



# Resources for planning scheduled emptying of septic tanks

Center for Water and Sanitation  
CEPT University

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# Resources for planning scheduled emptying of septic tanks

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*What is scheduled  
desludging and  
why is it needed?*

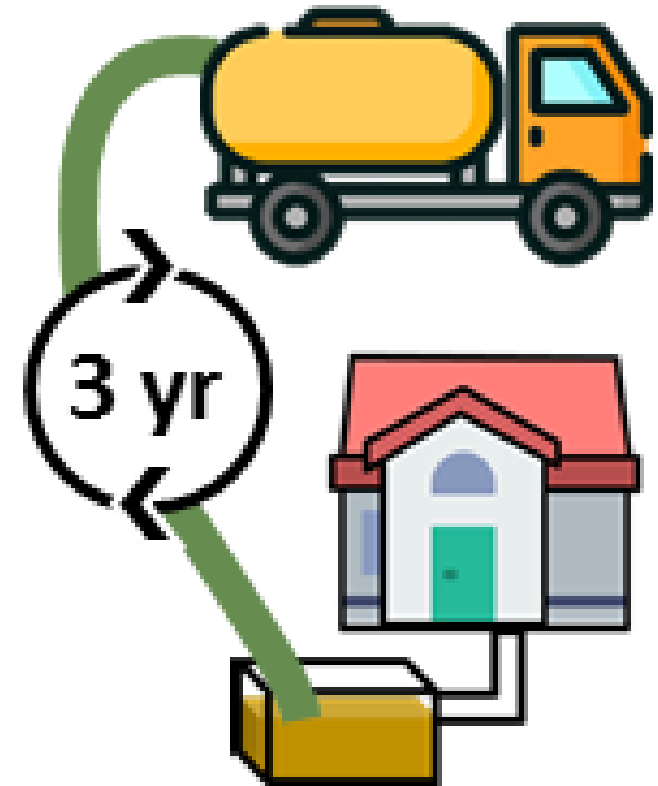
# Need for regular emptying of septic tanks

- Prevailing common practice to empty only when it is full and overflows
- Tendency to build oversized septic tanks to avoid frequent emptying
- Not emptying for long durations leads to reduced efficiency of septic tanks
  - Sludge hardens at bottom and is difficult to remove.
  - Effluent quality degrades.
  - Increased chances of manual scavenging
- Regular emptying advised by authorities

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”**

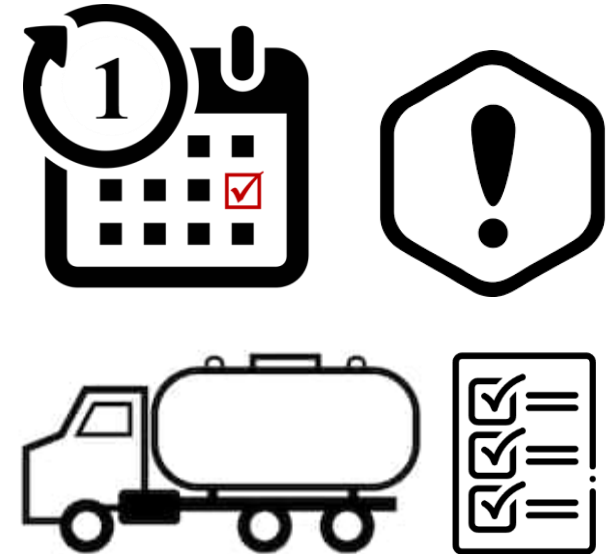
Pg 9-22, CPHEEO Manual





# What is scheduled desludging service?

- Current practice of septic tank owners is to call desludging operators only when tanks overflow. Sometimes owners construct oversized tanks to avoid emptying altogether
- Under a scheduled desludging service...
  - all septic tanks** in the city are visited...
  - once** during a **fixed cycle** and...
  - mandatory** desludging is done...
  - according to a **predetermined schedule**...
  - by one or more **licenced service providers**...
  - Who are paid through **annuity payment** backed by ULB revenues
  - who delivers sludge safely to a **designated disposal site for treatment and reuse**



# Scheduled desludging has many benefits compared to on-demand desludging

## On-Demand Basis

As a complaint redressal system  
Desludging done on call by the household, who do not see the need for regular cleaning. Usually done when septic tank overflows every 8-10 years. (~2% annually)

Low frequency of desludging results in poor efficiency of tank and low quality effluent. Overflow before emptying also pollutes environment.

User charges for emptying often very high as operators lack economies of scale.  
Poor households want to avoid filling up their tank and may avoid using toilets.

No monitoring mechanism and regulation of private informal providers.  
Manual labour is needed as sludge hardens in tank due to not being emptied for a long time.

Desludging frequency

Environmental benefits

Equity and affordability

Regulation and monitoring

## Scheduled Practice

As a regular service  
Desludging done on a fixed cycle of 3 years and predetermined schedule (33% annually) based on zoning of the city, jointly decided by the local government and service provider.

Likely reduction in BOD and coliform in septic tank effluent due to better efficiency of tank. Also avoids solid overflow

All properties covered. Lower prices due to trip optimization and assured business.  
Local taxes levied by ULB for recovering OpEx. This could be graded to make it affordable for all.

