Infrastructure Plan for

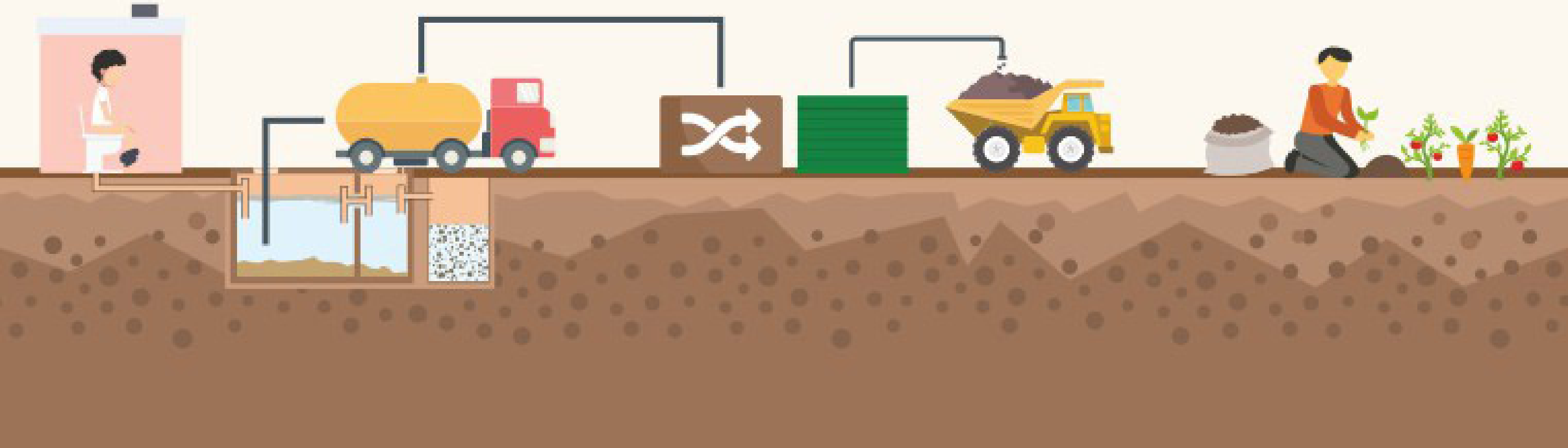
‘City Name’

The FSM Index score indicates that the Overall FSM performance of the city is

GOOD

Scale: Poor 0-33% | Developing 33-66% | Good 67-100%.

The FSM infrastructure of the city requires improvement with a focus on - containment systems and treatment infrastructure. The enabler ecosystem assessment score indicates need for improvement in aspects of - Operation and maintenance.



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Rapid Infrastructure Planning Report: City Name

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FSM
Faecal Sludge Management
TOOLBOX

Rapid Planning:

- City Name:
- State:
- Country:
- Total Population:

Name of the organisation:

The infrastructure planning tool is designed to assist users with estimating the infrastructure gap and planning the interventions across all stages of the FSM service chain - containment, emptying, transportation and treatment, in your city.

Here is a list of planning areas that you have chosen for your city/region

S#	Planning Question
1	Household Toilet Construction Plan new toilet construction at household level
2	Community Toilet Construction Plan new toilet construction at community level
3	Public Toilet Construction Plan new toilet construction in all public places across the city
4	Toilet User Interface selection Choose a suitable toilet user interface for the toilets in the city
5	Containment Selection Choose a suitable containment system for the toilets in the city
6	Total Faecal Sludge generation Estimate total faecal sludge generation in the city
7	Vehicle Procurement Decide on the number and types of trucks to procure
8	Treatment Plant Size Estimation Determine overall treatment plant size
9	Treatment Site Identification Identify appropriate treatment site locations in the city
10	Treatment Technology Shortlisting

	Shortlist treatment technologies suitable for identified sites
11	Regional Treatment Infrastructure Evaluate treatment infrastructure cross utilizability among neighbouring cities

Result

Household Toilet Construction

There are **Y1** households in the city without toilet facility in their premises. Of them, **Y2** households have space for construction of new household toilets within the household premises. Also, **Y3** households in the city have insanitary toilets. It is recommended that the city take efforts to upgrade insanitary toilets to sanitary and futureproof the groundwater from further pollution due to faecal sludge seepage.

Total number of household toilets to be constructed = total number of households without toilet but have additional space for construction within premises + total number of households with insanitary toilets

Community Toilet Construction

Y1 households in the city do not have a toilet facility due to space constraint and do not have access to a shared facility in the neighbourhood. Efforts must be made to support such households by creating access to safe shared sanitation solutions in close proximity to these households.

Total number of community toilet seats to be constructed for males:
Total number of community toilet seats to be constructed for females:

Public Toilet Construction

It has been established that there are **Y1** floating population in the city. A total of **Y2** male public toilet seats and **Y3** female public toilet seats are required to cater to the needs of the floating population in the city.

Back end: If demand > supply

However, there are only **Y4** male public toilet seats and **Y5** female public toilet seats available in the city. The city must take efforts to increase the overall availability of public toilets in the city to cater the sanitation needs of floating population.

