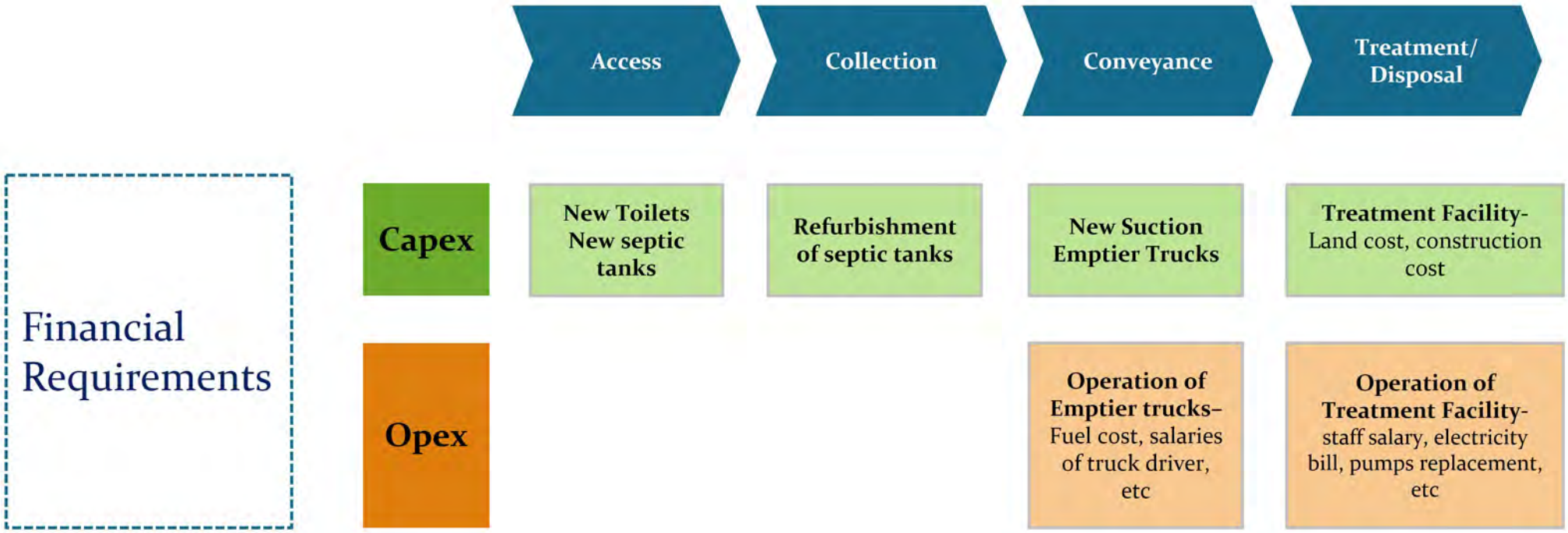
- This session will highlight that to ensure financial **sustainability** of **FSM services**, it is important to **assess capacity for financing** of both capital and O&M expenditure over the plan period.

- The session will give brief overview on how to **assess financial** requirements for both **capital** and **O&M expenditures** for implementation of FSSM in a city.

- The session will also **provides guidance** on **potential sources** of **finance** for meeting these expenditures including through external **grants**, **private sector investments**, user contributions, external **debt** or through local government internal resources.

Financial Requirements for FSSM

Assessment of Financing requirement across FSM service chain



- The first step in Financial Assessment is to determine the financing requirements for proposals for the full service chain – starting with toilets in the user interface, to collection, conveyance and treatment or disposal.
- The finance requirements are essentially based on costs of achieving the various improvement activities planned.
- It is also important to ensure that both capital costs and O&M costs are assessed.

Potential sources of Financing

- For developing a financing plan for FSM, potential sources of funds for capital expenditures will be required and terms and conditions for each will need to be identified.
- The potential sources for capital expenditures may include grants from national/provincial government; own resources of local government, CSR funds from corporate sector or loan from financial institutions.
- In case of private sector participation, the willingness of private players to meet capital expenditure will also need to be assessed.
- Similarly, background assessment of various ongoing programmes at the state and national levels will provide an idea of the possibility of accessing such funds to meet the capital expenditure requirements.
- The potential sources for operating expenditure may include local government own fund, levy of user charge or tax, sale of treated sludge to end users.

Identify potential sources of Financing

	Access	Conveyance	Treatment/ Disposal
CAPEX	**New toilets and Refurbishment of septic tanks**	**Suction Emptier Trucks**	**Treatment Facility-** Land and construction cost
	Households	Central/State Grants	Central/State Grants, VGF
	Government Subsidy	Local Govt. funds	Local Govt. funds
	CSR fund, Crowdfunding, Credit	Private Sector/PPP	Municipal Bonds/Public Finance
			CSR, Crowdfunding
			Private Sector/PPP
OPEX	**Repair of toilets and septic tanks**	**Operation of Emptier trucks–** Fuel cost, salaries of truck driver,etc	**Operation of Treatment Facility-** Salary, electricity , pumps replacement, etc
	Households, Housing society fees	Sanitation Tax/Other Taxes	Sanitation Tax/Other Taxes
		User Charges (Emptying fees)	Sale of Compost

Assess sources for CAPEX....

Current Government Programmes and funds availability

(eg: SBM, AMRUT, 14th FC)

Own funds of Urban Local Body for capital financing

Willingness of Private sector to invest

Innovative financing
Eg: CSR, Crowdfunding, loans

CAPEX: Emptying & Conveyance

A. Potential sources of finance for Capital Expenditure

Suction Emptier Trucks	Demand based FSM Services	Scheduled FSM Services
Central/state Grants/ Local Government Funds	Several states have earmarked funds/ grants for procurement of vacuum trucks for urban local governments.	
Private sector	Private sector is already investing as per demand	Private sector is generally willing to bring investment for vacuum trucks

CAPEX: Treatment system

A. Potential sources of finance for Capital Expenditure

FSSTP	Demand based FSM Services	Scheduled FSM Services
Central/state Grants	Size of treatment units is relatively small. Large cities may mobilize from own funds. Small cities may mobilize from 14th FC funds/ AMRUT.	-Large cities may use ongoing national level programmes - Small cities may require small size of grant from state programme or mobilize from 14th FC funds.
Local governments		
Private /VGF	Private sector is willing with VGF	
Innovative Finance	CSR, Social Impact Investor, Donor funding etc	

Identify Existing Revenue sources

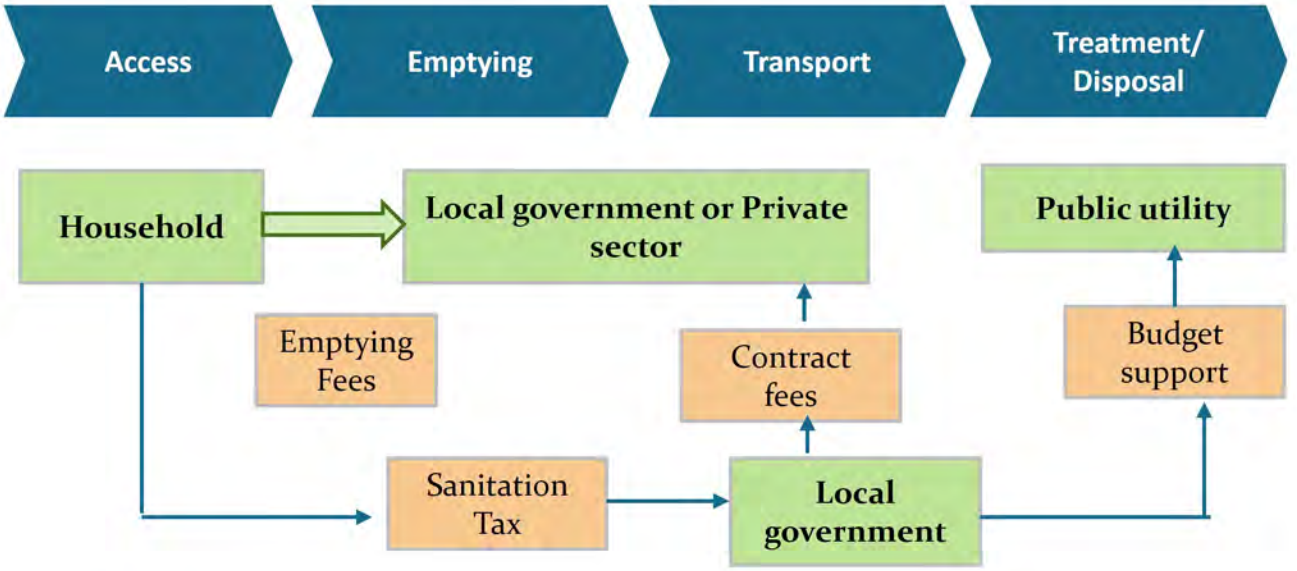
To make FSM activities sustainable, assessing the revenue sources is very important

- Local government become financially sustainable by leving taxes and/or user charges so as to recover O&M costs of recent urban development programmes.
- It is therefore imperative that any proposed investment plan includes ways to recover O&M costs.
- Besides meeting operating expenses, the ULB is required to keep sufficient surplus to meet repayment obligations in addition to its committed capital expenses.

Assessment of current tariffs levels across FSM service chain

FS Flow Diagram

Existing tariff flow

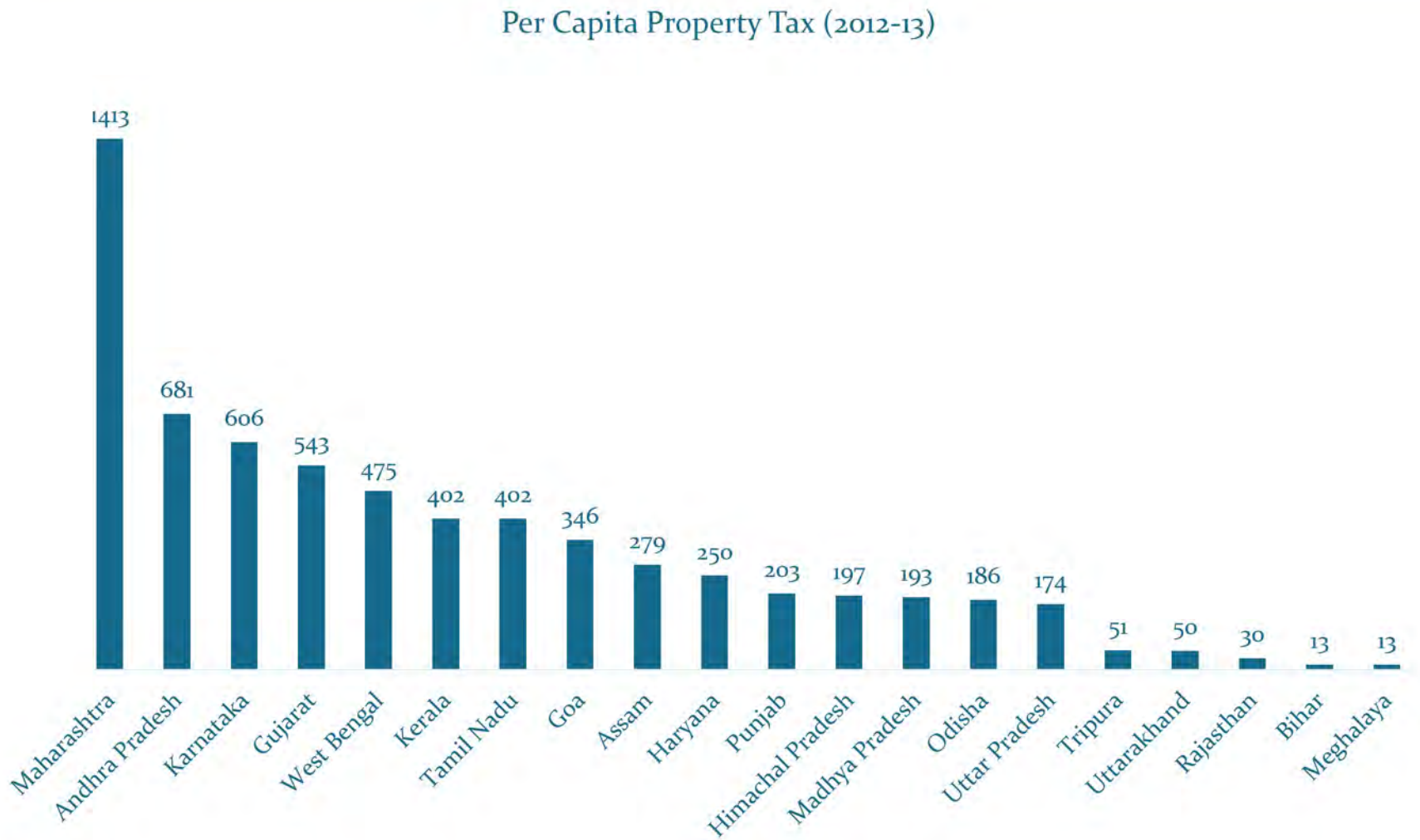


Source: Diagram adopted from Faecal Sludge Management: Systems Approach for Implementation and Operation, Linda Strande, Mariska Ronteltap, Damir Brdjanovic, IWA 2014