Regulated and monitored by ULB  
Removes need for manual labour due to regular emptying

# *Case studies from India and around the world*





# Scheduled desludging in Wai city, Maharashtra

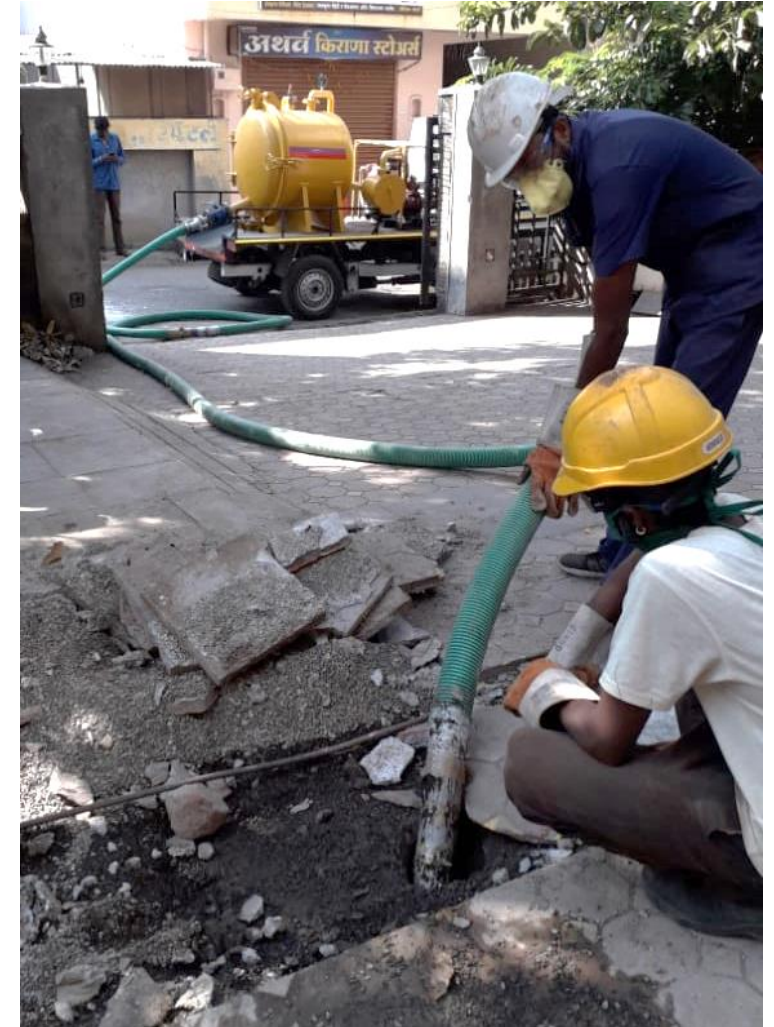
On May 30, 2018, Wai Municipal Council in Maharashtra became the first city in India to start a Scheduled Desludging service. Wai is small municipality with a population of 45,000 in Maharashtra.

If Wai can do this, it is possible for most cities in India to adopt this practice. This presentation is about how Wai did this and how other cities in India can adopt this practice.



# Main features of scheduled desludging service initiated in Wai

- Planned schedule and frequency for all
  - Each septic tank in the city is desludged once in three years.
  - This is like an Annual Maintenance Contract (AMC) for a water filter or an AC – or the way garbage is collected daily from each property
- Inclusive service
  - All properties are covered under this service – residential / non-residential, all slums, etc
- Sustainable finance through sanitation tax
  - The payment for the service is not through a user charge paid at the time of desludging BUT through a sanitation tax (levied as a flat charge or as a % of property tax) paid annually
- Safe disposal at treatment facility
- Monitoring system
  - Paper based forms for desludging and unloading are copied to all stakeholders to maintain accountability
  - Payment linked to these forms
  - A mobile and web app also planned for this
  - Visiting all septic tanks in the first cycle will also help build a detailed one-of-a-kind database of onsite systems in the city



# Achievements so far

- Scheduled emptying started since June 2018
- 7-8 septic tanks desludged per day as compared to 7-8 per month desludged when demand desludging was happening.
- 33% of all septic tanks in the city will be desludged by the end of first year of operations
- 2.5 million liter septage delivered to treatment facility
- >90% household readiness and acceptance in first cycle
- Sanitation workers now wear safety gear regularly
- Households pay sanitation tax instead of high user charges for desludging





# Leh, J&K - Scheduled desludging

- Leh Development Authority and Blue water Company - 5 yr Public Private partnership contract for scheduled desludging and treatment of fecal sludge
- Municipality will give its suction truck which will be operated by Blue Water Company (BWC) at its own costs
- Municipality will collect user fees, with help from BWC
- 90% of fees paid to BWC after service is delivered
- Inclusive Services: Cross-subsidize cost of FSM services to poorer households through higher fees from hotels and guesthouses (which are present in high number)
- Trips increased from 6-8 trips/month to about 80-100 trips/month
- Only 25% of septic tanks are easily accessible—extra time is planned to access narrow streets and open tanks, also an off-board pump near septic tank and can push septage from 100m distance
- Cold in nights—pipes break, septic tanks freeze – adjusted work duration
- Had to replace the LDA truck which broke down often, also added a smaller 2000 liter truck