Total number of public toilet seats to be constructed for males:
Total number of public toilet seats to be constructed for females:

Back end: If demand > supply

It is impressive that the city of CityName has **Y4** male public toilet seats and **Y5** female public toilet seats available in the city to cater the sanitation needs of floating population, which meets the installed capacity requirements.

FSM Toolbox has dedicated modules to assist you in construction of public toilets and identification of appropriate locations for the same. Learn more.

Suggested Toilet User Interface for your city

City characteristics

TI1	What is the water availability for toilet usage? *Water unavailable for toilet usage* *1 small bucket of water per use (5L per use)* *1 medium bucket of water per use (5-10L per use)* *1 large bucket of water per use (10-15L per use)*
TI2	What is the potential water sourcing method? *- Piped water connection supplied through overhead tank* *(or)* *- Other methods (fetched, hand pump, standpipe, open tank at floor level)*
TI3	What are the end use possibilities of sanitation products in the city/neighbourhood? *-Human urine as fertilizers for crops* *(or)* *- Dried human faeces as fertilizer for crops* *(or)* *- None*
TI4	Are the users comfortable about using two different compartments in the toilet user interface regularly? *(Yes/No)*
TI5	What is the preferred anal cleansing method? *(water/soft paper/others)*

After carefully studying the city characteristics, here is a menu of technologies that could be relevant to your city.

Dry Toilet
Urine Diverting Dry Toilet
Pour Flush Toilet
Cistern Flush Toilet
Urine Diverting Flush Toilet

To accurately determine the type of toilets that may be feasible in a specific site/location and capture citizen preferences, use the FSMPro Planner (insert link)

Suggested Containment Systems suitable for your city

City characteristics

Dry Toilet
Is the location flood prone? - Non-flood prone area - Flood prone area
At what depth is the ground water available? - Less than 2m - 2m to 5m - greater than 5m
What is the % of slope? - Less than 5% - 5% to 25% - greater than 25%
What is the vehicular accessibility? - No access (less than 3m) - limited/narrow (3m - 6m) - Full access (greater than 6m)
What is the soil type? - clayey - silty

- sandy - gravelly - rocky
What is the operational capacity/preference of the user for maintenance of the system? - High - Moderate - Low
Are the toilet users comfortable about using two different compartments for disposal of urine and faecal sludge at the facility regularly?

After carefully studying the city characteristics, here is a shortlist of technologies that could be relevant to your city.

- Single Pit
- Single Ventilated Improved Pit (VIP)
- Double Ventilated Improved Pit (VIDP)
- Fossa Alterna
- Twin Pits for Pour Flush
- Composting Chamber
- Septic Tank
- Biogas digester + Anaerobic Baffle Reactor & Anaerobic Filter
- Settler+ (Anaerobic Baffle Reactor & Anaerobic Filter)

Total FS Generation

The population, gender ratio and the total number of properties (household, buildings, community and public toilets) that are dependent on various containment typologies are identified. The country specific benchmarks on the average generation rate per person per day for each of the OSS typology is noted and the total population dependent on each of the containment types are identified to calculate the total FS Generation in the city.

- FS generation rate per person per day – septic tank
- FS generation rate per person per day – pit
- Population dependent on septic tank in households
- Population dependent on septic tank in commercial, institutional and industrial buildings
- Population dependent on septic tank in public toilets
- Population dependent on pits in households
- Population dependent on pits in commercial, institutional and industrial buildings
- Population dependent on pits in community toilets
- Population dependent on pits in public toilets

Total FS Generation per day:

Vehicle procurement

Based on overall faecal sludge generation rate across the city from properties located on both (1) roads with poor access, and (2) roads with good access, the total volume of small and large vehicles required for desludging such properties have been identified respectively. Assuming a standard desludging frequency of **Y1** years for all properties in the city, it is estimated that the total volume of faecal sludge to be desludged is **Y2** m3 in properties with poor road access and **Y3** m3 in properties with good road access. Based on a set of standard assumptions provided as input at the questionnaire stage (number of hours of operation per day – **Y4** hours/number of days of operation in a year – **Y5** days/average volume of small desludging vehicles – **Y6** m3/average volume of large desludging vehicles – **Y7** m3/number of trips to be carried out in a day – **Y8** trips), it is estimated that **Y9** small desludging vehicles and **Y10** large desludging vehicles are required for conducting desludging operations in the city.

Based on the existing vehicle availability (Y11 small desludging vehicles and **Y12** large desludging vehicles) in the city, **Y13** new small desludging vehicles and **Y14** new large desludging vehicles should be procured by the city.

NOTE: Small desludging vehicles refer to all vehicles which have smaller dimensions enabling them to access properties located on roads of width

Treatment infrastructure - Determining overall treatment plant size

The size of the treatment plant is arrived at after carefully considering the overall vehicle capacity that is likely to reach the treatment plant (vehicle capacity method) and the likely demand for treatment after 10 years (based on FS generation estimates), using population projection method.