Provision of Sanitation Tax/ user charge/ fee

State	Sanitation Tax	User charge/ fees/ cess
Gujarat	General sanitation tax upon private latrines, premises or compounds cleansed by municipal agency	
Maharashtra	Special sanitary tax upon private latrines, premises or compounds cleansed by municipal agency	
West Bengal	-	a fee with regard to a scavenging
Uttar Pradesh/ Uttarakhand	a conservancy tax in areas in which the Corporation undertakes the collection, removal and disposal of excrementitious and polluted matter from privies, urinals and cesspools	-
Punjab	Scavenging tax as percentage of annual value	Sewerage Cess
Haryana	-	a fee with regard to a scavenging
Rajasthan	-	User charge for provision of drainage and sewerage

Per capita Property Tax



Source: Municipal finances and service delivery in India (2014), ASCI

Assess HHs willingness to pay & reuse market

HHs willingness to pay

- Assess how much the people are willing to pay for regular or demand based emptying service
- Assess willingness of the local government to levy sanitation charges/taxes

Landscape assessment of reuse market

- Identify nearby industries or agriculture land
- Assess their willingness to reuse the treated septage and water
- Assess how much they are willing to pay to buy treated septage and water

Potential Revenue structure

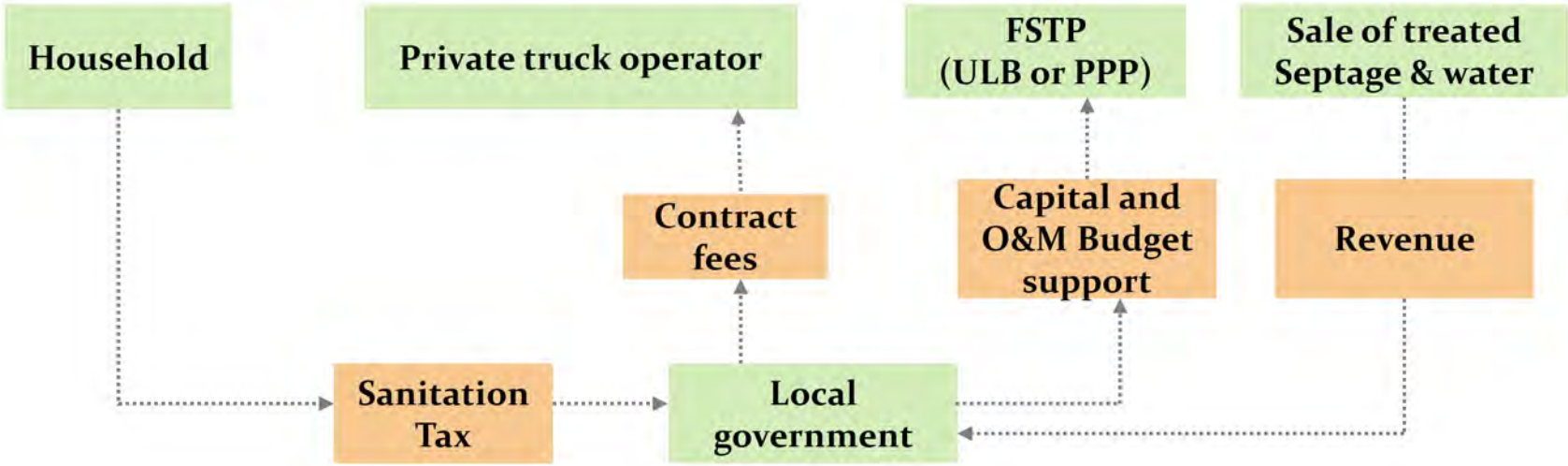
Scheduled Desludging through Sanitation Tax

Basis - a) sanitation tax collected from owners of OSSs, and
b) mandatory scheduled desludging of tanks/pits.

Sanitation tax is collected by the local authority either as a percentage of property tax or by the public utilities as a surcharge on water bills.

FS Flow Diagram

Proposed tariff flow



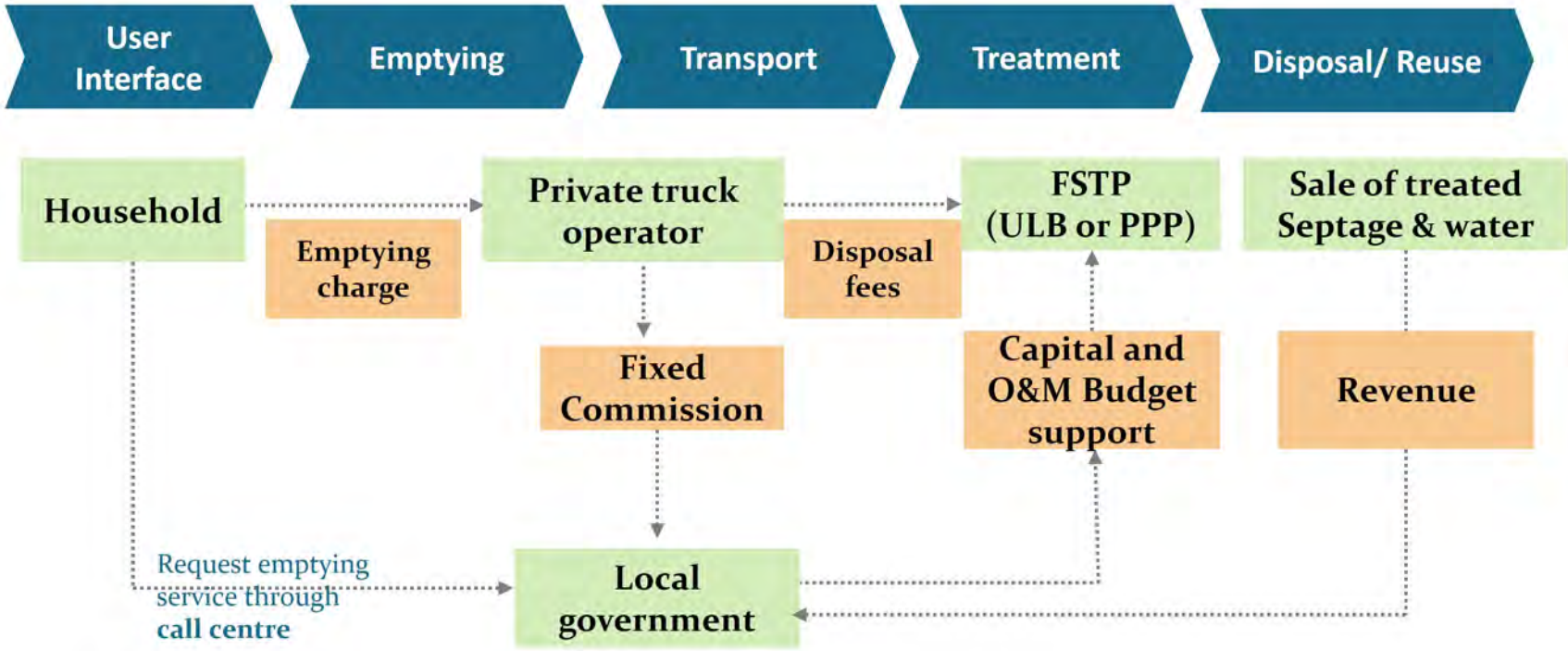
Potential Revenue structure

Demand Based Desludging through emptying charge

Basis - Requires setting up a call center or a customer help center managed by the local authorities which acts as a network orchestrator linking users of OSSs with vacuum truck operators. The truck operators register with the call center for a fixed annual fee which can also double up as a license or permit. Users of OSSs call the help center when their septic tanks or pits are full.

FS Flow Diagram

Proposed tariff flow



Discussion points

- **What are key issues in financing FSSM?**
- **Emptying charge or Sanitation tax?**
- **Potential Sources for CAPEX and OPEX in your state?**
  - Emptier trucks
  - Treatment plant

References

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Group Exercise

Tariff requirement to recover O&M cost

Step 1: O& M cost for schedule septic tank emptying service

1	Fuel cost for schedule emptying service = (Number of septic tank to be emptied daily*300* Average distance * 2 * Fuel price/ Fuel efficiency) - *Assume Fuel efficiency for truck = 5 km per liter* - *Assume Fuel price = Rs 70 per liter*	
2	Repair and maintenance cost = (Number of suction emptier truck requirement* 12 * 2,000) - *Assume average repair & maintenance cost = Rs 2,000 per month*	
3	Establishment expenses = ((Number of suction emptier truck requirement* 12 * No of manpower* Monthly Salary) - *Assume, 2 manpower requirement per truck* - *Assume, Salary = Rs 10,000 per month*	
4	**Sub-total = (1+2+3)**	
5	Overhead + Insurance + other Miscellaneous cost = Sub-total(4)*X% - *Assume, other cost as X% of sub-total (4)*	
6 –A	**Total O&M cost for schedule septic emptying service = (4+5)**	

Tariff requirement to recover O&M cost

Step 2: O& M cost for septage treatment facility

1	Energy cost for Septage treatment facilities = (Energy cost per month * 12) **Energy cost** - *< 25 cum/day = Rs 5,000 per month* - *25-50 cum/day = Rs 10,000 per month* - *50-75 cum/day = Rs 15,000 per month* - *> 75 cum/day = Rs 20,000 per month*	
2	Repair and maintenance cost = (Avg. Repair & maintenance cost * 12) - *Assume average repair & maintenance cost = Rs 10,000 per month*	
3	Establishment expenses = (No. of manpower*Monthly Salary *12) - *Assume, 4 manpower requirement (in 2 shifts)* - *Assume, Salary = Rs 10,000 per month*	
4	**Sub-total = (1+2+3)**	
5	Overhead + Insurance + other Miscellaneous cost = (4*X%) - *Assume, other cost as X% of sub-total (4)*	
6-B	**Total O&M cost for managing Septage treatment facility = (4+5)**	

Key Outputs . . .

A. **Annual O&M Cost= 6-A + 6-B =**

B. **Per property tariff requirement for septage management =**

=(Annual O&M cost (A)/ total properties)* collection efficiency

- *Considering tax collection efficiency= 70%*
- *Note: Users may calculate differential tariff structure across property uses; properties with toilet facility v/s properties dependent on community toilet etc.*

Session 8: SaniPlan

Saniplan

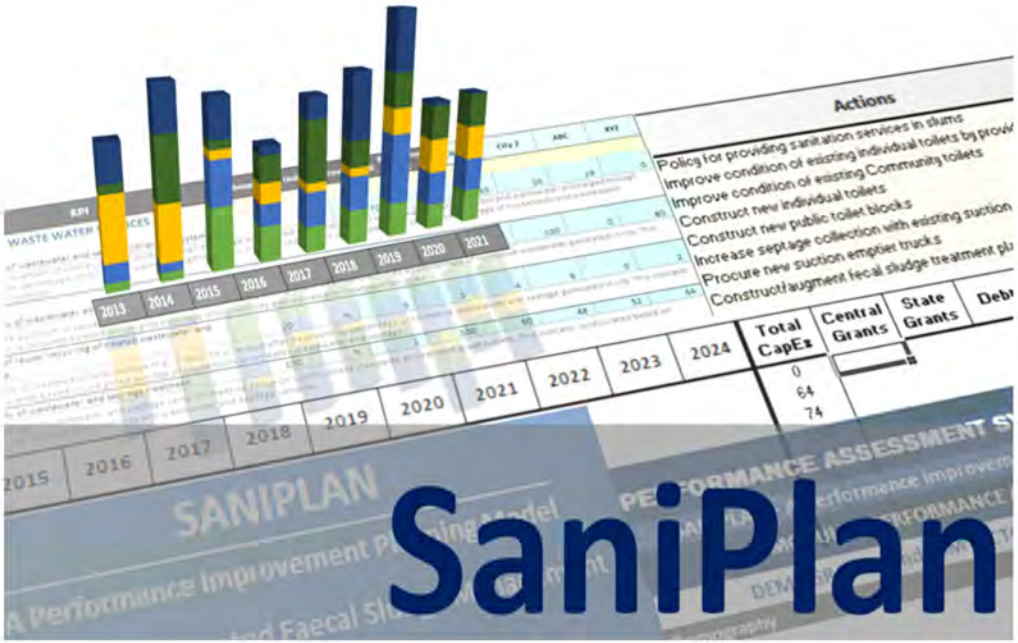
Decision support excel based tool for planning citywide sanitation

Key Features:

- Multi-year planning framework
- Menu of improvement actions
- Integrate Project and Municipal Financial Planning
  - Capex and Opex
- Inbuilt scenario comparison
- Public health impact

Audience:

Consultants | City Planners | Donors



Conventional Approach versus SaniPlan approach

Conventional Approach

'PROJECT'
based approach

Focus on achieving OUTPUTS

Starting point is an assessment of available grant funding – SUPPLY DRIVEN

Focus on developing INDIVIDUAL PROJECTS of various sectors

SANIPLAN Approach

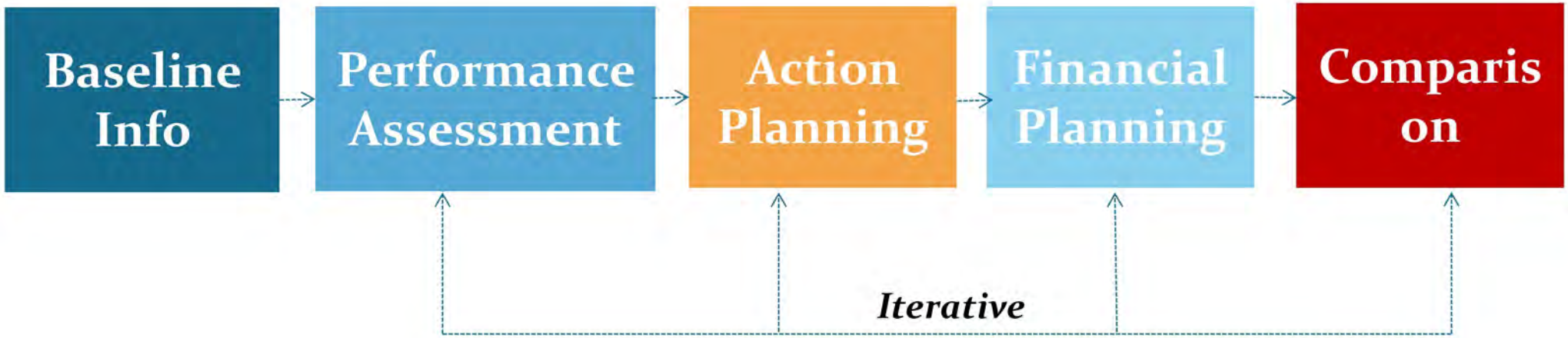
'SERVICE'
based approach

Focus on achieving OUTCOMES

Starting point is measurement of current performance and local priorities – NEED DRIVEN

Focus on developing integrated SECTORAL SOLUTIONS

SaniPlan framework



Baseline Information across sanitation value chain

General Info | Demography | Access | Collection | Conveyance | Treatment | Disposal/Reuse | Local Finance

What if there is **No baseline sanitation information available at household level**

"SaniTab": Android based application for Creating Database for Onsite Sanitation System

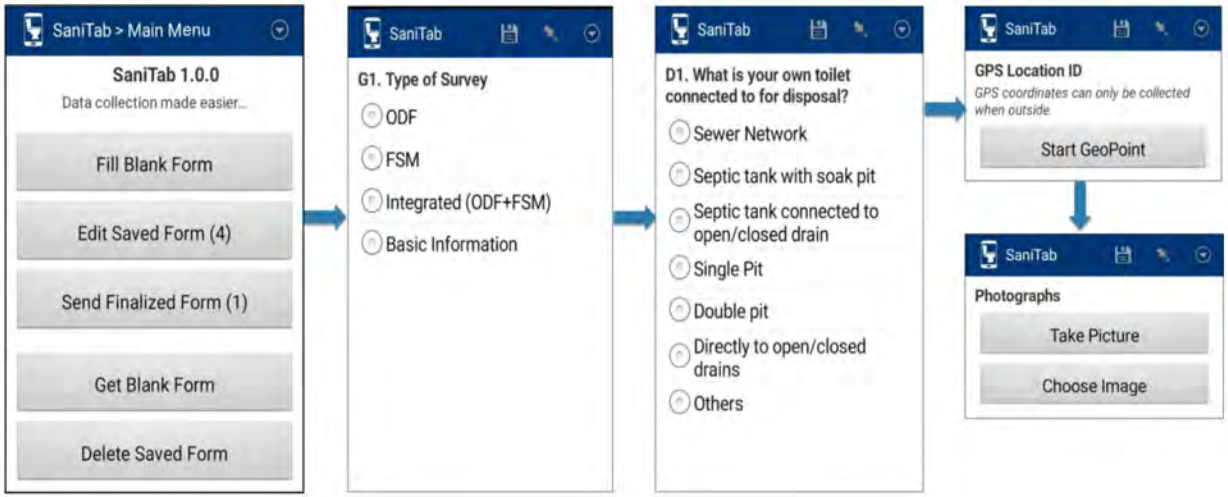
SaniTab

Online dashboard

Spatial Analysis

Key Features:

- Citywide digital data collection tool
- spatial analysis
- "Real time" monitoring of survey activity
- Survey at scale



Baseline Info

- Baseline Info
- PERFORMANCE ASSESSMENT
- ACTION PLANNING
- FINANCIAL PLANNING
- COMPARISON

Access	Collection	Conveyance	Treatment	Disposal
7580 HHs	5145 Toilets	4425 Septic tanks	4 MLD??	

3/4th HHs -**own toilets**
1/4th Community toilets or OD

Increased health risk

85% toilets connected to **septic tanks**

Only **2%** of septic tanks are empty

Effluent discharged directly **in open drains to water bodies**....

No treatment Facility- Dumped in SWM dumping site

Environmental and Health hazards

Performance Assessment

Baseline Info

PERFORMANCE ASSESSMENT

ACTION PLANNING

FINANCIAL PLANNING

COMPARISON

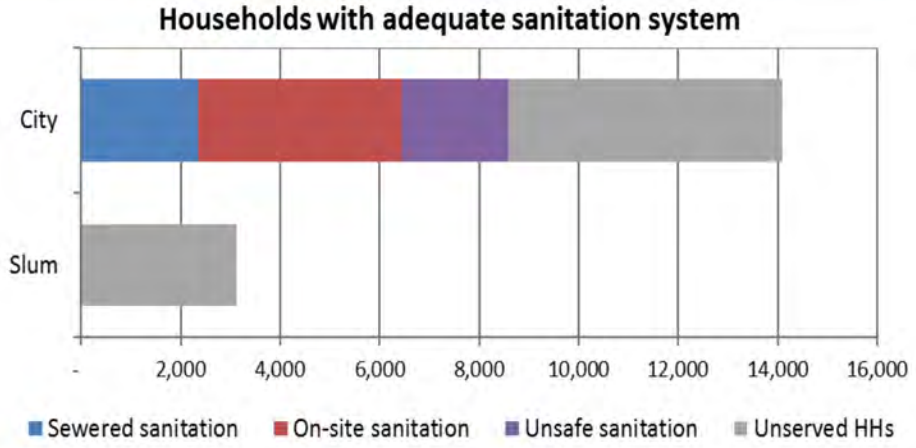
Levels

Key Performance Indicators - comparison against peer groups

Coverage of toilets 58%	Coverage of HHs with adequate sanitation system 5%	Efficiency of collection system 5%	Adequacy of treatment capacity 0%	Extent of reuse 0%
Quality of treatment 0%	Efficiency in redressal of customer complaints 70%	Collection of taxes and charges 0%	Cost recovery 0%	

Peer comparison with other cities

Local Action Indicators - indicated through graphs



Action Planning: Preparing improvement plans

Baseline Info

PERFORMANCE ASSESSMENT

ACTION PLANNING

FINANCIAL PLANNING

COMPARISON

110+ Bucket list of improvement actions with inter-sectoral linkages

Select improvement actions

Process change | Policy change | Improving existing infrastructure | New infrastructure

Calibrate selected actions

Technology | Phasing | Capital cost | Operating cost and revenue

Assess impact of improvement actions

Service levels | Coverage | Utility finances

Activate/ Deactivate actions

Phasing of actions

Baseline information

Improvement information

Cost and Finance information

PROVIDE WASTEWATER COLLECTION & CONVEYANCE SYSTEM TO HOUSEHOLDS				
Learn more	Activate	Procure new suction emptier trucks	2015	2016
Baseline		- Suction emptier trucks with LG at present	*Numbers*	1
		- Suction emptier trucks with private operators at present	*Numbers*	-
Improvement		Suction emptier trucks of LG		
		- Additional trucks to be procured by LG	*Numbers*	2
		- Aggregate capacity of all new suction emptier trucks	*kilo liters*	7.0
		- Number of trips by a suction emptier truck	*Trips/ truck/day*	3.0
		Suction emptier trucks of Private operators		
		- Additional number of trucks expected to be procured by private operators to function within city limits	*Numbers*	
		- Aggregate capacity of all new suction emptier trucks	*kilo liters*	
		- Number of trips by a suction emptier truck within city limits	*Trips/ truck/day*	
Finance		- Block cost for a suction emptier truck to be procured by LG	*Cost/truck*	1,200,000
		- O&M expenses for new trucks procured by LG	*% of CapEx/annum*	50%

Integrated Financial Planning

Matching financial requirements with available funds in an iterative manner

Assess aggregate funding demand from all improvement actions

Financial implications of each Improvement action

- Capital expenditure
- Revenue generation
- Operating and maintenance expenditure
- Effect of inflation based on phasing

Aligning both these financial streams to evolve sustainable 'Financing Plan'

External sources of funds

Exploring funding pattern possible for each improvement action

Internal sources of funds

Exploring options to increase revenue from own income sources

Assess financial health and extent of revenue surplus available

Municipal finances of urban local bodies

- Past trends of municipal finances
- Forecasting for finances for Business as Usual scenario

Integrated Financial Planning

Baseline Info

PERFORMANCE ASSESSMENT

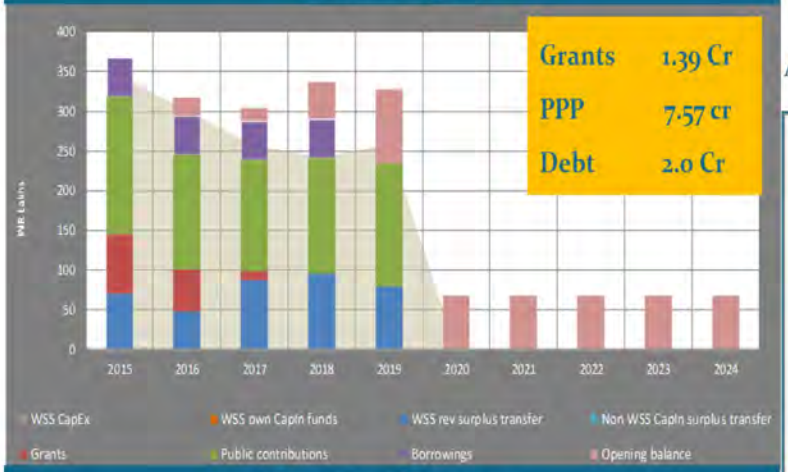
ACTION PLANNING

FINANCIAL PLANNING

COMPARISON

Matching financial requirements with available funds in an iterative manner

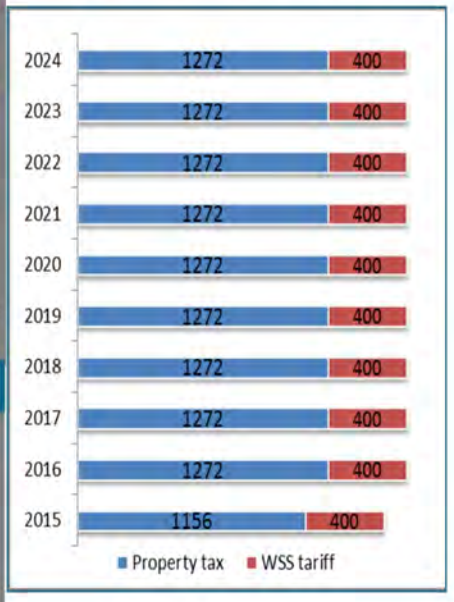
Investment plan



Operational Expenses

Tariff Revisions

Average tariffs (Rs./property/annum)