# Philippines - Scheduled emptying

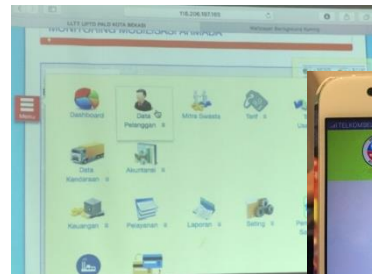
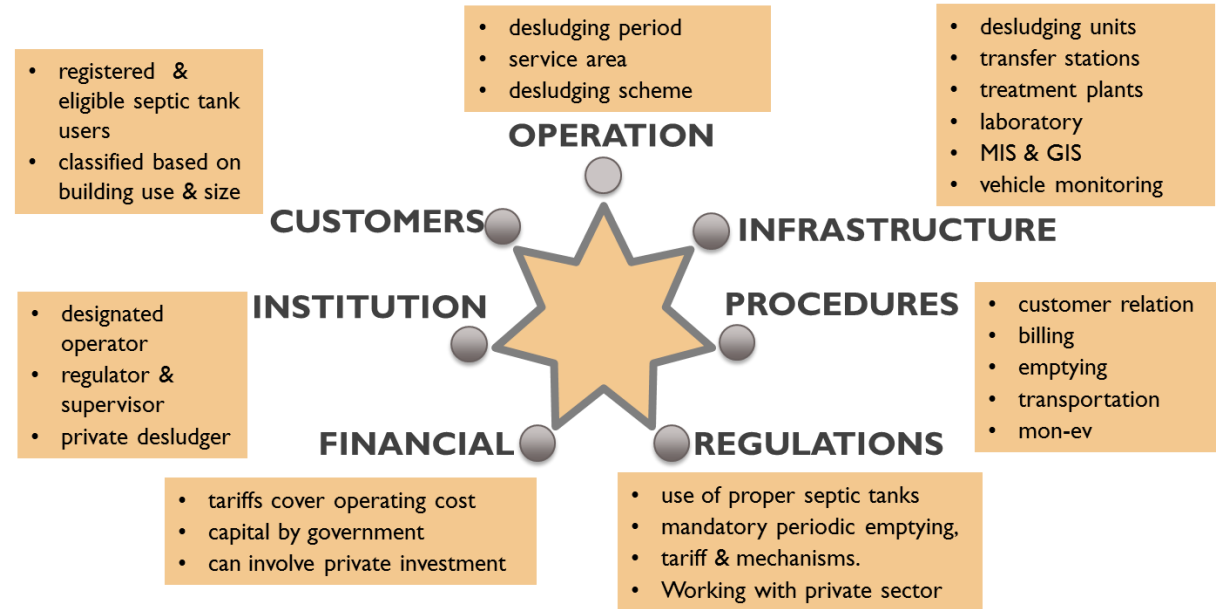
- The national Clean Water Act (CWA), 2004 obligates national agencies, local government units (LGUs) and other service providers (like water districts) to provide either septage management or sewerage services for all consumers.
- It recognizes the full service chain of sanitation and scheduled septic tank desludging cycle
- Services provided by private concessionaire (Manila) or city water district (Baliwag, Dumaguete)
- Levying an environment fee at 20% of water bill or a tariff linked to water consumption for regular desludging services
- Effective awareness programs and IEC activities
- Charges and penalty norms for denial of desludging service
- Safe desludging practices like use of safety gears in place

	Baliwag	Veteran Village (Maynilad)	Dumaguete
Desludging cycle	5	5	5
Start of 1 <sup>st</sup> cycle of desludging	2013	2012	2010
Responsibility of desludging	Baliwag Water District	Maynilad Water Services Inc	Dumaguete City Water District
Capex Funding	Baliwag Water District invested in 2 trucks of 5 m <sup>3</sup> capacity each	Maynilad invested in 27 trucks	Water district invested in 7 trucks of 3 m <sup>3</sup> size.
Opex Funding	10% of water bill	20% of water bill	Tariff of PHP2 per cubic meter of Water Consumed



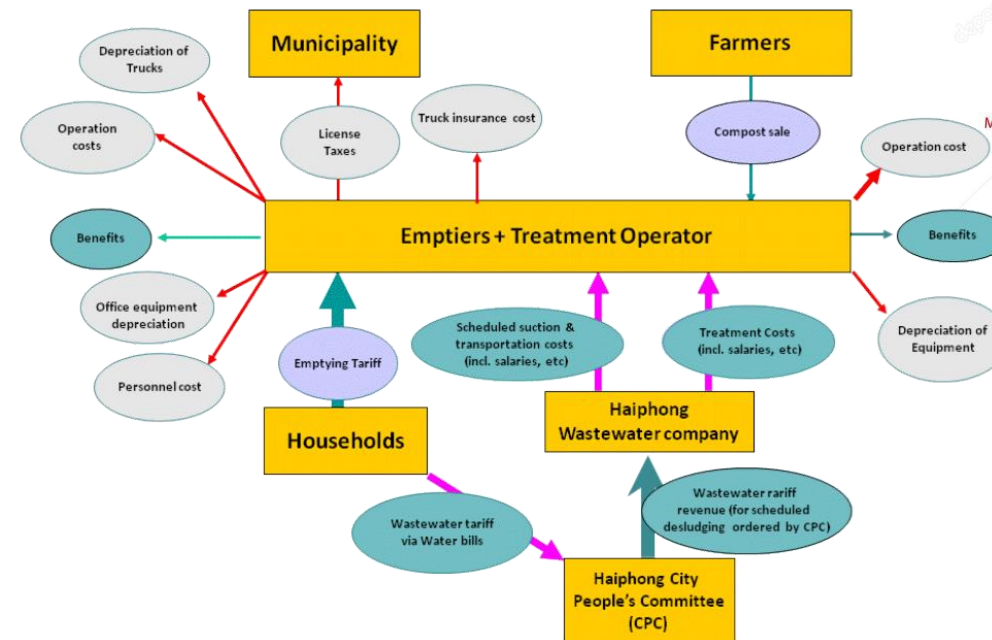
# Indonesia – Regular desludging through online systems

- Services by Govt. Public works department at regional(provincial) or city level
- All can request desludging but those who register as customer get scheduled desludging
- Tariff according to amount of sludge collected
- Especially procured high capacity pumps and long pipes to reach inside narrow lanes.
- Mobile based app and Dashboard for desludging requisition and monitoring in Bekasi City
  - Android Based App for households to request desludging services.
  - A single app provides access to the LG trucks and private trucks
  - HH register on the on-line platform, HHs inform their regular desludging period and based on their request service is provided
  - A dashboard is prepared to monitor the activities of the desludging vehicles.
  - The LG monitors the LG trucks as well as the private trucks
  - Access to the dashboard is given according to the stakeholder.
  - Bar-code is placed at every registered HH.