1. **Vehicle capacity method:**

   In this method, the total volume of FS from vehicles that will arrive at the treatment plant is estimated to arrive at the treatment plant size. (Y1 KLD)

2. **Population projection method:**

   In this method, a projected estimate of the total volume of faecal sludge generated in the city per day is calculated for arriving at the overall treatment plant size. (Y2 KLD)

Cities should carefully consider the current expected volume of faecal sludge that could arrive at the treatment plant facility (as per vehicle capacity method) and the potential demand of the treatment plant (based on population projection method) and take a calculated decision on the total size of the treatment plant.

Treatment infrastructure - Identify appropriate treatment site locations in the city

After careful consideration of all the location/site characteristics which are mentioned in the table below:

- the proposed site could be suitable for construction of faecal sludge treatment plant
- the proposed site might not be suitable for construction of faecal sludge treatment plant

Green – site characteristics matches with the requirement
Red – site characteristics do not match with the requirement

Site Characteristics

Is there any habitation in less than 200m distance from the identified site?	YES/NO
Are there any water bodies in less than 200m distance from the identified site?	YES/NO
Is the identified site a wetland?	YES/NO
Is the identified site in a flood prone area?	YES/NO
Is there an airport site (current/proposed) in less than 20Km distance from the identified site?	YES/NO
Is there a heritage site in less than 10Km distance from the identified site?	YES/NO
Is the groundwater table available in less than 3m distance from the ground?	YES/NO
Is there a drainage channel available next to the identified site?	YES/NO

Treatment infrastructure - Shortlist treatment technologies suitable for identified sites

City characteristics

Is the site flood prone? - Non-flood prone area - Flood prone area
At what depth is the ground water available in the site? - Less than 2m - 2m to 5m - greater than 5m
What is the % of slope at the site? - Less than 5% - 5% to 25% - greater than 25%
What is the soil type at the site? - clayey - silty - sandy - gravelly - rocky
What are the end use possibilities in the city/neighbourhood? -Human urine as fertilizers for crops (or) - Dried human faeces as fertilizer for crops (or) - None
What is the soil type? - clayey - silty - sandy - gravelly

- rocky
What is the operational capacity/preference of the user for maintenance of the system? - High - Moderate - Low

After carefully studying the city characteristics, here is a menu of technologies that could be relevant to your context.

It is important to note that there are 6 stages to any faecal sludge treatment plant and the technologies have been identified within each of these 6 stages. (A. Pre-treatment, B. Solid liquid separation, C. Dewatering, stabilization, D. Further treatment, E. Effluent treatment secondary, and F. Effluent treatment tertiary).

Pre-Treatment

Screen

Grit chamber

Solid/Liquid Separation

Anaerobic biogas reactor

Sedimentation/thickening ponds

Settler/thickening tank

Imhoff tank

Dewatering

Centrifugal sludge dewatering systems

Belt filter dewatering systems

Frame filter press dewatering systems

Screw press dewatering systems

Unplanted drying beds

Planted drying beds

Solar drying

Thermal drying (and pelletising)

Stabilization/Further Treatment

Co-composting

Deep row entrenchment

Lime/ammonia addition

Sludge incineration

Black soldier flies

Vermicomposting

Thermal drying

Solar drying

Planted drying beds

Effluent Treatment – Secondary

Anaerobic Baffled Reactor (ABR)

Anaerobic Filter (AF)

Waste Stabilization Ponds (WSP)

Aerated pond

Free-water surface constructed wetland

Horizontal subsurface flow constructed wetland

Vertical flow constructed wetland

Sequencing batch reactor

Membrane bioreactors

Upflow anaerobic sludge blanket reactor

Trickling filter

Integrated settler and anaerobic filter

Effluent Treatment – Tertiary

Polishing ponds

Floating plant (macrophyte) pond

Aquaculture ponds

Free-water surface constructed wetland

Horizontal subsurface flow constructed wetland

Vertical flow constructed wetland

Depth filtration

Chlorination

UV radiation

Ozonation

A. Key considerations

B. About the technology

C. Case studies

Regional Treatment infrastructure

Construction of the new treatment facility for FS is a capex intensive effort. Many city governments have cross utilized t existing treatment infrastructure in their region based on proximity and current utilization capacity of the plants. After studying various parameters:

- It is apparent that that the City of Cityname could potentially utilize the neighbouring treatment unit located at a distance of Y1 km from the city. The current utilization capacity of the treatment plant is Y2 m3 and has the potential to intake Y3 m3 of faecal sludge load. (Y4% of total faecal sludge generated in Cityname)
- We realize that the nearest location of treatment plant is quite far away (Y1 Km) from the centre of Cityname and hence it is not suitable to cross utilize the treatment infrastructure. Cityname city should take efforts to establish a treatment facility within Y5 km radius from the centre of the city. To determine a location for your new treatment plant, use our FSMPro Planner
- We realize that the nearest treatment plant in the region has attained peak utilization capacity and can no longer take incremental faecal sludge into the facility. Hence Cityname city should take efforts to establish a treatment facility within Y5 km radius from the centre of the city. To determine a location for your new treatment plant, use our FSMPro Planner

Please find below a list of suitable reading materials that are most relevant to your city. Click on the links to navigate to the reports