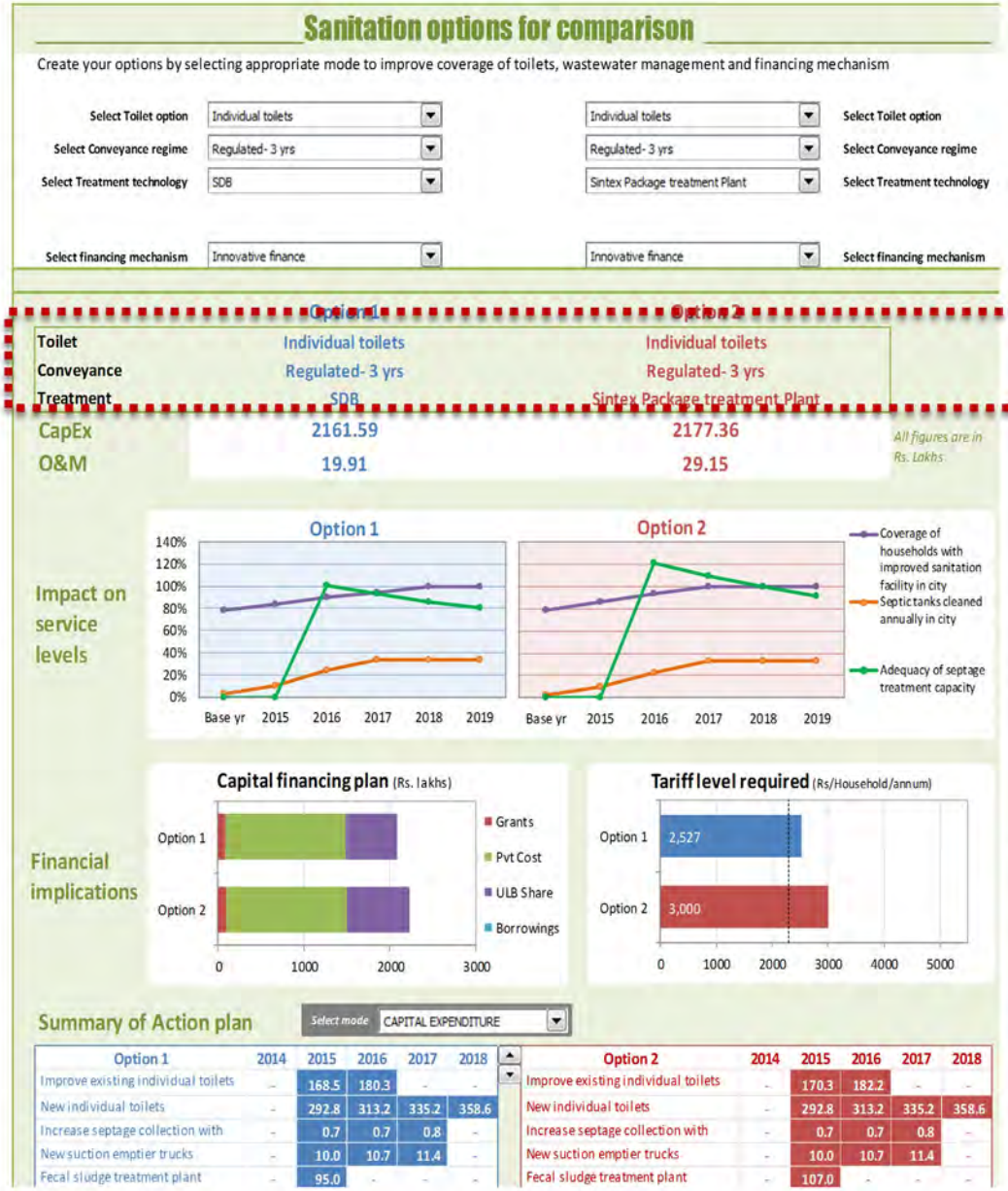


Immediate increase in tariffs by 35%;

No increments required later

Dashboard for comparison

- Baseline Info
- PERFORMANCE ASSESSMENT
- ACTION PLANNING
- FINANCIAL PLANNING
- **COMPARISON**



Scenarios:

- Toilet options,
- conveyance regime,
- Treatment technology and
- Financing mechanism

Comparisons:

- Cost,
- Impact on service levels,
- Financial implications

In Indian context -SaniPlan can assist in developing SLIPs for AMRUT

SLIP (Service level improvement plans)

- **Assess** the **service** level **gap**
- Examine **alternatives**
- **Estimate** the cost (both **capital** and **O&M**)
- **Prioritize** based on local demands
- Financing: **Investment** requirements, **revenue** improvements and **resource mobilization**

SaniPlan

- In SaniPlan, **SLBs** are used to **assess gaps**
- **Various action** areas **available** for use , each action **shows impact** on **service levels**
- Model computes **Capital** and **O & M** cost for **10 years**
- **Enables decision makers** to **evaluate options** and identify proposals
- It is the only available **model** that **links infrastructure decisions** to **finance** and helps **evaluate** various **financing plan options**

Session 9 : Private Sector Participation in FSSM services

Objective of the session

- Understanding ULB needs, interest and concerns for PSP
- Understanding the role of the contractor in providing sanitation services in small towns/ cities, and how to effectively manage their participation
- Planning and implementing engagements with the private sector right from assessing potential players to contracting of project and monitoring
- Learning about key challenges encountered before, during and after awarding the contract

Source : PSP toolkit for FSSM, CEPT University

Need for exploring PSP

Urban Local Body

- Mandate to ensure service provision
- Challenges in FSSM
  - Improper onsite systems that do not conform to standards
  - No treatment facility and unsafe disposal
  - Limited funds, manpower, equipment
  - Low technical know-how

+

Private sector

- Already Active
- Better access to technology and knowhow
- Competitive prices

=

Win-Win situation

- ULB able to ensure adequate services and standards
- Citizens get timely services at competitive prices
- Entrepreneurs get business opportunities
- Current govt policies and schemes support and encourage PSP in urban infrastructure projects

Existing resources to guide PSP in large scale sanitation projects, but need for guidance on engaging contractors in small-scale sanitation projects based on the FSSM approach.

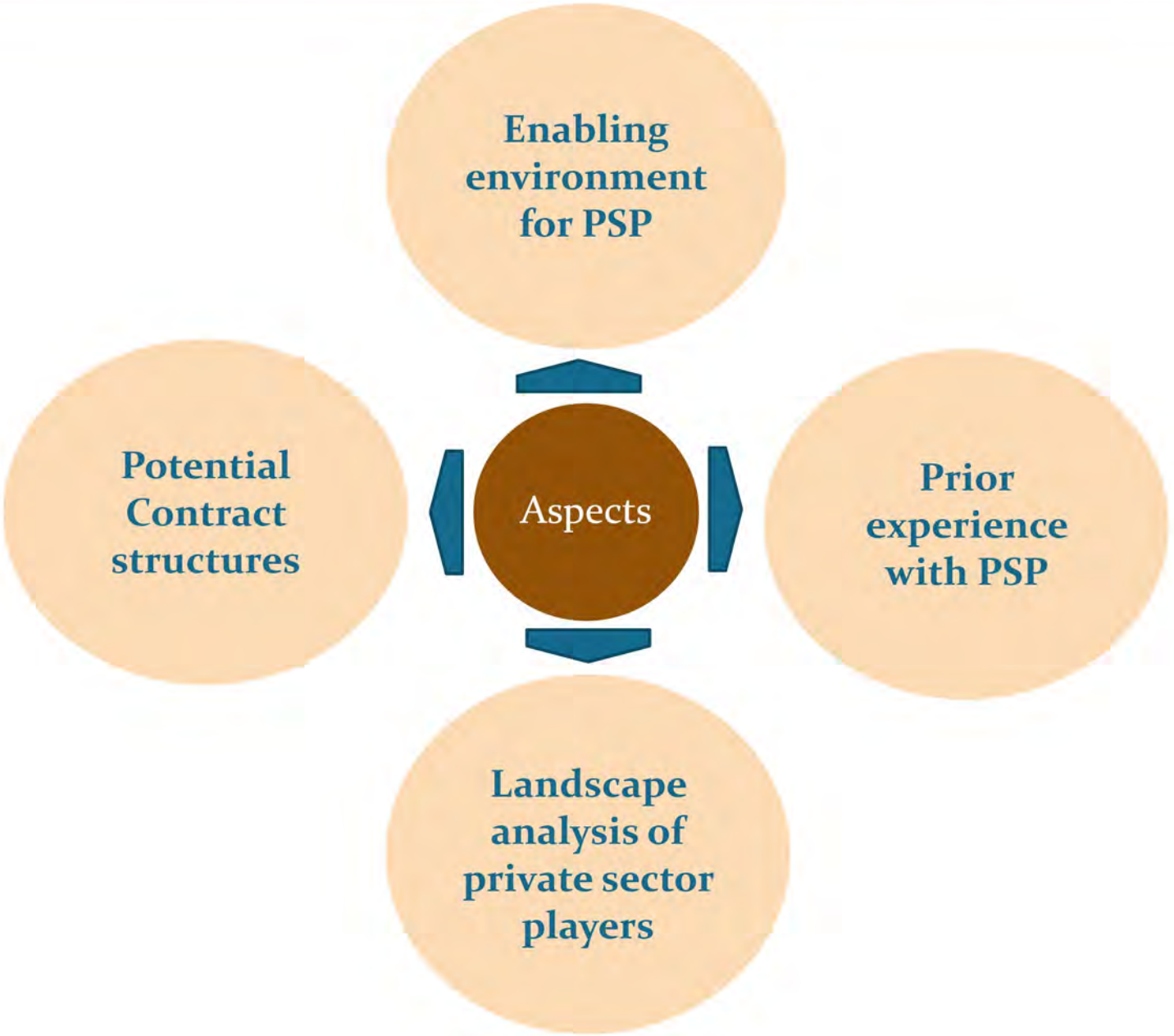
Typical challenges and opportunities for PSP across sanitation chain

Access	Collection	Conveyance	Treatment	Disposal/ Reuse
	Improper onsite systems	**Inadequate suction trucks, manpower**	**No treatment facility**	**Unsafe disposal**
	• Onsite systems **lack access manhole covers and are not of standard size**	• Very few **onsite systems cleaned** annually • Informal sector	• **No facility** for faecal sludge treatment	• Septage disposed in the open **without treatment**
	1 **Regular emptying** of onsite systems to ensure that 1/3 of the onsite systems in the town/city are cleaned every year as per GOI guidelines[1]		3 **Construction of Septage Treatment Facility (STFs)** for the treatment of faecal sludge	4 **Regular reuse / disposal of treated sludge and cleaning of STF**
	2 **Regular refurbishment** of the onsite systems which includes providing access manhole covers to allow regular emptying, and repair of onsite system (if needed)			

Note: (i) As per MoUD guidelines, a household onsite system/onsite system must be emptied every 3 years hence 33% of all onsite systems/ onsite systems should be emptied annually

Source: CEPT, Dalberg research

Aspects to be assessed while engaging private sector



Enabling environment for PSP

- ☑ a. Legal and political environment
- ☑ b. Key processes involved
- ☑ c. Procurement process

Favourability toward PSP from a legal and political standpoint

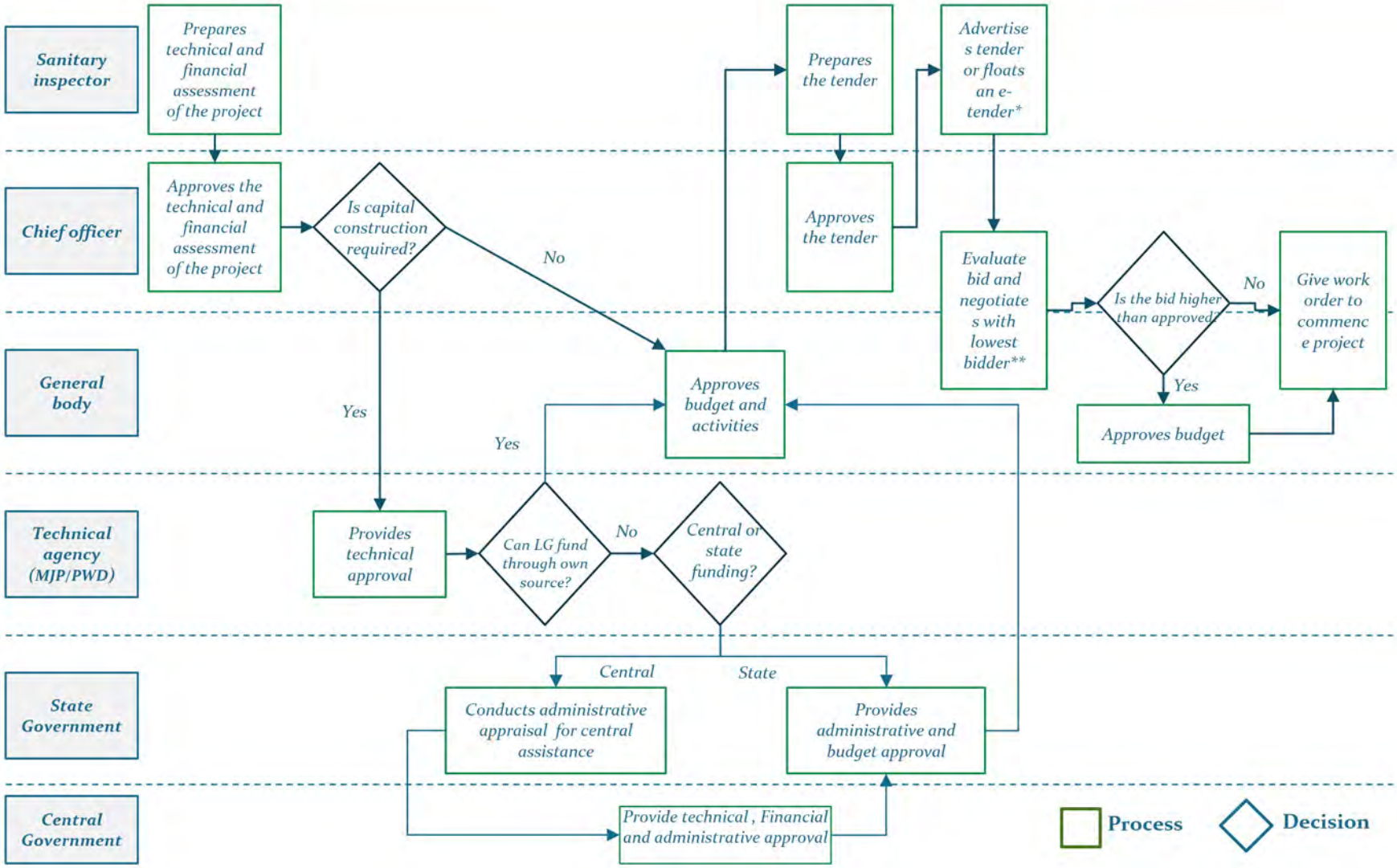
Existing drivers that can propel a potential PSP

Feasibility and ease of engaging with contractors

Tool : Checklist for assessing enabling environment for PSP

Microsoft Word Document

Understand the key processes involved in implementing private engagements



Note: Functions highlighted over the dotted line are done by both the stakeholders. *If tender value is over INR 1 million, e-tendering is required

Source: Interviews with Wai city officials, City contract documents

Understand the procurement process . . .