# Vietnam - Scheduled desludging in Hai Phong

- Hai Phong Sewerage and Drainage One member state Company limited (Hai Phong SADCO) is responsible for provision of sanitation services
- Its GIS database has 86,501 septic tanks under scheduled desludging across 4 urban districts.
- Desludging interval for household septic tanks once in 5 - 6 years, and for communal apartments once in 1 - 2 years
- Scheduled emptying is covered by the city's budget and waste water fee of 15% surcharge on water bill
- In the city of Hai Phong, scheduled fecal sludge emptying service for the communities is through the surcharge.

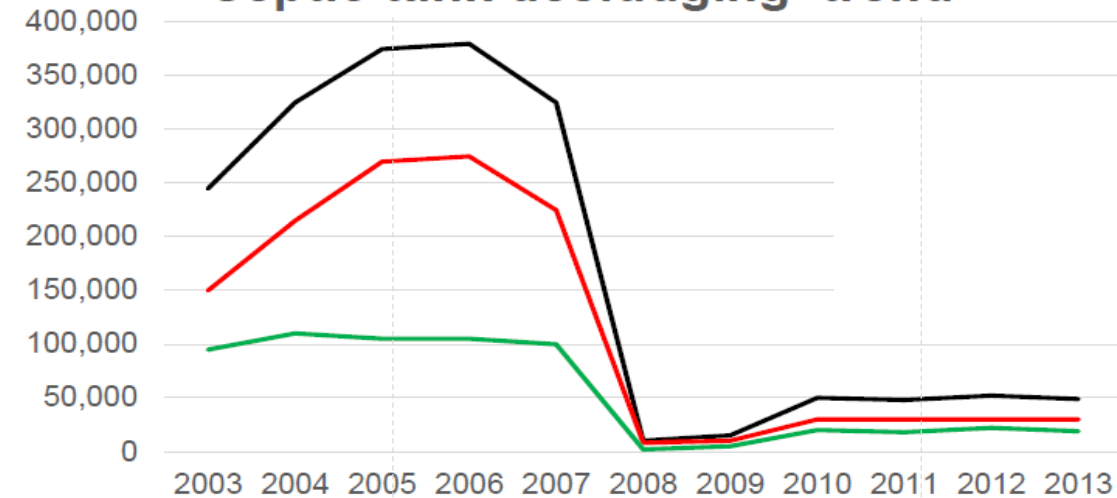




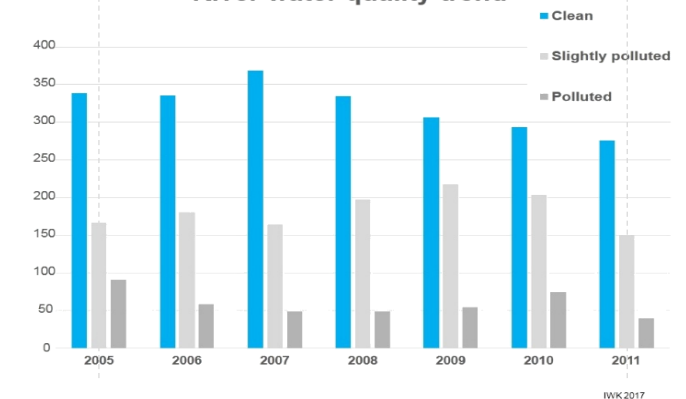
# Malaysia - Learning from mistakes in scheduled desludging

- Scheduled emptying was being provided by Indah Water Konsortium (IWK) between 2005-2007. There was a small monthly tariff (RM 6) and the service was experiencing a high success rate
- Post 2008, with liberalization, other desludgers could also operate and tank owners could call any permit holder (incl Indah Water). Tariff changed to a one off charge (RM 230–300) and it was observed that households were hesitant to pay. There wasn't adequate efforts made for awareness generation. This led to a huge drop in desludging and a significant decrease in river water quality.
- Now, the new model is that IWK will schedule and permit holding operators will carry out desludgings and transport to Indah Water facility for treatment
- Neighbourhood Consultation – for awareness on scheduled desludging and discussion on tariff - setting
- Tariff proposed to be spread over a 3 year period (monthly billing) and linked to water tariff to improve collection efficiency.
- Volumetric tariff based on water consumption

Septic tank desludging trend



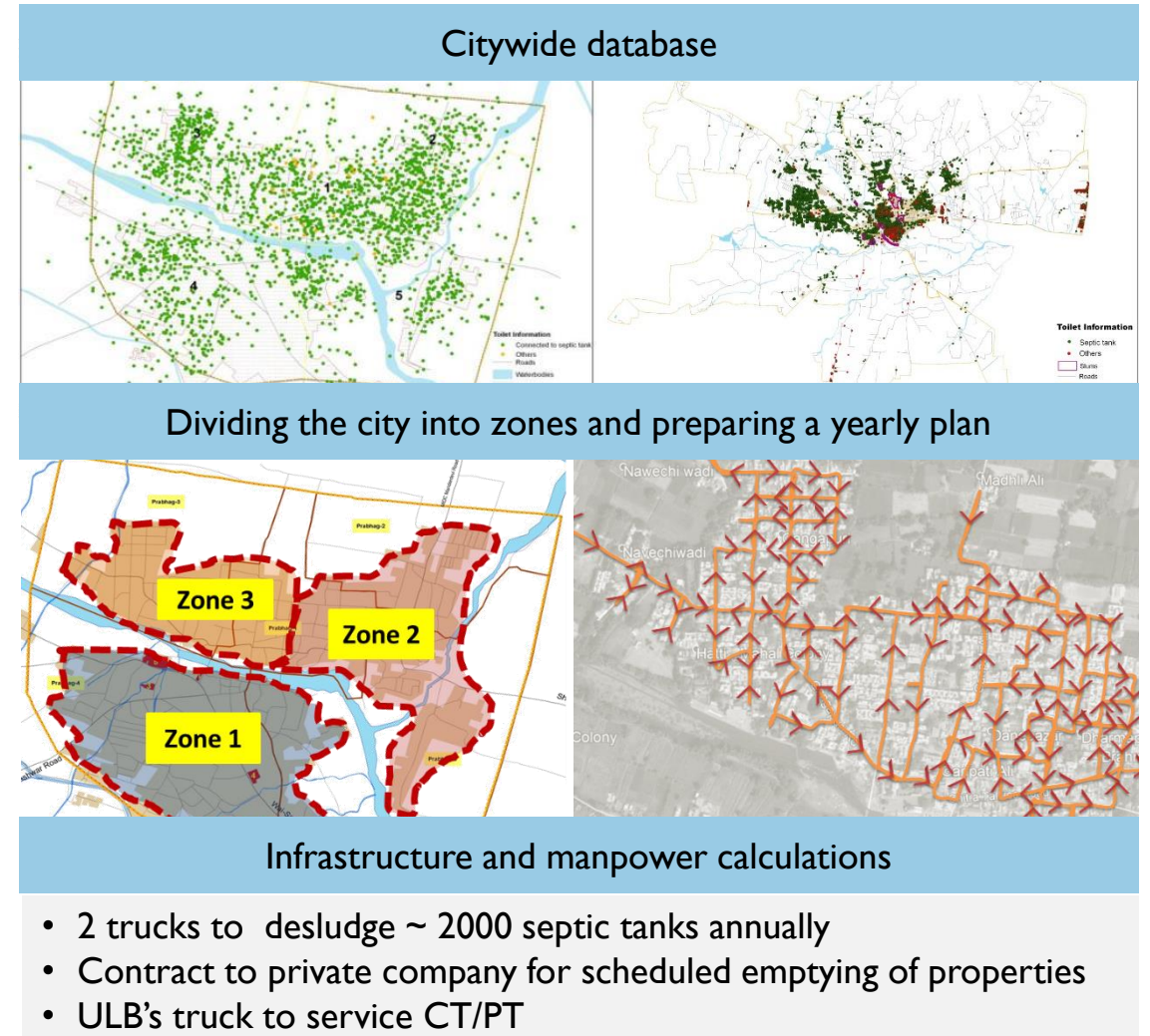
River water quality trend



*How do I plan for a  
scheduled desludging  
service in my city?*

# Designing a scheduled emptying service

- Database
  - Using property tax data as a base OR
  - A citywide household and sanitation survey to create a database on toilets and septic tanks
- Scheduling for complete cycle
  - City divided into zones to be covered each year
  - Route mapping for zone 1
- Infrastructure and manpower requirement calculations
  - Schedule cycle – 2/3 years
  - Number to septic tanks and Average yield from each emptying
  - Working days and number to trips possible by each vehicle daily
- Partnerships with the private sector
  - Tendering process
  - Performance based contract
- Measures for successful implementation
  - Regulations and penalties set in place to ensure periodic cleaning
  - Awareness generation activities to educate households about the need for regular cleaning increases acceptability of service





# I. Database and monitoring

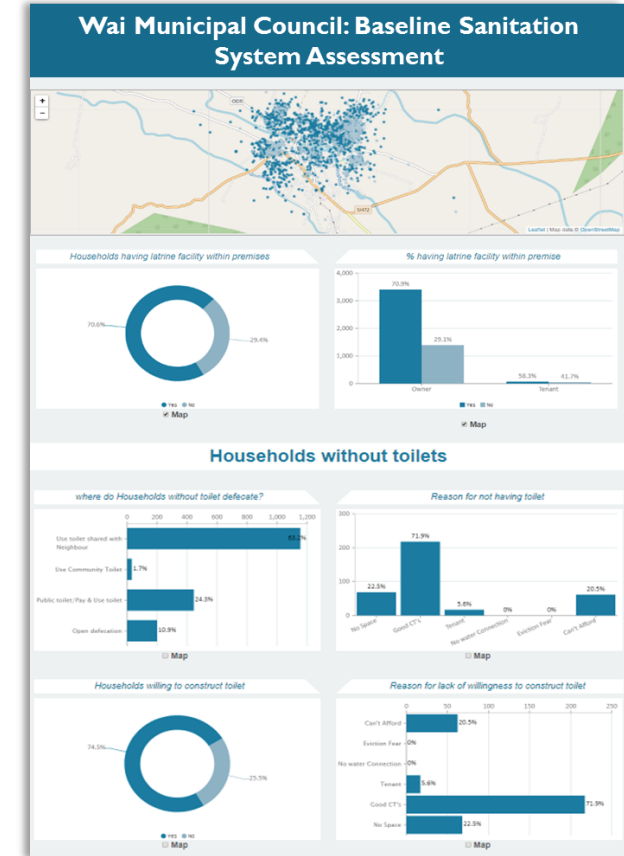
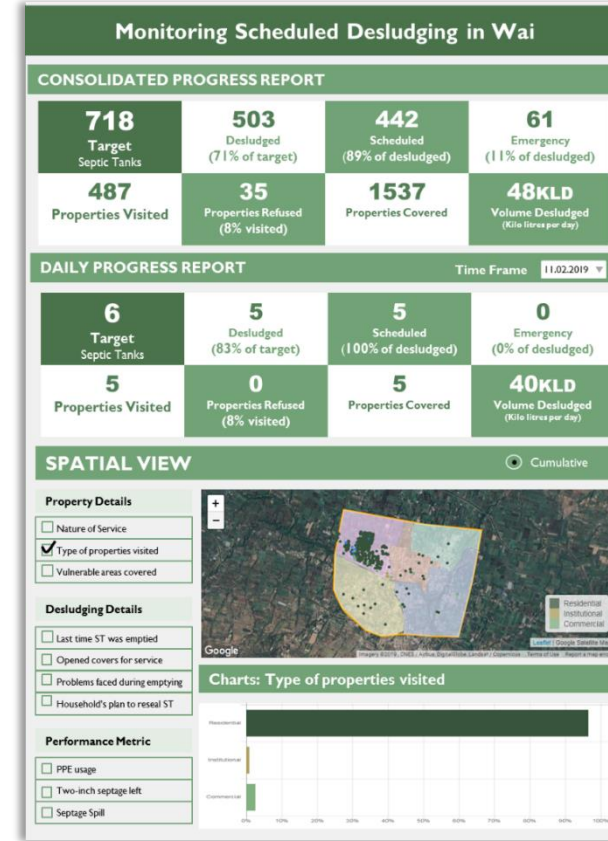
## Property tax database