Procurement process

Draft contract and place a request for proposals → **Receive bids from private players** → **Evaluate bids and sanction work order**

- officials hold initial discussions with potential private players to understand their requirements[1]
- Chief officers (CO) approves tender drafted by the Sanitary Inspector (SI)
- Bids are then solicited in local newspaper[2]

- Private players submit their bids including:
  - ✓ Business license and registration
  - ✓ Employee Provide fund details
  - ✓ Tax records
  - ✓ Previous work experience
  - ✓ Pricing quote

- Received bids are evaluated by the council and negotiated by the officers
- Contractors meeting the minimum specified criteria and offering the lowest bid are issued a Work order

Key Gaps

- **Focus on lowest cost:** Service quality or level is not the main award criteria. Current requirements include the most basic legal requirements, which are met by most bidders. As a result, contracts are awarded to the lowest bidder resulting in lack of focus on service levels. Even when service levels are found to be higher, bids must be negotiated down to the lowest level offered by other players.

"Our old vermi-compost operator quit because of labor issues. We have learned from that experience and now assess feasibility by holding informal talks with the private sector contractors to make sure we are understanding their requirements as well."

- Engineer

Prior experience with PSP engagement . . .

- ☑ **a. Has the ULB engaged the private sector for FSSM or in other sectors previously ?**
- ☑ **b. What has been the ULB's experience and satisfaction in such engagements?**
- ☑ **c. What was the structure of the contracts?**
- ☑ **d. What were the risk mitigations terms in the contracts?**

Output
A list of do's and dont's for future engagements with the private sector

Tool : Interview guide for Local government to assess capacity for PSP

4A.Interview
for Local governn

Assess the existing contracts which the LG has taken up . . .

Sector	Type of the contract	LG responsibilities	Contractor responsibilities
	• Management contract for door collection of waste and cleaning of drains	• Fixed monthly payment made to the contractor	• Door to door collection of waste and cleaning to drains • Provision of labor required • Provision, Operation and maintenance of trucks
	• Management contract for the O&M of vermi-compost treatment plant	• Monthly payment made to contractor for operation and maintenance of compost plant constructed by the LG	• Provision of labor, equipment and utilities for the plant • Sale of compost, 50% of the proceeds of which, need to paid to the LG
	• Management contract for the O&M of community toilets	• Monthly payment made to contractor • Payment for utilities	• O&M of community toilets along with regular cleaning and repairs
	• Management contract for cleaning of pre-monsoon drain cleaning	• Fixed monthly payment made to the contractor	• Undertaking cleaning of drains • Provision of labor required • Provision of equipment required to undertake cleaning

Source: Artwork from the Noun project, Interviews with Wai city officials, City contract documents

Understand the Overall satisfaction of the officials related to provision of private sector services

- Risk mitigation
- Performance monitoring clauses
- Consider empanelment of companies

"Our experience with these contracts has been quite good. The LG has not received any complaints so far. It is a relief for our staff."

- A city Engineer

"We are paying more than we did when we did these activities ourselves. However, the service levels have improved and we have shifted a lot of our burden on to the private player. For example, we constantly faced issues with theft and vandalism in community toilets. That is now the responsibility of the private player to keep this toilets operational."

- A city Sanitary Inspector

Source: Interviews with Wai city officials

Understand the contractual engagements that the municipality has entered into with the private sector

Contract to be assessed on the following parameters

Features	1	2	3	4
Contract length	3 years	3 years	3 years	Annual
Automatic Renewal	✗	✗	✗	✗
Tender type	Open bid	Open bid	Open bid	Open bid
Payment duration	Monthly	Monthly	Monthly	Monthly
Item rate or Lump sum/fixed fee[1]	Fixed fee	Fixed fee	Fixed fee	Item rate
Rate per unit (INR)	1,90,000 per month	221,000 per month	1,55,000 per month	~1600-2000 per truck trip, ~350/manday
Penalty clause for non-performance	✓	✓	✓	✓
Number of bids received last year	5	3	3	4

Key features

- **The LG may prefer medium term** 3 years contracts to allow for stability in services
- **In addition, the LG may prefer lump sum contracts** because they are not tied to inputs and avoid incentives for private players to inflate bills. In addition, they are easier to monitor with fewer disputes.

✓ However, private players complain that the lump sum payments do not account for repair costs they face

- **Payment is not linked clearly to monitoring**
  - ✓ Penalty clauses are open-ended and not tied to monitored outputs or service levels

✓ There is no mention of monitoring or reporting requirements

✓ There are no positive performance incentives tied directly to outputs or service levels

"If any complaint is received by this office that the collection vehicle has not visited the designated area, an appropriate amount shall be deducted from my monthly bill and I will have no objection to such deductions."
– Performance penalty in contract for door-to-door collection of waste

Understand the Current contracts in terms clauses for dispute resolution and termination risk and whether they mitigate key risks faced by the private player

Priority contract clauses for effective engagements

Features	Door-to-door waste collection	O&M of vermi-compost plant	Cleaning of community + public toilets	Pre-monsoon drain cleaning
Redress of user complaints	✓	NA	✓	✗
Dispute resolution mechanism	✓	✓	✓	✓
Mitigating payment risk	✗	✗	✗	✗
Mitigating Termination risk	✗	✓	✓	✓

Key features

- **All contracts include a dispute resolution clause** that *"Any dispute regarding the bills will be settled at City X and in the jurisdiction of City X court."*
- **All contracts except the door-to-door collection contract, have a termination clause** in case of public and private termination.
- **Current contracts put the responsibility for complaint redress entirely on the private sector,** but do not mention processes or expected service standards for complaint registration and redress
- There is no clause to **manage delays in payments** (e.g. interest paid to the private sector)

"In case of any complaint or a conflict regarding the public lavatory, it would be my responsibility to solve the complaint and I will not involve the municipal council in the matter."

– Complaint redress clause in contract for community toilet cleaning

"I agree that the Town Council has reserved the right to cancel this contract if the work is not satisfactory and the work is not improved after due notice and instructions.

– Termination clause in contract for vermi-compost plant

Source: Interviews with Wai city officials

Landscape study of private sector . . .

☑ a. Are contractors available to provide the proposed services?

- Who are the relevant contractors for the proposed project?
- How can they be identified?

☑ b. Do these players have expertise in delivering similar projects?

- Do the players possess relevant technical expertise and knowledge?
- Do they have prior experience in IFSM?
- Do they have prior experience of working with the public sector?

☑ c. What are their key considerations or interests?

Output

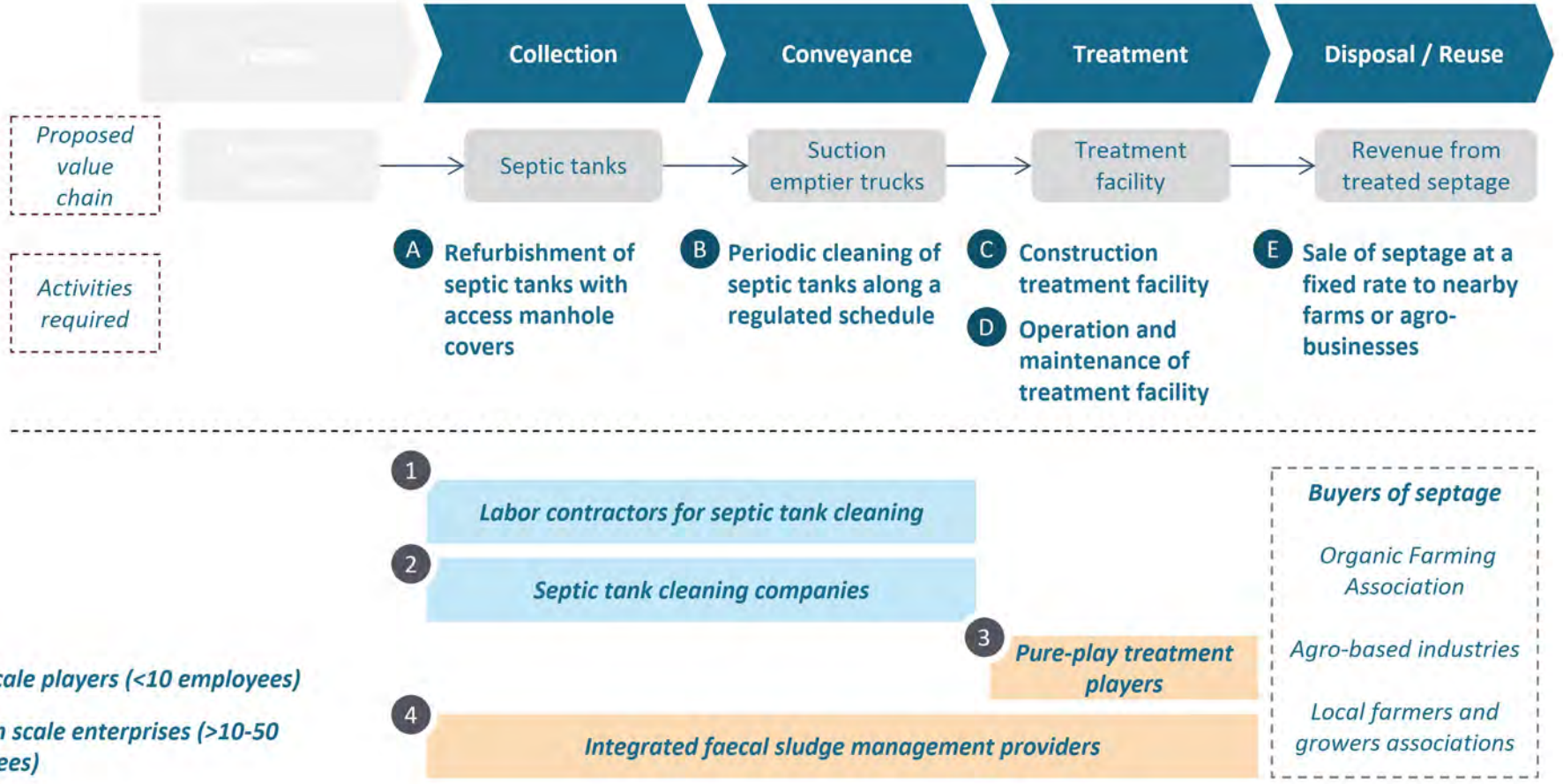
1. Detailed player profiles
2. Shortlist of contractors to engage

Tool: Player Assessment Checklist

Microsoft Word Document

Scope possible players for bundled and unbundled FSSM activities

ULB can invite Expression of interest (EoI) to scope possible players



Assess their work profiles, interests and capacity . . .