- Can be used as base list for designing schedule

If city wants to have more detailed data through surveys, mobile app is available –

## SaniTab

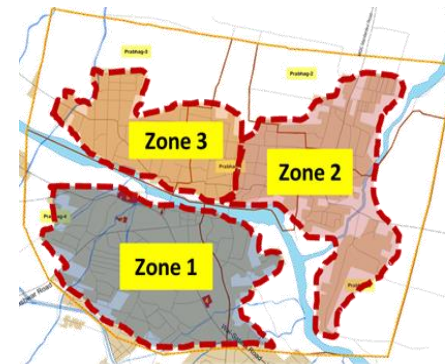
- Customizable forms on mobile phones
- Build 100% database of septic tanks and toilets in the city
- Monitoring of service also possible without paper based forms
- Dashboard for results



# 2. Scheduling and infrastructure assessments

- Number of zones = cleaning cycle
- Number of septic tanks to be emptied daily
  - =  $\frac{\text{Total number of Septic tanks in the city}}{(\text{Septic tank cleaning cycle} * \text{No. of working days per year})}$
  - = \_\_\_\_\_ daily
- Number of trucks required (Nos.)
  - =  $\frac{\text{Number of septic tanks to be emptied daily}}{\text{Number of trips possible per truck per day}}$
  - = \_\_\_\_\_ nos
- Manpower requirement
  - = drivers + helpers + manager for call center and scheduling + mason for opening covers
- Volume of septage to be treated (cum/day)
  - = Av.Vol. of septic tanks \* no. of septic tanks emptied per day
  - = \_\_\_\_ cum/day

Divide the city into zones and prepare a yearly plan



Year	Zone	Septic tanks to be cleaned annually (no)	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

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

# 3. Financial assessments and tariff calculations

1	<p>Fuel cost for schedule emptying service = (Number of septic tank to be emptied daily <math>\times</math> Number of working days in a year <math>\times</math> Average distance <math>\times 2 \times</math> (Fuel price / Fuel efficiency))</p> <ul style="list-style-type: none"> <li>- Assume Fuel efficiency for truck = 5 km per liter</li> <li>- Assume Fuel price = Rs 70 per liter</li> <li>- Assume number of working days in a year= 300 days</li> </ul>	
2	<p>Repair and maintenance cost = (Number of suction emptier truck requirement <math>\times</math> months in a year <math>\times</math> avg repair and maintenance cost per month)</p> <ul style="list-style-type: none"> <li>- Assume average repair &amp; maintenance cost = Rs 2,000 per month</li> </ul>	
3	<p>Establishment expenses = ((Number of suction emptier truck requirement <math>\times 12 \times</math> No of manpower <math>\times</math> Monthly Salary)</p> <ul style="list-style-type: none"> <li>- Assume, 2 manpower requirement per truck</li> <li>- Assume, Salary = Rs 10,000 per month</li> </ul>	
4	<b>O&amp;M cost per year</b>	<b>Sub-total = (1+2+3)</b>
5	<p>Overhead + Insurance + other Miscellaneous cost = Sub-total(4) <math>\times 10\%</math></p> <ul style="list-style-type: none"> <li>- Assume, other cost as 10 % of sub-total (4)</li> </ul>	
6A	<b>Total O&amp;M cost for schedule septic emptying service = (4+5) (Per year)</b>	
6B	<b>Sanitation Tax (per property per year)</b>	
	= Total O&M cost (6-A) / Total number of properties in city	



# 4. City council resolution for implementation

- An example of a formal expression of opinion or intention of the local body to
  - a) Undertake FSM activities
  - b) Levy a sanitation tax and open an escrow account for the same.

## Sample resolution



Sample council  
resolution

# 5. Engaging the private sector

- Outsourcing emptying service
  - Private company to be outsourced emptying service – will bring own trucks and manpower
- Transparent tender process
  - Tenders floated on state government's tender website
  - Bids assessed and private contractors selected
- Protecting ULB interests - Performance based contracts
  - Payments linked to schedule and safety compliance – eg no. of tanks cleaned, use of PPE
  - Forms signed by households and FSTP operator ensure accountability
- Protecting Private sector interests - Escrow account mechanism
  - Private player protected against payment risk as ULB is to maintain pre-determined amount in account held by third party bank
- Efficient costing
  - Private company charges lesser amount per tank emptying as compared to demand based model due to surety of getting enough work as well as route and infrastructure optimization

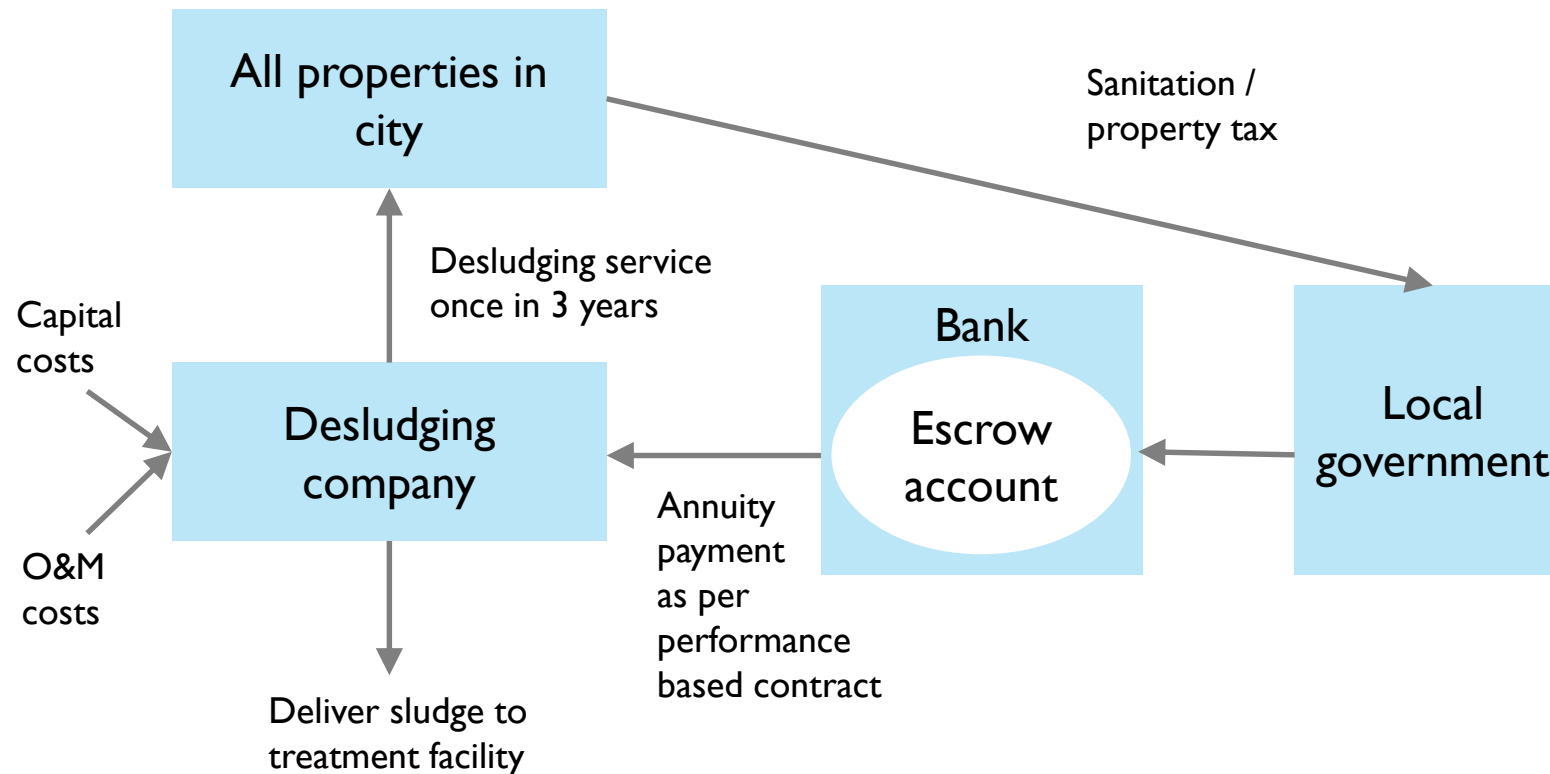
## Model performance based contract

[Weblink for contract document](#)



Toolkit for engaging the private sector - [Weblink](#)

# 6. Performance linked annuity model (PLAM) for finance

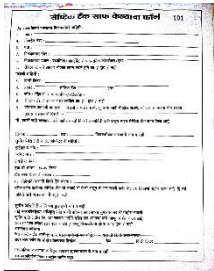


- Monthly payments based on performance
  - Targeted amount of septic tanks emptied
  - Compliance to safety standards and laws
  - Quality of service
- Escrow Mechanism to safeguard from late payment risk – Municipality to maintain 3 months' payment in Escrow account held by bank.

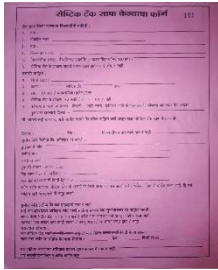


# 7. Performance monitoring

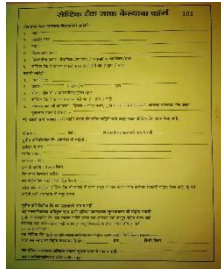
## Daily report formats to monitor emptying process.



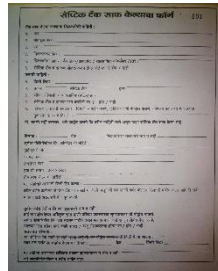
Municipal Council's copy



Property holder's copy



Emptying service provider's copy



Treatment plant's copy

These records are linked to the payment of private emptying service provider

Developing online monitoring system



## Template for emptying form

### Template Manifest form for emptying

is an integral part of a comprehensive septage management program. This completed form, along 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<sup>1</sup>

**Sample Form to be filled by Operator / Transporter of Septage**

**i. Identification of Waste:**

a) Volume: \_\_\_\_\_  
 b) Type: \_\_\_\_\_ Septic Tank \_\_\_\_\_ Others  
 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.