Name: Company X

Geographic focus: Maharashtra, Karnataka, Tamil Nadu, Goa and Delhi NCR

Services offered: Company X core business is the manufacture and supply of recyclable portable toilets, but they also offer commercial and residential septic tank cleaning and septage treatment

Business model (conveyance):

- *Scale:* ~60 Mercedes Benz suction emptier trucks, each operated by a driver and a technician
- *Customers:* Mostly residential, but also some commercial clients
- *Payment structure:* Charges INR ~400 – 1000 per trip. Run trucks on a regulated "DHL – like" schedule, but also take emergency calls
- *Expected return:* 20 - 25% EBITDA margin

Interest in business opportunity

*"**We have invested in high quality trucks** so that our employees do not have to come into contact with the waste at all. We want them to feel proud of the work they do. Customers don't care, they just want the job done. But we have a rule book, and it clearly tells the customers what we will and will not do"*

*"**We would be interested in an integrated contract for faecal sludge management.** In terms of profitability, the business is only viable if you're doing at least a 20-25% EBITDA"*

Key Concerns

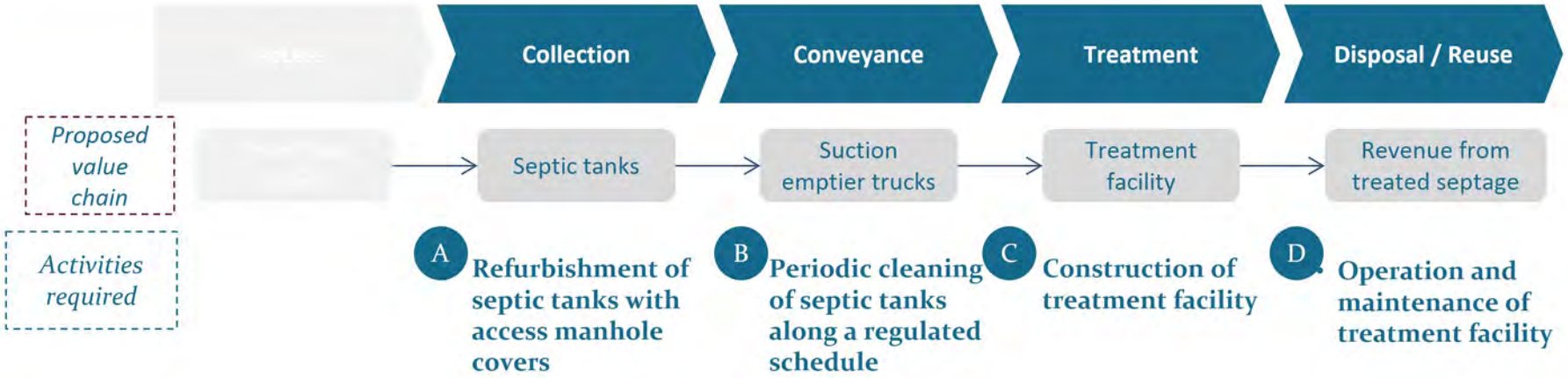
Labour contractors

Septic tank cleaning companies

Pure play treatment players

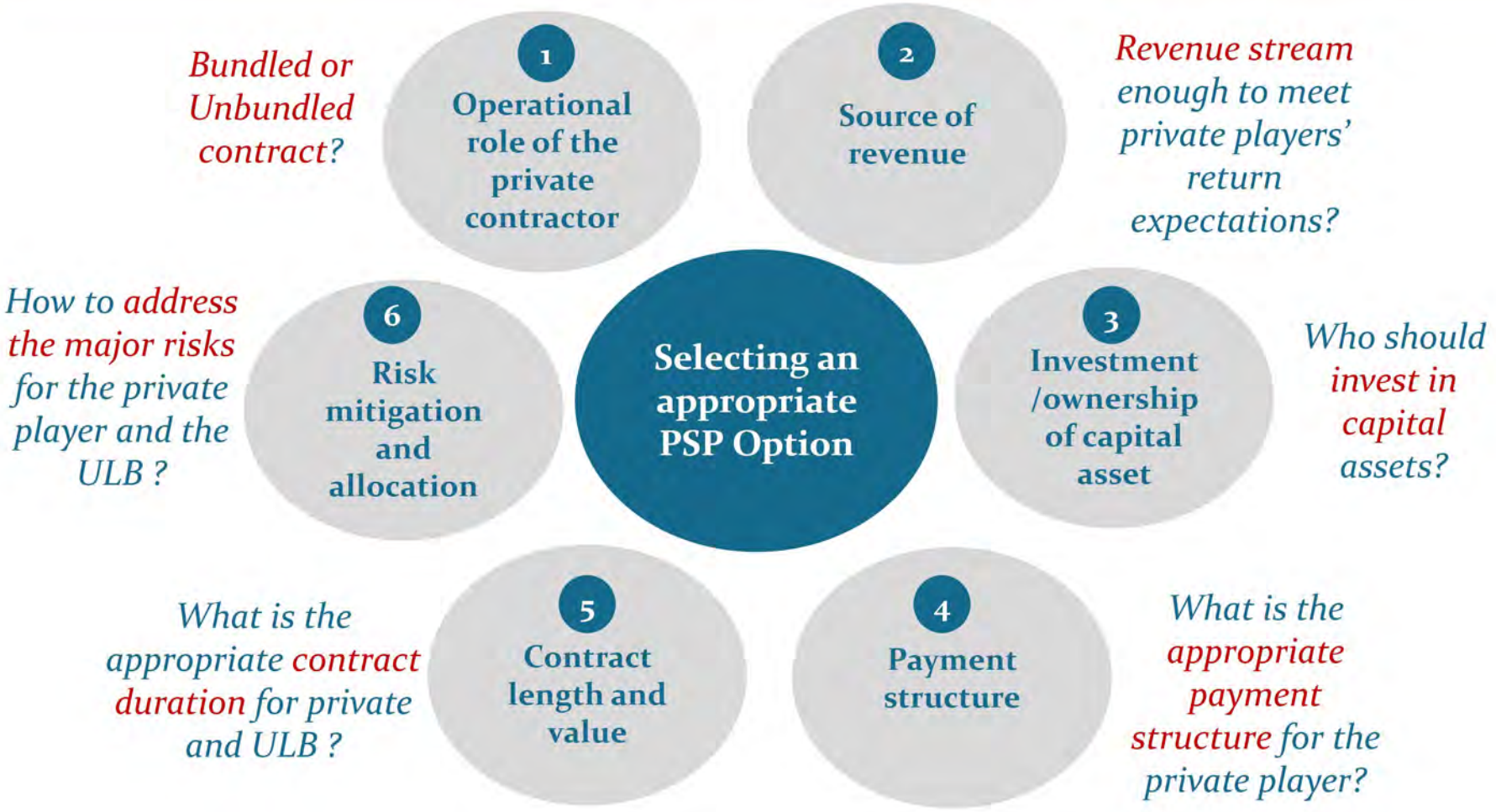
IFSM service providers

Exploring their willingness of players to undertake various activities in the sanitation value chain as per their competencies and interests



Labor contractors	Company 1				
	Company 2				
Small-scale septic tank cleaners	Company 3				
	Company 4				
	Company 5				
STP companies	Company 6				
	Company 7				
Integrated players	Company 8				
	Company 9				

Six step processes in structuring a PSP option for FSSM



Checklist to decide contract structure Microsoft Word Document

Financial Assessment tool for contract length and value Microsoft Excel ro-Enabled Works

Sample Contracts Microsoft Word Document

Operational role of the private contractor – creating bundled contracts

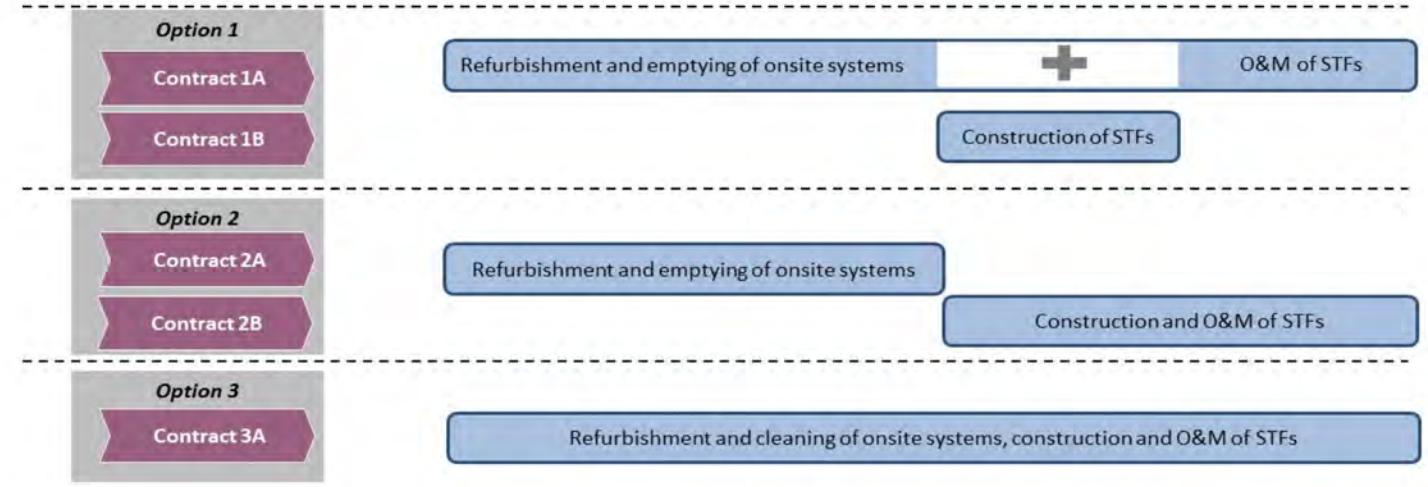
Identify the different activities under the sanitation value chain

Collect | **Transport** | **Treat** | **Dispose**

- A Periodic emptying of onsite systems as per a regulated schedule
- B Refurbishment of onsite systems with access manhole covers
- C Construction of STFs
- D O&M of STFs

Consider the interest and capabilities of the different contractors

Create bundling options according to activities



Bundling contracts simplifies vendor management, and ensures greater accountability

Advantages of bundled contracts

- **Ensures greater accountability:** Having a single point of contact avoids the issue of players blaming each other for lapses in service
- **Aligns performance incentives:** Creates incentives for the private player to manage each element of the chain successfully
- **Simplifies contract management:** Reduces the number of transactions needed to co-ordinate with different players

Advantages of unbundled contracts

- **Diversifies non-performance risk:** With a bundled contract, non-performance puts all activities at risk
- **Takes advantage of player expertise**: Contracts can be awarded to the most qualified player for each activity

The elements of integrated faecal sludge management are highly connected and success of one element is closely tied to the success of the others. Hence, bundled contracts have tangible benefits over unbundled contracts for IFSM.

Identify revenue sources

Identify the different sources of revenues

- ULB sources
- Government sources
- Miscellaneous sources

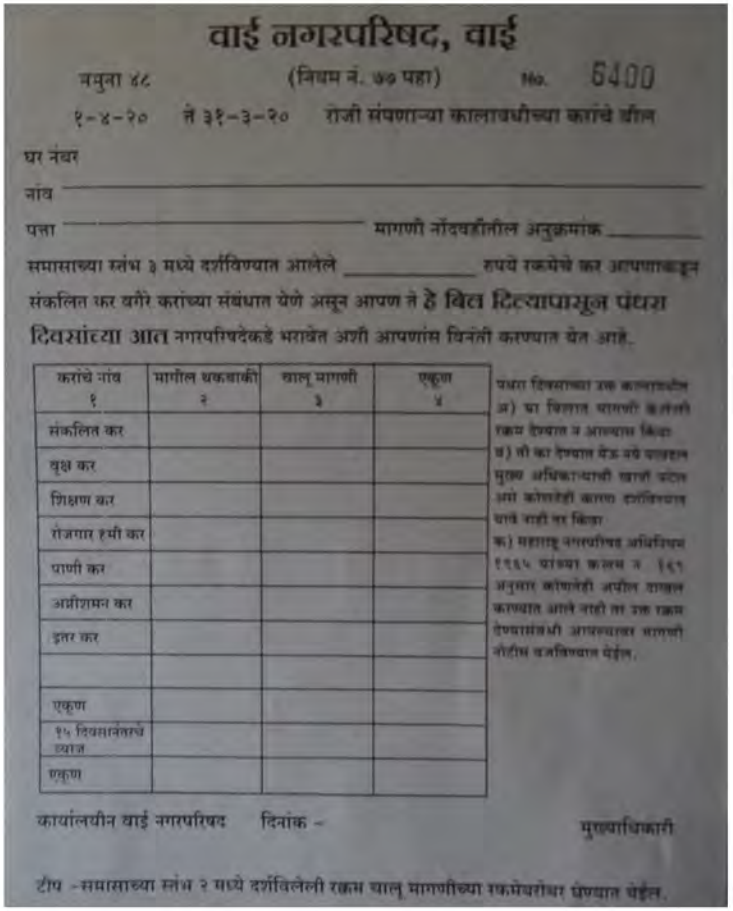
Can be used individually or in combination

Assess the different options on the basis of sustainability and reliability

- Is fund available through the duration of the contract?
- Are the financing terms acceptable to ULB?
- Is revenue source reliable in terms of guarantee?
- Does the source of active political and community support?
- Does the cash flow timing match the requirement?

Sanitation tax as a revenue source: A Case of Wai

Current taxes levied



वाई नगरपरिषद, वाई

नमुना ४८ (नियम नं. ७७ पहा) No. 6400

१-४-२० ते ३१-३-२० रोजी संपणाऱ्या कालावधीच्या करांचे बील

घर नंबर

नांव

पत्ता मागणी नोंदवहीतील अनुक्रमांक

समासाच्या स्तंभ ३ मध्ये दर्शविण्यात आलेले रुपये रक्कमेचे कर आपणाकडून संकलित कर वगैरे करांच्या संबंधात येणे असून आपण ते हे बिल दिल्यापासून पंधरा दिवसांच्या आत नगरपरिषदेकडे भरावेत अशी आपणास विनंती करण्यात येत आहे.

करांचे नांव १	मागील थकबाकी २	चालू मागणी ३	एकूण ४
संकलित कर			
वृक्ष कर			
शिक्षण कर			
रोजगार हमी कर			
प्राणी कर			
अग्निशमन कर			
इतर कर			
एकूण			
१% दिवसानेतर्चे व्याज			
एकूण			

कार्यालयीन वाई नगरपरिषद दिनांक - मुख्याधिकारी

टीप -समासाच्या स्तंभ २ मध्ये दर्शविलेली रक्कम चालू मागणीच्या रकमेबरोबर घेण्यात येईल.