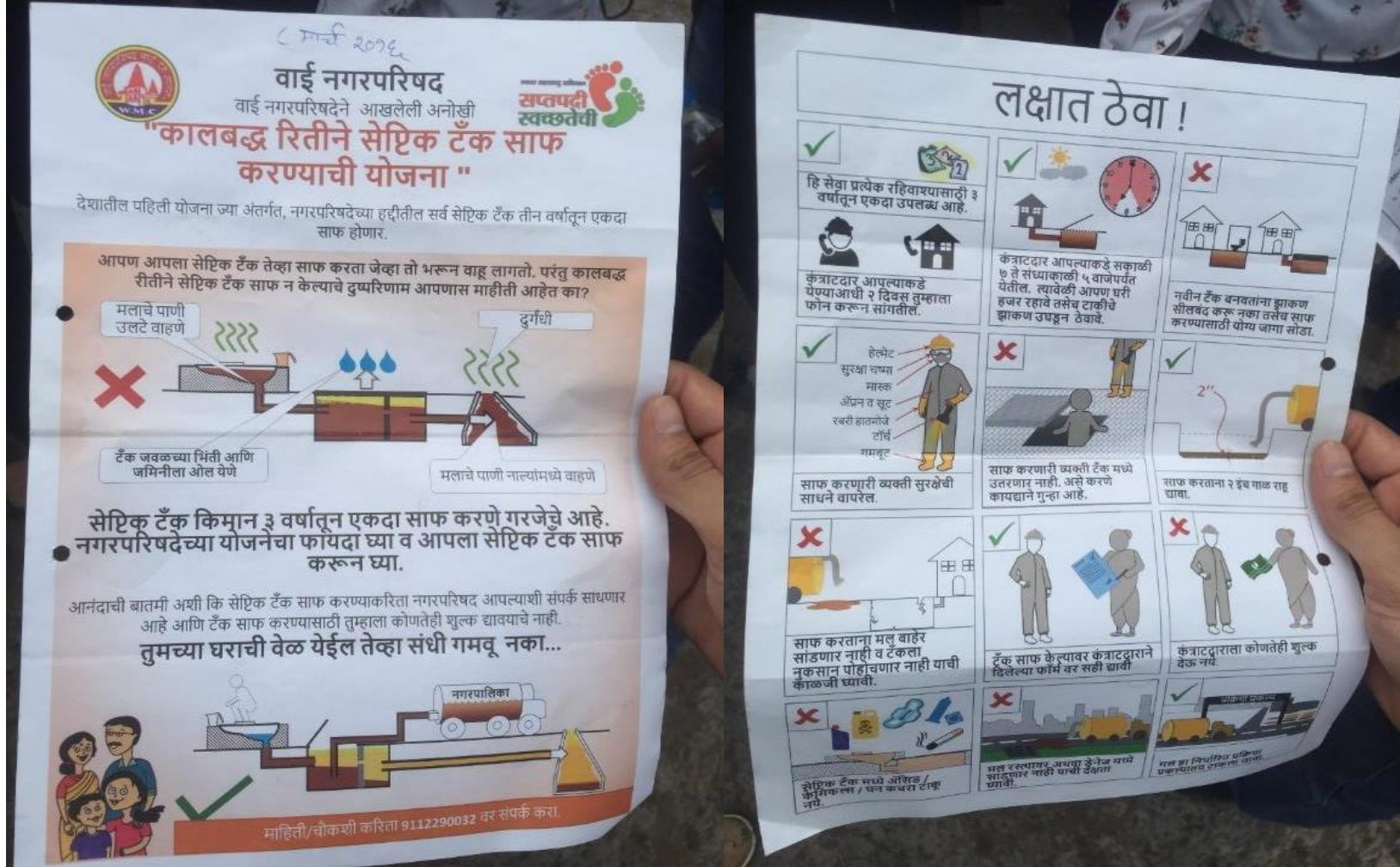
Disposal date: \_\_\_\_\_ Amount Collected from Transporter (if any): \_\_\_\_\_

Signature of authorized signatory and title: \_\_\_\_\_


NOTE: SUBJECT TO THE TERMS AND CONDITIONS OF \_\_\_\_\_ MUNICIPALITY.

<sup>1</sup> Adapted from operative guidelines for septage management for urban and rural local bodies in Tamil Nadu. (2014)


# 8. Awareness generation - pamphlets and house to house visits



## Pamphlets samples



English



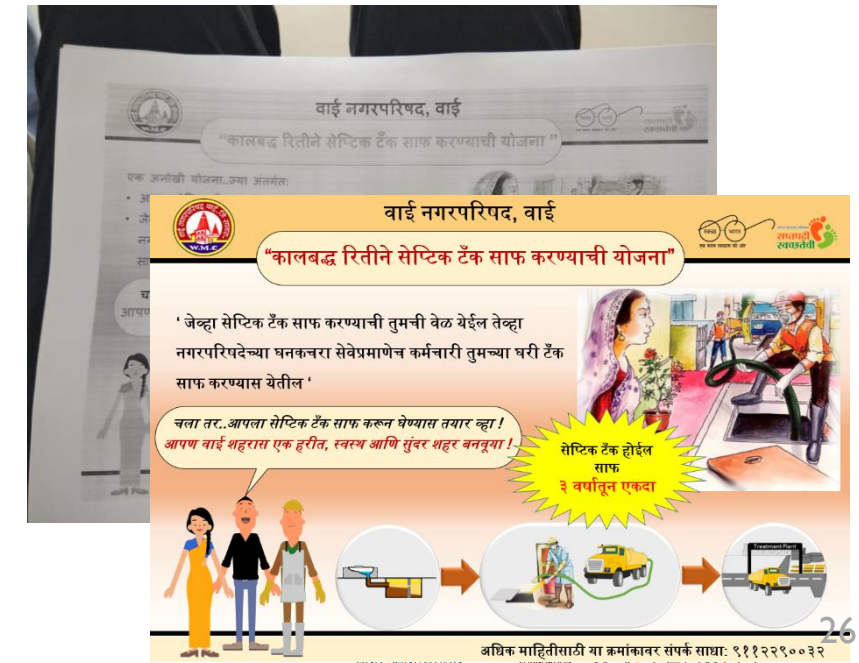
Marathi





# 8. Awareness generation

## - Citywide banners, posters, wall paintings









# Thank you

[cwas@cept.ac.in](mailto:cwas@cept.ac.in)  
[pas.org.in](http://pas.org.in)

## About us

The Center for Water and Sanitation (C-WAS) at CEPT University carries out various activities – action research, training, advocacy to enable state and local governments to improve delivery of services.

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