Appropriate awareness can ensure willingness to increase local taxes

- Currently, households clean their septic tanks once in 8-10 years and spend INR ~1000 in Wai and INR ~400 - 800 in Sinnar
- Property owners currently have to pay local taxes of about Rs 2200/annum in Wai and Rs.1600/annum in 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 **10% in Wai and 20% in Sinnar.**
- As these are reasonable increases for a regular service and related environmental as well as personal benefits , it is expected that with appropriate awareness there will be willingness to pay additional taxes.

The ULB can consider using its conservancy taxes to support the integrated faecal sludge management plan, and will need to compensate private players directly through a management fee

Sale of treated septage for reuse: source of revenue

"Larger farmers who export their crops are bound by restrictions on the use of animal and human waste. ***Sludge can be sold mainly to small and marginal farmers****, who lack access to synthetic fertilizers."*

- Person X

*"****Faecal sludge cannot be used in organic farming*** *due to concerns about e-coli and shigella infections. However, it is often used by small farmers as 'son-khad'."*

- Person Y, Farming association

"We make compost from solid waste. The market is extremely seasonal. Creating a continuous market for this waste is tough. People say that you are creating compost from waste so we don't want to use it. ***Source is very important.****"*

- Person Z, Entrepreneur

*"****I often have to pay farmers*** *to dump sludge in their farms, I do not think the sale of septage is a viable revenue source."*

- X Enterprises

"It (sale of septage) is possible, ***but will require investment in marketing and distribution****, which we do not do."*

- Y Enterprises

There is demand for sludge among small and medium farmers, but willingness to pay is unclear

Decide ownership of capital assets

Types of capital expenditure

Purchase of suction trucks (determined by number of trucks needed, existing capacity of the contractor)

Construction of the septage treatment facility (determined by the number of STFs needed and land acquisition details) (USUALLY LARGE INVESTMENT)

Gauge the willingness of contractors..

..to invest in trucks (how many trucks)

..to invest in STFs

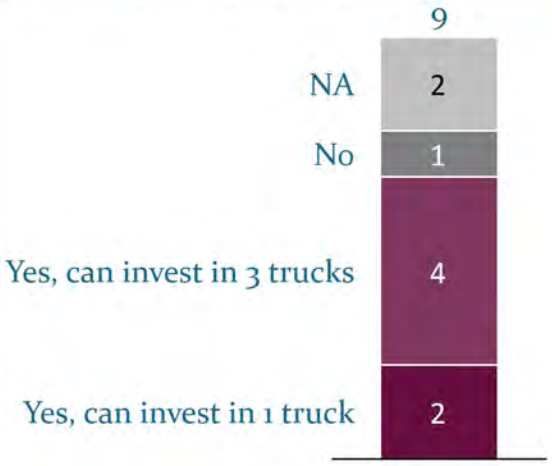
..to invest in both

The **PSP contract must clearly define who will purchase or pay for the asset** and who will pay for maintenance, and if there is a transfer of asset after a specified period of time

Case Study: Assessment of contractors revealed that contractors were willing to invest in suction trucks, but not want in the construction of STFs

Willingness to invest in a suction truck

(Number of players)



*"**Yes, I can procure a truck** and operate it on the regulated schedule... I can use (the truck) for other business in case the contract does not work out."*

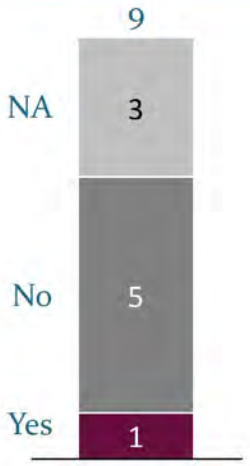
- X Enterprises

*"**I cannot afford to buy more than one truck.** I have just ordered a truck, and faced financial troubles there too."*

- Y Cleaning Services

Willingness to invest in construction of STFs

(Number of players)



*"**Payment needs to be mile-stone based,** ~40% up-front, 50% when materials are delivered to the site and 10% post-completion."*

- Z company

*"**It would be interesting** to explore an integrated contract structured as a build-operate-transfer concession agreement."*

- V Enterprise

Private sector investment in trucks has significant benefits for the ULB

Benefits to public sector

- ✓ **Ease of procurement:** ULB procurement of the truck would require floating a tender, inviting, evaluating and negotiating bids. This is likely to be time consuming, and involve transaction costs that can be avoided if the private player purchases the truck.
- ✓ **Aligns private sector incentives:** Private sector investment in trucks incentivizes the player to use and maintain the truck well.
- ✓ **Allows investment in quality:** ULBs are often bound to minimize cost, while the private sector can invest in quality trucks with longer lifecycles and additional features like water jets.

Benefits to private sector

- ✓ **Facilitates access to finance:** Having a contract from the ULB can make it easier for the private player to raise capital for the truck and negotiate better financing terms.
- ✓ **Provides a platform for business expansion:** A contract with the ULB serves as a low-risk platform for private sector players to scale by providing access to guaranteed demand to recoup investment in a truck.

Define payment structure for different activities

Factors to decide payment structure

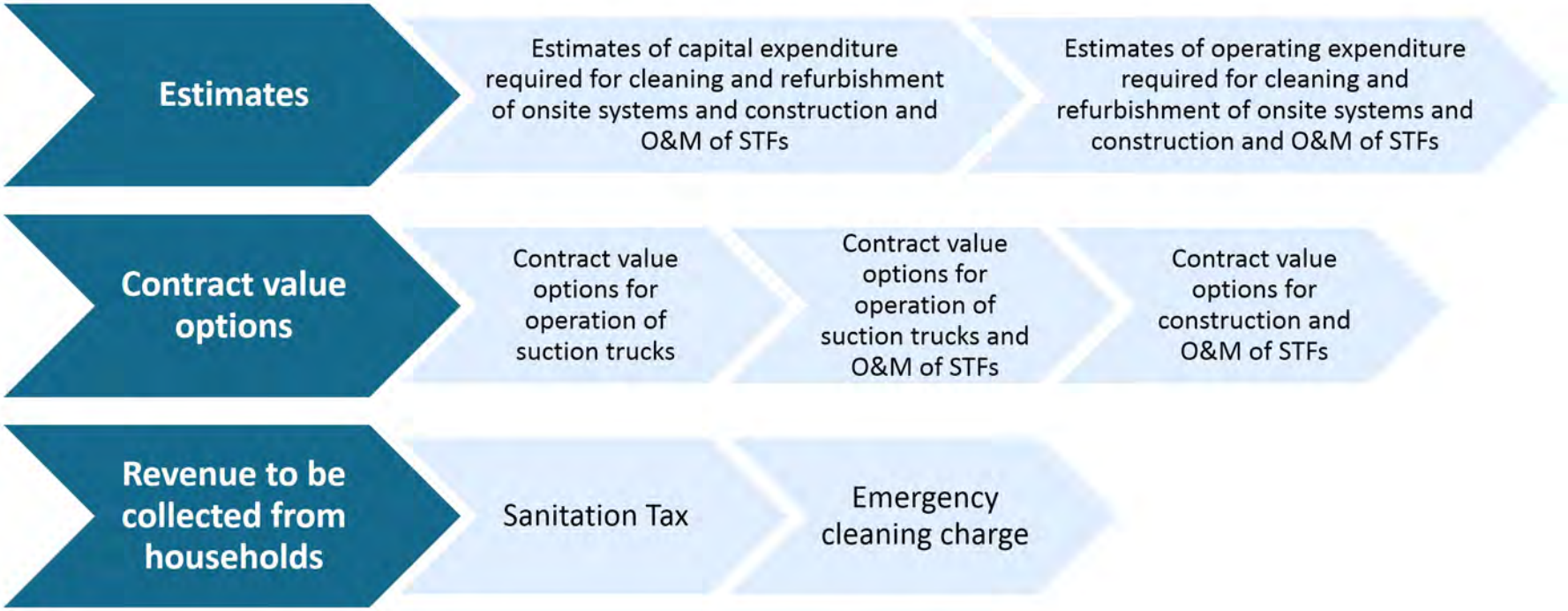
- **Frequency of the activity**
- **Whether outputs are measurable**
- **Whether total costs are known**
- **Whether timelines are known**

Key activities	Payment structure	Rationale
Refurbishment of septic tanks	*Fixed fee per unit*	Refurbishment is a one time activity in which the cost per tank is known, but the number of tanks is not. Hence a fixed fee per refurbished tank is paid
Regular cleaning of septic tanks	*Recurring fixed fee*	Because of the ULB HH survey, the number of tanks to be cleaned and the schedule is well determined. Hence it is an ongoing activity for which a fixed monthly fee is paid given the schedule being followed and proper field reports are submitted by the private sector.
Emergency Cleaning of septic tanks	*Fixed fee per emptying service*	The emergency septic tank emptying service can be provided by the ULB using its own vehicle. The fee of this would be kept high as a deterrent for users to not opt out of regulated services
O&M of FSTPs	*Recurring fixed fee*	O&M of FSTPs is an ongoing activity for which the costs and procedures are well defined. Hence, a recurring fixed fee is paid
Construction of FSTPs	*Overall fixed fee*	Construction of FSTPs would be a one time activity. Since the design is specified by the ULB, the costs would be well known. Hence, an overall fixed fee can be given

Define contract length and value . . .

Estimating the contract length and value

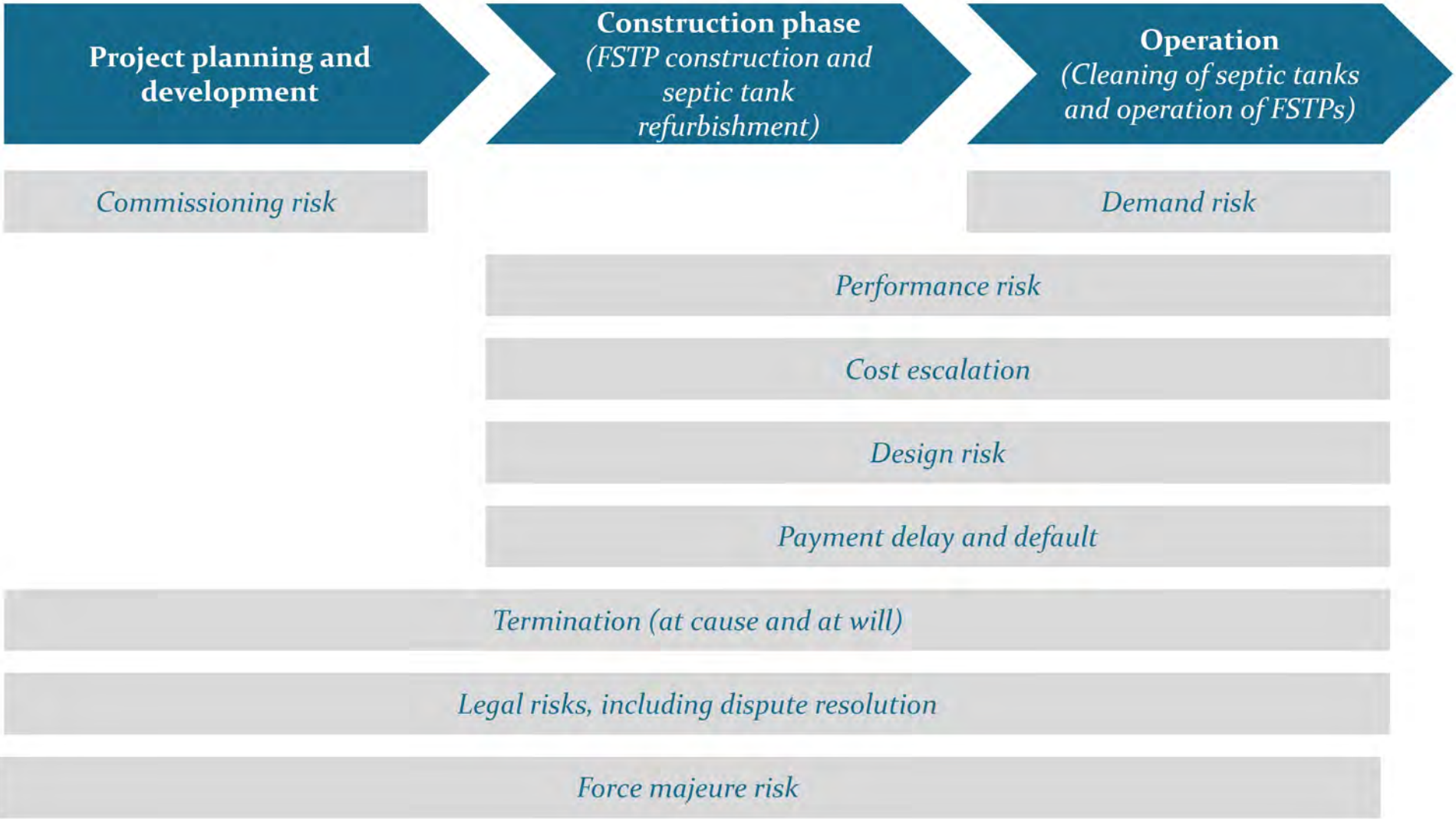
Calculate the total taxes that need to be raised from the households to finance the increased expenditure



Sample contract structures . . .

Contracts	Source of revenue	Ownership of asset	Payment method	Contract length and value	Tax /annum / property
1A Refurbishment and cleaning of septic tanks + O&M of FSTPs	*LG*	Private player	Recurring fixed fee with Fixed fee per unit for refurbishment	2-3 year, ~INR 32-36 lakhs in City Y and ~INR 15-17 lakhs in City X	Resi : 190-270 Non-Resi : 230-320
1B Construction of FSTPs	*LG*	LG	Overall fixed fee on a pre-decided schedule	~ INR 96 lakhs in City Y and ~71 lakhs in City X lasting the time period of construction	
2A Refurbishment and cleaning of septic tanks	*LG*	Private player	Recurring fixed fee with Fixed fee per unit for refurbishment	2-3 year, ~INR 27-32 lakhs in City Y , ~INR 11-13 lakhs in City X	Resi : 140-230 Non-Resi : 170-270
2B Construction and O&M of FSTPs	*LG*	ULB	Overall fixed fee on a pre-decided schedule + recurring fixed fee for O&M	12-18 months, Construction cost plus ~5-6 lakhs annually for O&M in City Y and ~4-5 lakhs in City X	
3A Integrated contract involving refurbishment, cleaning of septic tanks, construction and O&M of FSTPs	*LG*	Trucks – Private FSTP- LG	Recurring fixed fee for cleaning and O&M with Fixed fee for Construction and Fixed fee per unit for refurbishment	Payment for refurbishment, cleaning and O&M as in 1A above; payment for construction as in 1B above	Resi : 190-270 Non-Resi : 230-320

Risk Assessment



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'"

Protecting Private enterprise interests . . .

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."

– X 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."

– Y 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."

- Z company

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."

- AA Enterprises

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

– ZY 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."

– AB 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."

– AX Enterprises

Risk mitigation: Performance and meeting contract clauses

Cleaning of septic tanks

Risk	*Mitigation*	*Allocation of remaining risk*
Private player uses **manual scavenging** for cleaning septic tanks or SDBs	• Requirement of safety gear for all personnel • A clear description of activities that constitute manual scavenging	• Contract terminated if complaints of manual scavenging are received from HH or ULB staff
Private player does not clean septic tanks **as per schedule**	• Portion of monthly payment tied to number of HH signatures collected whose septic tanks have been cleaned • Undertaking random inspections of HH whose signatures have been submitted • A complaint redress mechanism to be opened by the ULB for the HH	• Penalties imposed if number of cleanings is lower than specified in the contract, or if discrepancies found during random sampling, or if complaints not dealt with • Large or persistent breaches can lead to termination
Private player **damages tanks** during cleaning	• As above	• Work would have to be remedied within a specified days of complaint and the cost borne by the private player
Private player **spills septage** during transportation	• A complaint redress mechanism to be opened by the ULB for the HH	• Complaints of spillage and illegal dumping must be addressed within a specified period, to avoid a fine
Private player **dumps septage in the open**	• A portion of monthly payment is tied to signatures collected from the SDB operator	• If the number of complaints exceeds a specified number in a time period, the contract can be terminated

Risk mitigation: Payment and costs

	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 escalation**	• Cost of inputs increase over the course of contract	• Adjustment of contract value annually for inflation • Inclusion of a cost re-negotiation clause	• Private player would be responsible for bearing the cost escalations within the negotiated period

Source: Adapted from 'Improving sanitation outcomes through service level agreements' – Castalia Partners

Each contract option along with draft tender clauses should be discussed with the contractor and ULB to understand their concern and requirement. . .

Aspects covered with ULB

- Obligations before and after signing of contract
- Scope of work for contract
- Payment mechanism of contracts
- Critical performance standards – linked to payment terms
- Termination clauses
- Payment delay clauses
- Cost escalation

Additional Aspects covered with ULB

- Pros & Cons of each option
- Contract costs
- Taxes to be levied
- Bid document process and requirements

Following this process bid documents have been rolled out in few cities of Maharashtra

Sinnar Municipal Council, Sinnar

TENDER DOCUMENT

Name of Work
"Scheduled cleaning of septic tanks, Sinnar"

Estimated Cost: To be given by the bidder

E.M.D. :40,000/-

Office of the

Chief Officer,
SinnarMunicipal Council, Sinnar

Sunil S. Patil	Vyanktesh R. Durvas	Sanjay Navse	Ashvini Deshmukh
Municipal Engineer	Chief Officer	Vice President	President

Septic tank emptying Tender document

CONTENTS

Validate | Print | Help

Item Rate BoQ

Tender Inviting Authority: Sinnar Municipal Council, Nashik

Name of Work: Scheduled cleaning of septic tanks, Sinnar

Contract No:

Bidder Name :

PRICE SCHEDULE

(This BOQ template must not be modified/replaced by the bidder and the same should be uploaded after filling the relevent columns, else the bidder is liable to be rejected for this tender. Bidders are allowed to enter the Bidder Name and Values only)

NUMBER	TEXT #	NUMBER #	TEXT #	NUMBER	NUMBER #	NUMBER #	TEXT #
Sl. No.	Item Description	Quantity	Units	Estimated Rate	BASIC RATE In Figures To be entered by the Bidder Rs. P	TOTAL AMOUNT Inclusive of all Taxes	TOTAL AMOUNT In Words
1	2	4	5	6	13	53	55
2	Schedule B						
3	Cleaning of 4000 septic tanks per year for three years of households/properties as per schedule and emergency cleaning with appropriate safety gears for septic tank emptying cleaners and operators, transportation of septage in GPS mounted suction emptier trucks owned by private sector and safe disposal of collected sludge in septage treatment facility The bidders shall also undertake IEC activities to spread awareness about regular cleaning of septic tanks in areas where scheduled cleaning needs to be undertaken	1.00	Per year			0.00	INR Zero Only
Total in Figures						0.00	INR Zero Only
Quoted Rate in Words					INR Zero Only		

Following this process bid documents have been rolled out in these cities (2/2)

Sinnar Municipal Council, Maharashtra

TENDER DOCUMENT

Name of Work
A Turnkey project on Design, Construction, Commissioning and Operation of Fecal Sludge & Septage treatment plant of capacity 70 m3/day at Sinnar Municipal Council, District - Nashik, Maharashtra

The work includes (i) Design, Construction and Commissioning of Fecal Sludge & Septage treatment plant (FSSTP) with all appurtenant structures and allied works including all necessary approvals from various government departments etc. complete including testing, trial run for One Month and commissioning of the plant (ii) operation & maintenance of the complete works of FSSTP and allied works for a period of 3 years

Chief Officer,

Sinnar Municipal Council, Maharashtra

Municipal Engineer | Chief Officer | Vice President | President

DBOT Tender Document for Fecal Sludge & Septage Treatment Plant at Sinnar, Maharashtra

Table of Contents

Tender Inviting Authority: Sinnar Municipal Council, Sinnar Dist.Nashik

Name of Work: Turnkey project on Design, Construction, Commissioning and Operation of Fecal Sludge & Septage treatment plant of capacity 70 m3/day at Sinnar Municipal Council, District - Nashik, Maharashtra

Contract No:

Bidder Name :	

PRICE SCHEDULE

(This BOQ template must not be modified/replaced by the bidder and the same should be uploaded after filling the relevent columns, else the bidder is liable to be rejected for this tender. Bidders are allowed to enter the Bidder Name and Values only)

NUMBE	TEXT	NUMBER	TEXT	NUMBER	NUMBER	TEXT
Sl. No.	Item Description	Quantity	Units	RATE In Figures To be entered by the Bidder (inclusive of all taxes) in	TOTAL AMOUNT inclusive of all Taxes	TOTAL AMOUNT In Words
1	2	4	5	13	53	55
2	**Schedule A**					
2.1	Design, drawings and all necessary approvals from various government departments etc. before start of execution of the project etc. complete and Construction and Commissioning Fecal Sludge & Septage treatment plant with all appurtenant structures and allied works complete including testing, trial run for 1(one) month and commissioning of the plant to the satisfaction of the Engineer-In-Charge	1.0000	No		0.00	INR Zero Only
3	**Schedule B**					
3.1	Operation & Maintenance of Fecal Sludge & Septage treatment plant and allied works etc.	1.0000	No		0.00	INR Zero Only

Units
Please enter Units in text

Septage Treatment Plant DBOT Tender

Discussion points

- Can PSP in FSSM be worked out in your cities and state ?
- Is there private sector available in your cities and state for providing FSSM services ?
- Do you envisage any hurdles in implementing the PSP for FSSM?

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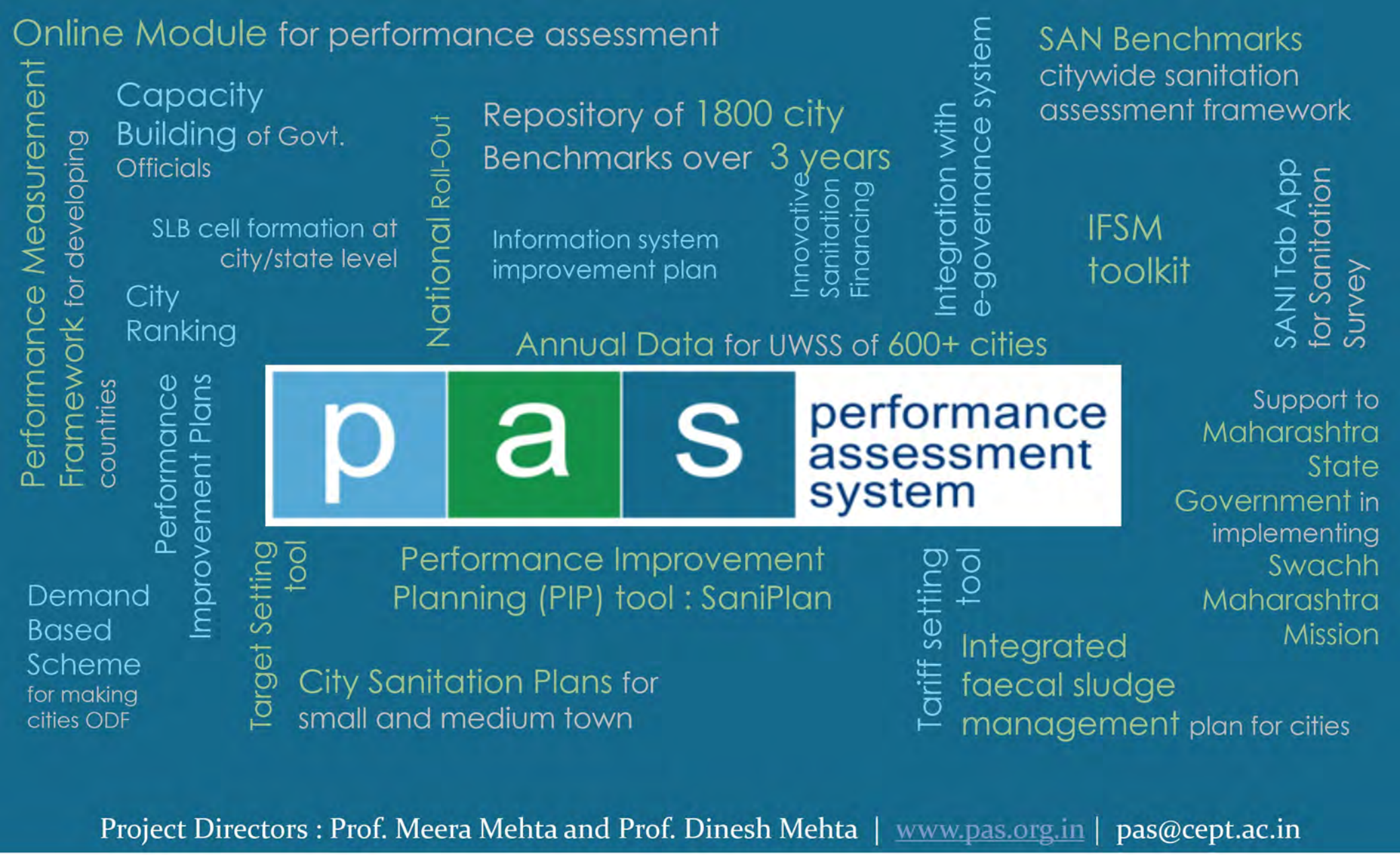
Group Discussion

Design of Training Module . . .

- Develop training agenda according to different target groups? Eg: Elected representatives, executive wing, Consultants (2 days/ 1 days)
- What are the key takeaways?
- How to translate lessons further?
- How to tweak this workshop model according to time constraints?



Project Directors : Prof. Meera Mehta and Prof. Dinesh Mehta | www.pas.org.in | pas@cept.ac.in

p a s performance assessment system

C-WAS, CEPT University, Ahmedabad, India